Effects of oil spill response technologies on the physiological performance of the Arctic copepod Calanus glacialis

A mesocosm study with oil in ice was performed in Van Mijenfjorden, Svalbard to compare effects of the oil spill responses (OSR) in situ burning, chemical dispersion and natural attenuation on the physiological performance of the Arctic copepod Calanus glacialis. Seawater collected from the mesocosms in winter and spring was used in laboratory incubation experiments, where effects on fecal pellet production, egg production and hatching success were investigated over a period of 14 days. Polycyclic aromatic hydrocarbon (PAH) seawater concentrations were lowest in winter. Brine channel formation in spring resulted in an 18 times increase in PAH concentration in the chemical dispersion treatment (1.67 μg L⁻¹), and a 3 fold increase in the natural attenuation (0.36 μg L⁻¹) and in situ burning (0.04 μg L⁻¹) treatments. The physiological performance of female C. glacialis was unaffected by the PAH seawater concentrations. However, a higher mortality and deformity of nauplii was observed in the chemical dispersion treatment, highlighting the importance of considering secondary effects on next generation in future environmental risk assessment of OSR. This study shows that during the ice-covered period, chemical dispersion of oil spills leads to higher PAH exposure than natural attenuation and in situ burning, with potential consequences for recruitment of Arctic copepods.
Acute hyperoxia induces systemic responses with no major changes in peripheral tissues in the Senegalese sole (Solea senegalensis Kaup, 1858)

Senegalese sole Solea senegalensis is currently farmed in recirculation aquaculture systems that often involve water reoxygenation, which in turn may cause acute or prolonged hyperoxia exposures. In order to understand the impact of acute hyperoxia on the fish immune system and peripheral tissues such as gills and gut, Senegalese sole juveniles (30g) were exposed to normoxia (100% O2sat) as control and two hyperoxic conditions (150 and 200% O2sat) and sampled at 4 and 24 h. Fish haematological profile, total and differential blood cell counts and plasma immune parameters were analysed. Histomorphology and Immunofluorescence analyses of gills and intestine were performed, respectively, whereas head-kidney samples were used for assessing the expression of immune-related genes. Results indicate that acute hyperoxia exposure may reduce fish erythrocyte and haemoglobin levels. Moreover, decreases in total leucocytes numbers, circulating lymphocytes, monocytes, alternative complement pathway activity and expression of cyclooxygenase-2 were observed in fish exposed to hyperoxia. In contrast, hyperoxia did not induce major effects on gill histomorphology nor in the protein content of ion and glucose cotransporters as well as a macrophage marker (V-ATPase) in the intestine. Although the activation of humoral mechanisms and immune-related genes were not dramatically affected by acute hyperoxia, the compromised immune cell status and the reduction of some inflammatory indicators are issues to consider under acute hyperoxia conditions.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Porto, Wilfrid Laurier University, Sea8 - Aquacria Piscícolas
Authors: Machado, M. (Ekstern), Malheiro, D. (Ekstern), Couto, A. (Ekstern), Wilson, J. M. (Ekstern), Guerreiro, M. (Ekstern), Azeredo, R. (Ekstern), Svendsen, J. C. (Intern), Afonso, A. (Ekstern), Serradeiro, R. (Ekstern), Costas, B. (Ekstern)
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.36 SJR 1.114 SNIP 1.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.268 SNIP 1.171 CiteScore 3.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.138 SNIP 1.089 CiteScore 2.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.001 SNIP 1.149 CiteScore 3.11
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.151 SNIP 1.174 CiteScore 3.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.196 SNIP 1.265 CiteScore 3.52
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Adaptive differences between wild and farmed trout: linking traits with genomic variation

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Frank-Gopolos, T. (Intern)
Publication date: 2018

Publication information
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research › Ph.D. thesis – Annual report year: 2018

Adaptive Feeding behavior and functional responses in pelagic copepods
Zooplankton may modify their feeding behavior in response to prey availability and presence of predators with implications to populations of both predators and prey. Optimal foraging theory predicts that such responses result in a type II functional response for passive foragers and a type III response for active foragers, with the latter response having a stabilizing effect on prey populations. Here, we test the theoretical predictions and the underlying mechanisms in pelagic copepods that are actively feeding (feeding-current feeders), passively feeding (ambushers), or that can switch between the two feeding modes. In all cases, individual behaviors are consistent with the resulting functional response. Passive ambushing copepods have invariant foraging behavior and a type II functional response, as predicted. When foraging actively, the species with switching capability change its functional response from type II to III and modify its foraging effort in response to prey density and predation risk, also as predicted by theory. The obligate active feeders, however, follow a type II response inconsistent with the theoretical prediction. A survey of the literature similarly finds consistent type II response in ambush feeding copepods, but variable (II or III) responses in active feeders. We examine reasons for why observed behaviors at times deviate from predictions, and discuss the population dynamics and food web implications of the two types of functional responses and their underlying mechanisms.

General information
A generic framework for individual-based modelling and physical-biological interaction

The increased availability of high-resolution ocean data globally has enabled more detailed analyses of physical-biological interactions and their consequences to the ecosystem. We present IBMlib, which is a versatile, portable and computationally effective framework for conducting Lagrangian simulations in the marine environment. The purpose of the framework is to handle complex individual-level biological models of organisms, combined with realistic 3D oceanographic model of physics and biogeochemistry describing the environment of the organisms without assumptions about spatial or temporal scales. The open-source framework features a minimal robust interface to facilitate the coupling between individual-level biological models and oceanographic models, and we provide application examples including forward/backward simulations, habitat connectivity calculations, assessing ocean conditions, comparison of physical circulation models, model ensemble runs and recently posterior Eulerian simulations using the IBMlib framework. We present the code design ideas behind the longevity of the code, our implementation experiences, as well as code performance benchmarking. The framework may contribute substantially to progresses in representing, understanding, predicting and eventually managing marine ecosystems.
A global mismatch in the protection of multiple marine biodiversity components and ecosystem services

The global loss of biodiversity threatens unique biota and the functioning and services of ecosystems essential for human wellbeing. To safeguard biodiversity and ecosystem services, designating protected areas is crucial; yet the extent to which the existing placement of protection is aligned to meet these conservation priorities is questionable, especially in the oceans. Here we investigate and compare global patterns of multiple biodiversity components (taxonomic, phylogenetic and functional), ecosystem services and human impacts, with the coverage of marine protected areas across a nested spatial scale. We demonstrate a pronounced spatial mismatch between the existing degree of protection and all the conservation priorities above, highlighting that neither the world's most diverse, nor the most productive ecosystems are currently the most protected ecosystems. Furthermore, we show that global patterns of biodiversity, ecosystem services and human impacts are poorly correlated, hence complicating the identification of generally applicable spatial prioritization schemes. However, a hypothetical "consensus approach" would have been able to address all these conservation priorities far more effectively than the existing degree of protection, which at best is only marginally better than a random expectation. Therefore, a holistic perspective is needed when designating an appropriate degree of protection of marine conservation priorities worldwide.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Oceans and Arctic, University of Copenhagen, Imperial College London
Authors: Lindegren, M. (Intern), Holt, B. G. (Ekstern), MacKenzie, B. R. (Intern), Rahbek, C. (Ekstern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Scientific Reports
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ISSN (Print): 2045-2322
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A microsatellite baseline for genetic stock identification of European Atlantic salmon (Salmo salar L.)

Atlantic salmon (Salmo salar L.) populations from different river origins mix in the North Atlantic during the marine life stage. To facilitate marine stock identification, we developed a genetic baseline covering the European component of the species’ range excluding the Baltic Sea, from the Russian River Megra in the north-east, the Icelandic Ellidaar in the west, and the Spanish Ulla in the south, spanning 3737 km North to South and 2717 km East to West. The baseline encompasses data for 14 microsatellites for 26,822 individual fish from 13 countries, 282 rivers, and 467 sampling sites. A hierarchy of regional genetic assignment units was defined using a combination of distance-based and Bayesian clustering. At the top level, three assignment units were identified comprising northern, southern, and Icelandic regions. A second assignment level was also defined, comprising eighteen and twenty-nine regional units for accurate individual assignment and mixed stock estimates respectively. The baseline provides the most comprehensive geographical coverage for an Atlantic salmon genetic data-set, and a unique resource for the conservation and management of the species in Europe. It is freely available to researchers to facilitate identification of the natal origin of European salmon.

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Marine Scotland Science, University College Cork, Institute of Marine Research, Queen's University Belfast, University of Exeter, Swansea University, Agri-Food and Biosciences Institute Northern Ireland, Genindex, University of the Highlands and Islands, Universidad de Oviedo, Marine and Freshwater Research Institute, Norwegian Institute for Nature Research, Matís ltd., University of Turku, Knipovich Polar Research Institute of Marine Fisheries and Oceanography, Karelian Research Institute, Rivers and Fisheries Trusts of Scotland (RAFTS)
Pages: 662-674
Annual variation in the composition of major nutrients of the common starfish (Asterias Rubens)

To study the annual variation in the composition of nutrients relevant to pig and poultry feeding, monthly samples of starfish (Asterias Rubens) were taken in Denmark. The effect of different locations and starfish sizes was also assessed. Crude protein (CP) and phosphorus were high from February to May and lower thereafter. The AA profile remained constant and followed the same pattern as CP. An opposite pattern of CP was observed for both ash and calcium. Fat followed no clear annual pattern. Starfish within the smallest size group had the lowest fat and CP levels and the highest ash and calcium levels. The most profound differences between locations were observed in May. The seasonal pattern in chemical composition seemed related to spawning and gonadal developments. Large and medium sized starfish caught between February and May will be most suitable for pig and poultry feed.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Aarhus University
Authors: van der Heide, M. E. (Ekstern), Møller, L. F. (Intern), Petersen, J. K. (Intern), Nørgaard, J. V. (Ekstern)
Pages: 91-97
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Main Research Area: Technical/natural sciences

Publication Information
Journal: Animal Feed Science and Technology
Volume: 238
ISSN (Print): 0377-8401
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.11 SJR 0.903 SNIP 1.425
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.162 SNIP 1.495 CiteScore 1.97
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.234 SNIP 1.71 CiteScore 2.4
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.129 SNIP 1.356 CiteScore 2.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.012 SNIP 1.306 CiteScore 1.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.12 SNIP 1.587 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.147 SNIP 1.423
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.25 SNIP 1.755
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.267 SNIP 1.639
Scopus rating (2007): SJR 0.758 SNIP 1.366
Scopus rating (2006): SJR 0.868 SNIP 1.254
Scopus rating (2005): SJR 0.747 SNIP 1.395
Another paradigm lost? Autumn downstream migration of juvenile brown trout: Evidence for a presmolt migration

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Danish Center for Wild Salmon
Authors: Aarestrup, K. (Intern), Birnie-Gauvin, K. (Intern), Larsen, M. H. (Intern)
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Publication date: 2018
Main Research Area: Technical/natural sciences

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Journal: Ecology of Freshwater Fish
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.061 SNIP 1.247 CiteScore 2.05
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.979 SNIP 0.887 CiteScore 1.65
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.812 SNIP 0.968
Web of Science (2010): Indexed yes
Applying a new ensemble approach to estimating stock status of marine fisheries around the world: Estimating global fisheries status

The exploitation status of marine fisheries stocks worldwide is of critical importance for food security, ecosystem conservation, and fishery sustainability. Applying a suite of data-limited methods to global catch data, combined through an ensemble modeling approach, we provide quantitative estimates of exploitation status for 785 fish stocks. Fifty-six percent (439 stocks) are below BMSY and of these, 261 are estimated to be below 80% of the BMSY level. While the 178 stocks above 80% of BMSY are conventionally considered "fully exploited," stocks staying at this level for many years, forego substantial yield. Our results enable managers to consider more detailed information than simply a categorization of stocks as "fully" or "over" exploited. Our approach is reproducible, allows consistent application to a broad range of stocks, and can be easily updated as new data become available. Applied on an ongoing basis, this approach can provide critical, more detailed information for resource management for more exploited fish stocks than currently available.

General information
State: Published
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Conservation Letters
Participatory management is widely recognised as a working method of paramount importance, based on the principles of knowledge sharing, accountability and legitimacy. Hence, it is broadly considered suitable for addressing issues related to the sustainable development of the seafood industry, and specifically, of the aquaculture system. A survey focused on the current EU regulatory framework was carried out to elicit stakeholders’ preferences, knowledge and experience on key issues for the development of organic aquaculture, supported by science-based regulations. The survey was completed by 65 stakeholders belonging to several categories, and it was supported by the implementation of the Analytic Hierarchy Process method. Stakeholders’ preferences were elicited on organic production methods and control systems, the quality of the environment and organic products, fish health and welfare. The views expressed by the participants revealed both competence and awareness, despite the complexity of the subject. Several ideas and useful suggestions emerged regarding unresolved technical issues. In addition, the need for a targeted communication strategy on the quality of organic aquaculture products and the necessity of fostering European/national programs to support the production and marketing of organic aquaculture products were highlighted.
Både laks og ørred er vilde med nyt gydestryg

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern), Sivebæk, F. (Intern)
Publication date: 2018

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http://www.fiskepleje.dk/nyheder/2018/02/laks-og-ørred-gyde-paa-samme-stryg?id=7c5cc8f6-ccda-46e6-9361-403ca9b18a3&utm_source=newletter&utm_media=mail&utm_campaign=2018_02_09_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2018

Bækørredbestanden og lystfiskeriets betydning i Nørreå 2009 – 2012

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Pedersen, S. (Intern), Ravn, H. D. (Intern), Koed, A. (Intern), Sivebæk, F. (Intern), Aarestrup, K. (Intern), Jepsen, N. (Intern)
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http://www.aqua.dtu.dk/Om_DTU_Aqua/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Publication: Research › Report – Annual report year: 2018

Bioenergetics modeling of the annual consumption of zooplankton by pelagic fish feeding in the Northeast Atlantic
The present study uses bioenergetics modeling to estimate the annual consumption of the main zooplankton groups by some of the most commercially important planktivorous fish stocks in the Northeast Atlantic, namely Norwegian spring-spawning (NSS) herring (Clupea harengus), blue whiting (Micromesistius poutassou) and NEA mackerel (Scomber scombrus). The data was obtained from scientific surveys in the main feeding area (Norwegian Sea) in the period 2005–2010. By incorporating novel information about ambient temperature, seasonal growth and changes in the diet from stomach content analyses, annual consumption of the different zooplankton groups by pelagic fish is estimated. The present study estimates higher consumption estimates than previous studies for the three species and suggests that fish might have a greater impact on the zooplankton community as foragers. This way, NEA mackerel, showing the highest daily consumption rates, and NSS herring, annually consume around 10 times their total biomass, whereas blue whiting consume about 6 times their biomass in zooplankton. The three species were estimated to consume an average of 135 million (M) tonnes of zooplankton each year, consisting of 53–85 M tonnes of copepods, 20–32 M tonnes of krill, 8–42 M tonnes of appendicularians and 0.2–1.2 M tonnes of fish, depending on the year. For NSS herring and NEA mackerel the main prey groups are calanoids and appendicularians, showing a peak in consumption during June and June–July, respectively, and suggesting high potential for inter-specific feeding competition between these species. In contrast, blue whiting maintain a low consumption rate from April to September, consuming mainly larger euphausiids. Our results suggest that the three species can coexist regardless of their high abundance, zooplankton consumption rates and overlapping diet. Accordingly, the species might have niche segregation, as they are species specific, showing annual and inter-annual variability in total consumption of the different prey species. These estimates and their inter-annual and interspecific variation are fundamental for understanding fundamental pelagic predator-prey interactions as well as to inform advanced multispecies ecosystem models.
Breaking resilience for a sustainable future: Thoughts for the anthropocene

Strong resilience of a system usually enables the protection of a status quo. Most resilience studies assume that resilience-building is the central objective of sustainability work. Even though transformation has become a central theme in development and social-ecological debates, questions surrounding the weakening resilience of undesired system states are rarely analyzed. We suggest that resilience studies not only serve to protect systems and feedbacks we want to maintain, but may also help to understand and overcome chronic, undesirable,—and thus wicked—resilience. This contribution focuses on reef fisheries in the Spermonde Island Archipelago in Indonesia, based on social and ecological studies between 2004 and 2016. We identify a number of interlocking wickedly resilient vicious cycles as predominant drivers of the impoverishment of fishing households and the overexploited, polluted and degraded state of the coral reefs that fishers’ livelihoods depend on. We argue that, more often than not in the Anthropocene, breaking resilience has a central role in the pursuit of sustainable human-nature relations. Therefore, the link between the resilience and the transformation debates needs to be much more explicitly made. Breaking interlocking, wicked resilience at multiple levels is needed to move toward sustainable human-nature relations from the local to the global level. There are lacunae in debate, literature, and research practice as to when, where and how wicked resilience might need to be weakened. A more complete resilience lens is particularly needed under Anthropocene conditions to support the unmaking of chronically resilient, anthropogenic systems.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Leibniz Centre for Tropical Marine Research, Universitas Hasanuddin, University of Bremen
Cannibalism as a selective force on offspring size in fish

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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Olsson, K. (Intern), Andersen, K. H. (Intern)
Publication date: 2018
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.313 SNIP 1.348
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.389 SNIP 1.346 CiteScore 3.59
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.494 SNIP 1.486 CiteScore 3.69
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.24 SNIP 1.375 CiteScore 3.55
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.364 SNIP 1.419 CiteScore 3.53
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.475 SNIP 1.305 CiteScore 3.28
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Changes in microbial water quality in RAS following altered feed loading

Intensive recirculating aquaculture systems (RAS) with its hyper-eutrophic water offer ideal conditions for bacterial growth, abundance and activity, potentially affecting fish and system performance. Feed composition and feed loading in particular will have significant impact on organic and inorganic nutrients available for microbial growth in RAS. How these nutrient inputs affect and regulate bacteria in RAS water is, however, unclear. To investigate this relationship and the associated water quality dynamics, the effects of altered feed loading on microbial water quality in RAS was studied. The study included six independent, identical pilot-scale RAS, each with a total volume of 1.7 m3 (make-up water: 80 L/day) stocked with juvenile rainbow trout (Oncorhynchus mykiss). All systems had been operating with constant and identical feed loading of 3.13 kg feed/m3 make-up water for a period of three months before the experiment was initiated. Three controlled levels of feed loading where established in duplicates: no feed (0 kg feed/m3), unchanged feeding (3.13 kg feed/m3), and doubled feeding (6.25 kg feed/m3). The experimental period was seven weeks, where microbial and chemical water quality was monitored weekly. Bacterial activity was measured using Bactiquant®, and microbial hydrogen peroxide degradation. Bacterial abundance was quantified by flow cytometry, and water quality parameters by standardized methods. The study showed that water quality as well as bacterial activity and abundance were affected by the changes in feed loading. The microbial water quality parameters, however, did not respond to feed loading changes as quickly and straightforward as the physicochemical parameters such as nitrate, chemical oxygen demand and biological oxygen demand. It was presumed that the fixed bed biofilter suppressed microbial response in the water phase. Hydrogen peroxide degradation assay proved to have considerable potential for assessing overall bacterial load in RAS water although further adjustments and standardization procedures are required.
Combined effects of microplastics and chemical contaminants on the organ toxicity of zebrafish (Danio rerio)

Microplastics contamination of the aquatic environment is considered a growing problem. The ingestion of microplastics has been documented for a variety of aquatic animals. Studies have shown the potential of microplastics to affect the bioavailability and uptake route of sorbed co-contaminants of different nature in living organisms. Persistent organic pollutants and metals have been the co-contaminants majorly investigated in this field. The combined effect of microplastics and sorbed co-contaminants in aquatic organisms still needs to be properly understood. To address this, we have subjected zebrafish to four different feeds: A) untreated feed; B) feed supplemented with microplastics (LD-PE 125–250 µm of diameter); C) feed supplemented with 2% microplastics to which a mixture of PCBs, BFRs, PFCs and...
methylmercury were sorbed; and D) feed supplemented with the mixture of contaminants only. After 3 weeks of exposure fish were dissected and liver, intestine, muscular tissue and brain were extracted. After visual observation, evaluation of differential gene expression of some selected biomarker genes in liver, intestine and brain were carried out. Additionally, quantification of perfluorinated compounds in liver, brain, muscular tissue and intestine of some selected samples were performed. The feed supplemented with microplastics with sorbed contaminants produced the most evident effects especially on the liver. The results indicate that microplastics alone does not produce relevant effects on zebrafish in the experimental conditions tested; on the contrary, the combined effect of microplastics and sorbed contaminants altered significantly their organs homeostasis in a greater manner than the contaminants alone.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, National Food Institute, Research Group for Analytical Food Chemistry, AZTI Technalia
Authors: Rainieri, S. (Ekstern), Conlledo, N. (Ekstern), Larsen, B. K. (Intern), Granby, K. (Intern), Barranco, A. (Ekstern)
Pages: 135-143
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Volume: 162
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.12 SJR 1.394 SNIP 1.334
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.449 SNIP 1.349 CiteScore 3.71
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.787 SNIP 1.766 CiteScore 4.32
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.552 SNIP 1.596 CiteScore 3.75
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.534 SNIP 1.362 CiteScore 3.31
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.696 SNIP 1.51 CiteScore 3.7
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.657 SNIP 1.491
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.495 SNIP 1.39
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.368 SNIP 1.414
Scopus rating (2007): SJR 1.304 SNIP 1.614
Scopus rating (2006): SJR 1.189 SNIP 1.507
Scopus rating (2005): SJR 1.08 SNIP 1.334
Scopus rating (2004): SJR 0.811 SNIP 0.97
Scopus rating (2003): SJR 0.76 SNIP 1.183
Scopus rating (2002): SJR 0.943 SNIP 1.264
Scopus rating (2001): SJR 0.941 SNIP 1.261
Comparison of vegetable shortening and cocoa butter as vehicles for cortisol manipulation in Salmo trutta
This study demonstrates that vegetable shortening and cocoa butter are two effective vehicles for intraperitoneal cortisol implants in juvenile teleosts, specifically brown trout Salmo trutta, residing in north temperate freshwater environments. Each vehicle showed a different pattern of cortisol elevation. Vegetable shortening was found to be a more suitable vehicle for long-term cortisol elevation [elevated at 3, 6 and 9 days post treatment (dpt)], while cocoa butter may be better suited for short-term cortisol elevation (only elevated at 3 dpt). Additionally, plasma cortisol levels were higher with cortisol–vegetable shortening than with cortisol–cocoa butter implants. Plasma glucose levels were elevated 6 and 9 dpt for fishes injected with cortisol–vegetable shortening, but did not change relative to controls and shams in cortisol–cocoa butter fishes. In conclusion, vegetable shortening and cocoa butter are both viable techniques for cortisol manipulation in fishes in temperate climates, providing researchers with different options depending on study objectives.
Confirmation that pulse and continuous peracetic acid administration does not disrupt the acute stress response in rainbow trout

Peracetic acid (PAA) is considered an eco-friendly alternative to other antimicrobial agents of common use in aquaculture. The literature suggests that fish can habituate to PAA exposure based on a reduction of the fish corticosteroid response to PAA administration after repeated exposures. If that is true, PAA would also be a good option from the point of view of fish physiology. However, stronger evidence is needed to confirm that the use of PAA is welfare-friendly to fish. Besides habituation, other hypothetical factors such as desensitization, physiological exhaustion or PAA-mediated endocrine disruption could potentially explain the reduction in the corticosteroid response after repeated/prolonged PAA exposure. In this study, rainbow trout that had been exposed to PAA for several weeks were challenged with a secondary chasing stressor: fish were pursued with a dipnet for 1 min and their acute response was evaluated by measuring plasma cortisol, plasma glucose, plasma lactate and brain serotonergic activity. All fish were equally able to mount a normal physiological stress response to the secondary stressor independent of previous exposure to PAA. This suggests that the decrease in the cortisol response after repeated exposure to PAA, as seen in previous studies, is a true habituation to PAA administration, which supports the use of PAA as a welfare-friendly antimicrobial agent in aquaculture.

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Conflicts in the coastal zone: human impacts on commercially important fish species utilizing coastal habitat

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Universidade de Lisboa, Swedish University of Agricultural Sciences, Wageningen IMARES, National Research Council of Italy, INRA Institut National de La Recherche Agronomique
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Contrasting physiological responses to future ocean acidification among Arctic copepod populations

Widespread ocean acidification (OA) is modifying the chemistry of the global ocean, and the Arctic is recognised as the region where the changes will progress at the fastest rate. Moreover, Arctic species show lower capacity for cellular homeostasis and acid-base regulation rendering them particularly vulnerable to OA. In the present study, we found physiological differences in OA response across geographically separated populations of the keystone Arctic copepod Calanus glacialis. In copepodite stage CIV, measured reaction norms of ingestion rate and metabolic rate showed severe reductions in ingestion and increased metabolic expenses in two populations from Svalbard (Kongsfjord and Billefjord) whereas no effects were observed in a population from the Disko Bay, West Greenland. At pH 7.87, which has been predicted for the Svalbard west coast by year 2100, these changes resulted in reductions in scope for growth of 19% in the Kongsfjord and a staggering 50% in the Billefjord. Interestingly, these effects were not observed in stage CV copepodites from any of the three locations. It seems that CVs may be more tolerant to OA perhaps due to a general physiological reorganisation to meet low intracellular pH during hibernation. Needless to say, the observed changes in the CIV stage will have serious implications for the C. glacialis population health status and growth around Svalbard. However, OA tolerant populations such as the one in the Disko Bay could help to alleviate severe effects in C. glacialis as a species. This article is protected by copyright. All rights reserved.

General information

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Contrasting responses in the niches of two coral reef herbivores along a gradient of habitat disturbance in the Spermonde Archipelago, Indonesia

Habitat modification of coral reefs is becoming increasingly common due to increases in coastal urban populations. Coral reef fish are highly dependent on benthic habitat; however, information on species-specific responses to habitat change, in particular with regard to trophic strategies, remains scarce. This study identifies variation in the trophic niches of two herbivorous coral reef fishes with contrasting trophic strategies, using Stable Isotopes Bayesian Ellipses in R, along a spatial gradient of changing coral reef habitats. In the parrotfish Chlorurus bleekeri, a roving consumer, the range of δ 15 N and δ 13 C and their niche area displayed significant relationships with the amount of rubble in the habitat. In contrast, the farming damselfish, Dischistodus prosopotaenia, showed a narrow range of both δ 15 N and δ 13 C, displaying little change in niche parameters among sites. This may indicate that parrotfish vary their feeding according to habitat, while the damselfish continue to maintain their turf and invertebrate resources. Assessing isotopic niches may help to better understand the specific trophic responses to change in the environment. Furthermore, the use of isotopic niches underlines the utility of stable isotopes in studying the potential impacts of environmental change on feeding ecology.
Developing and testing a computer vision method to quantify 3D movements of bottom-set gillnets on the seabed

Gillnets are one of the most widely used fishing gears, but there is limited knowledge about their habitat effects, partly due to the lack of methodology to quantify such effects. A stereo imaging method was identified and adapted to quantify the dynamic behaviour of gillnets in-situ. Two cameras took synchronized images of the gear from slightly different perspectives, allowing to estimate the distance from the observation unit to the gear such as in the human 3D vision. The sweeping motion on the seabed and the penetration into the sediment of the leadline of light and heavy commercial bottom gillnets deployed in sandy habitats in the Danish coastal plaice fishery were assessed. The direct physical disruption of the seabed was minimal as the leadline was not penetrating into the seabed. Direct damage to the benthos could however originate from the sweeping movements of the nets, which were found to be higher than usually estimated by experts, up to about 2 m. The sweeping movements were for the most part in the order of magnitude of 10 cm, and resulted in a total swept area per fishing operation lower than any of the hourly swept area estimated for active fishing gears. Whereas the general perception is that heavy gears are more destructive to the habitat, light nets were moving significantly more than heavy ones. The established methodology could be further applied to assess gear dynamic behaviour in situ of other static gears.
Dietary supplementation of yeast (Saccharomyces cerevisiae) improves growth, stress tolerance, and disease resistance in juvenile Nile tilapia (Oreochromis niloticus)

The yeast Saccharomyces cerevisiae is one of the commonest probiotics incorporated in aquafeeds. An 84-day feeding trial was conducted to evaluate the effects of varying dietary inclusions of S. cerevisiae, 0% (control), 3% (YF3), 5% (YF5), and 7% (YF7), on growth, stress tolerance, and disease resistance in juvenile (body mass ~ 21 g) Nile tilapia (Oreochromis niloticus). Fish were randomly distributed in groups of 20 into 12 1-m³ hapas and fed isoenergetic (~ 17 kJ g⁻¹ gross energy) and isonitrogenous (~ 300 g kg⁻¹ crude protein) diets at 3% of their bulk weight daily. Specific growth rates were significantly higher for the yeast-fed fish (0.77–0.78% day⁻¹) than for the control fish (0.60% day⁻¹) and resulted in significantly higher mean final weights for the yeast-treated groups. Protein and lipid retention efficiencies were also significantly higher in the yeast-fed fish than in the control group. In subsequent stress challenge trials, the yeast-fed fish had greater tolerance to acute heat as well as hypoxia exposure than the control fish. Survival rates of the yeast-treated groups following sudden exposure to elevated water temperature (40 °C) ranged from 82.5 to 100% compared to 15% for the control. Mean survival rates following a 24-h hypoxia exposure were also generally significantly higher for the yeast-fed fish. The probiotic groups recorded a relative percent survival (RPS) of 75% after a 14-day Aeromonas hydrophila infection challenge. The results of this study indicate that S. cerevisiae as an additive in Nile tilapia diets has beneficial impacts on growth, stress tolerance, and disease resistance.

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Web of Science (2016): Indexed yes
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Scopus rating (2013): SJR 0.626 SNIP 0.796 CiteScore 1.17
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Scopus rating (2012): SJR 0.599 SNIP 1.04 CiteScore 1.15
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Scopus rating (2011): SJR 0.553 SNIP 0.857 CiteScore 0.99
ISI indexed (2011): ISI indexed yes
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Scopus rating (2010): SJR 0.533 SNIP 0.832
Web of Science (2010): Indexed yes
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Differential expression of gonadotropin and estrogen receptors and oocyte cytology during follicular maturation associated with egg viability in European eel (Anguilla anguilla)

In captivity, oogenesis and ovarian follicle maturation in European eel can be induced experimentally using hormonal therapy. The follicle's ability to respond effectively to the induction of maturation and ovulation, resulting in viable eggs, depends on the oocyte stage at the time of induction. We hypothesized that variation in the expression of key hormone receptors in the ovary and size of oocyte lipid droplets are associated with changes in oocyte stage. Thus, we induced ovarian follicle maturation using a priming dose of fish pituitary extract followed by the administration of a 17α, 20β-dihydroxy-4-pregnen-3-one (DHP) injection. Females were then strip-spawned, the eggs were fertilized in vitro, incubated and larval survival was recorded at 3 days post hatch (dph). The expression of gonadotropin receptors (fshr, lhcgr1 and lhcgr2) and estrogen receptors (esr1, esr2a, esr2b, gpera and gperb) was quantified and the size of oocyte lipid droplets measured. Larval survival at 3 dph was used to differentiate high- and low-quality egg batches. Results showed significantly higher abundance of lhcgr1 and esr2a at priming for high-quality egg batches whereas fshr and gperb transcripts were significantly higher at DHP injection for low-quality egg batches. Therefore, high levels of lhcgr1 and esr2a may be important for attaining follicular maturational competence, while high fshr and gperb mRNA levels may indicate inadequate maturational competence. Furthermore, lipid droplet size at DHP and in ovulated eggs was significantly smaller in high-quality egg batches than in low-quality, which indicates that droplet size may be a useful marker of follicular maturational stage.
Distribution and timing of spawning Faroe Plateau cod in relation to warming spring temperatures

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Oceans and Arctic, University of the Faroe Islands, Faroe Marine Research Institute
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Early life stress induces long-term changes in limbic areas of a teleost fish: the role of catecholamine systems in stress coping

Early life stress (ELS) shapes the way individuals cope with future situations. Animals use cognitive flexibility to cope with their ever-changing environment and this is mainly processed in forebrain areas. We investigated the performance of juvenile gilthead seabream, previously subjected to an ELS regime. ELS fish showed overall higher brain catecholaminergic (CA) signalling and lower brain derived neurotrophic factor (bdnf) and higher cfos expression in region-specific areas. All fish showed a normal cortisol and serotonergic response to acute stress. Brain dopaminergic activity and the expression of the α2A adrenergic receptor were overall higher in the fish homologue to the lateral septum (Vv), suggesting that the Vv is important in CA system regulation. Interestingly, ELS prevented post-acute stress downregulation of the α2A receptor in the amygdala homologue (Dm3). There was a lack of post-stress response in the β2 adrenergic receptor expression and a downregulation in bdnf in the Dm3 of ELS fish, which together indicate an allostatic overload in their stress coping ability. ELS fish showed higher neuronal activity (cfos) post-acute stress in the hippocampus homologue (Dlv) and the Dm3. Our results show clear long-term effects on limbic systems of sebream that may compromise their future coping ability to environmental challenges.

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Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
Effect of bait type and size on catch efficiency of narrow-barred Spanish mackerel (Scomberomorus commerson) in the Persian Gulf handline fisheries

In the Persian Gulf handline fishery, fishers mostly use Cutlassfish (Trichiurus lepturus) bait for targeting narrow-barred Spanish mackerel (Scomberomorus commerson) However, Cutlassfish are expensive compared to other baits and also a commercially important species that is typically exported to Asian countries. In order to conserve Cutlassfish resources and reduce costs of fishing, the effect of changing bait type and size on the catch efficiency and size structure of narrow-barred Spanish mackerel caught in the Persian Gulf handline fishery was investigated. The alternative baits investigated, Indian mackerel (Rastrelliger kanagurta) and artificial bait (lead lure), resulted in a lower overall catch efficiency and a shift in catch pattern towards smaller individuals. The two alternative baits had very similar overall catch efficiencies. The results obtained demonstrate that bait type and size affects both overall catch efficiency and size structure of narrow-barred Spanish mackerel caught in the Persian Gulf handline fishery. This implies that managing bait type and size might complement standard harvest regulations and facilitate changing exploitation pattern in the Persian Gulf handline fishery.
Effect of fish length and nutritional condition on the fecundity of distressed Atlantic cod Gadus morhua from the Baltic Sea: Potential fecundity of Baltic G. Morhua

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Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
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BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
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Scopus rating (2007): SJR 0.996 SNIP 1.06
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Web of Science (2002): Indexed yes
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Effects of artificial lakes on migrating juvenile brown trout (Salmo trutta)

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Effects of chronic bottom trawling on soft-seafloor macrofauna in the Kattegat
Impact studies of chronic bottom trawling aiming to reveal long-term effects on benthic organisms are often hampered by the lack of comparable untrawled conditions and the difficulty in assessing the spatial distribution of trawling intensity. We sampled soft-seafloor macrofauna over a precise trawling gradient in the Kattegat using hourly vessel monitoring systems and logbooks. The gradient included the establishment of a marine protected area (MPA), where trawling intensity declined sharply to zero. Our results show shifts in the macrofauna assemblage and non-linear responses, with decreases in the number and diversity of species at low to medium trawling intensities. The benthic community was dominated by burrowing brittle stars, of which one species, Amphiura chiajei, increased in abundance from low to medium trawling intensities. We interpret this positive response to increasing trawling intensities as a consequence of reduction in predation by benthivorous flatfish and Norway lobster Nephrops norvegicus, which are significant catches of the fishery. The response was supported by a corresponding trend towards lower abundance of the dominating brittle stars following enforcement of the MPA and presumably an increase in benthivore density and predation pressure within the MPA. We conclude that chronic bottom trawling reduces diversity and may boost the abundances of species resistant to bottom trawling. The results emphasize the need to consider food web effects when assessing the impact of bottom trawling.

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Effects of Salinity, Commercial Salts, and Water Type on Cultivation of the Cryptophyte Microalgae Rhodomonas salina and the Calanoid Copepod Acartia tonsa

Marine aquaculture facilities positioned far from the sea need access to seawater (SW); hence, commercial salts are often the chosen solution. In marine hatcheries, most fish larvae require live feed (zooplankton) that are in turn fed with microalgae. The objective of this research was to investigate the applicability of commercial salts and clarify the potential effects on the cultivation of the microalgae Rhodomonas salina and the copepod Acartia tonsa. Three commercial salts were tested, Red Sea Salt (RS), Red Sea – Coral Pro Salt (CP), and Blue Treasure Salt. R. salina was cultured at salinities of 10, 20, and 30 psu resulting in equal growth rates at salinities 20 and 30 in SW and RS mixed with deionized (DI) water. The optimum salinity for R. salina was 29 psu. For A. tonsa eggs, we observed highest hatching success in 30 psu with CP or RS mixed with DI water. The egg hatching success was not affected by salinities 15–40 and optimal hatching was obtained at 27 psu. Results confirm it was possible to use commercial salts for rearing of both R. salina and A. tonsa, widening the application of these species for aquaculture facilities without access to SW.
Environmental calcium and variation in yolk sac size influence swimming performance in larval lake sturgeon (Acipenser fulvescens)

In many animal species, performance in the early life stages strongly affects recruitment to the adult population; however, factors that influence early life history stages are often the least understood. This is particularly relevant for lake sturgeon, Acipenser fulvescens, living in areas where environmental calcium concentrations are declining, partly due to anthropogenic activity. As calcium is important for muscle contraction and fatigue resistance, declining calcium levels could constrain swimming performance. Similarly, swimming performance could be influenced by variation in yolk sac volume, because the yolk sac is likely to affect drag forces during swimming. Testing swimming performance of larval A. fulvescens reared in four different calcium treatments spanning the range of 4-132 mg l-1 [Ca2+], this study found no treatment effects on the sprint swimming speed. A novel test of volitional swimming performance, however, revealed reduced swimming performance in the low calcium environment. Specifically, volitionally swimming larvae covered a shorter distance before swimming cessation in the low calcium environment compared to the other treatments. Moreover, sprint swimming speed in larvae with a large yolk sac was significantly slower than in larvae with a small yolk sac, regardless of body length variation. Thus, elevated maternal allocation (i.e., more yolk) was associated with reduced swimming performance. Data suggest that larvae in low calcium environments or with a large yolk sac exhibit reduced swimming performance and could be more susceptible to predation or premature downstream drift. Our study reveals how environmental factors and phenotypic variation influence locomotor performance in a larval fish.
Essential coastal habitats for fish in the Baltic Sea

Many coastal and offshore fish species are highly dependent on specific habitat types for population maintenance. In the Baltic Sea, shallow productive habitats in the coastal zone such as wetlands, vegetated flads/lagoons and sheltered bays as well as more exposed rocky and sandy areas are utilized by fish across many life history stages including spawning, juvenile development, feeding and migration. Although there is general consensus about the critical importance of these essential fish habitats (EFH) for fish production along the coast, direct quantitative evidence for their specific roles in population growth and maintenance is still scarce. Nevertheless, for some coastal species, indirect evidence exists, and in many cases, sufficient data are also available to carry out further quantitative analyses. As coastal EFH in the Baltic Sea are often found in areas that are highly utilized and valued by humans, they are subjected to many different pressures. While cumulative pressures, such as eutrophication, coastal construction and development, climate change, invasive species and fisheries, impact fish in coastal areas, the conservation coverage for EFH in these areas remains poor. This is mainly due to the fact that historically, fisheries management and nature conservation are not integrated neither in research nor in management in Baltic Sea countries. Setting joint objectives for fisheries management and nature conservation would hence be pivotal for improved protection of EFH in the Baltic Sea. To properly inform management, improvements in the development of monitoring strategies and mapping methodology for EFH are also needed. Stronger international cooperation between Baltic Sea states will facilitate improved management outcomes across ecologically arbitrary boundaries. This is especially important for successful implementation of international agreements and legislative directives such as the Baltic Sea Action Plan, the Marine Strategy Framework Directive, the Habitats Directive, and the Maritime Spatial Planning Directive, but also for improving the communication of information related to coastal EFH among researchers, stakeholders, managers and decision makers. In this paper, efforts are made to characterize coastal EFH in the Baltic Sea, their importance and the threats/pressures they face, as well as their current conservation status, while highlighting knowledge gaps and outlining perspectives for future work in an ecosystem-based management framework.
Evidence from the past: exploitation as cause of commercial extinction of autumn-spawning herring in the Gulf of Riga, Baltic Sea

Historical marine ecology has shown that many exploited animal populations declined before their abundance was quantified by scientists. This situation applies for autumn-spawning herring (Clupea harengus) in the Baltic Sea. This stock used to be the dominant spawning group of herring in the early decades of the 1900s and supported several commercially important fisheries, including in the Gulf of Riga (GoR).

However, the GoR stock declined during the 1960–1970s and has not recovered. Neither the former biomass nor reasons for its decline are known. Here, we recover and analyse historical fishery and biological data and conduct population development simulations to evaluate the hypothesis that exploitation may have been sufficient to lead the stock towards commercial extinction. We found that the estimated exploitation pattern, including exploitation of juveniles, was unsustainable and led to stock decline. The pattern of exploitation of this stock was consistent with that which caused collapses of other herring stocks, which have since recovered. If autumn-spawning herring in the GoR recovers, our findings indicate that this stock could support sustainable annual yields of 4000 t and diversify the fishery resource base, which is presently restricted to a relatively small number of species for essentially local coastal inhabitants.

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University of Tartu
Authors: MacKenzie, B. R. (Intern), Ojaveer, H. (Ekstern)
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BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
Evolution of boldness and life-history in response to selective harvesting

Whether intensive harvesting alters the behavioral repertoire of exploited fishes is currently unknown, but plausible. We extend a fish life-history model to account for boldness as a personality trait that affects foraging intensity, which affects energy intake and risk from predation and fishing gear. We systematically investigate life-history and behavioral trait evolution along the boldness–timidity axis in response to the full range of common selectivity and exploitation patterns in fisheries. In agreement with previous studies, we find that any type of harvesting selects for fast life histories and that merely elevated, yet unselective, fishing mortality favors boldness. We also find that timid-selective fishing (which can be expected in species targeted by active gear types) selects for increased boldness. By contrast, increased timidity is predicted when fishing targets bolder individuals common to passive gears, whether in combination with selection on size or not. Altered behavior caused by intensive harvesting should be commonplace in nature, which can have far-reaching ecological, evolutionary, and managerial impacts. Evolution of timidity is expected to strongly erode catchability, which will negatively affect human well-being and influence the reliability of stock assessments that rely on fishery-dependent data.
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Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
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Scopus rating (2008): SJR 1.589 SNIP 1.379
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.621 SNIP 1.236
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.354 SNIP 1.267
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.558 SNIP 1.553
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.744 SNIP 1.542
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.097 SNIP 1.622
Scopus rating (2002): SJR 1.909 SNIP 1.457
Web of Science (2002): Indexed yes
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Fangstjournalen fejrer 2 år – og går på Facebook

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
First genetic quantification of sex- and stage-specific feeding in the ubiquitous copepod Acartia tonsa

Marine copepods provide the major food-web link between primary producers and higher trophic levels, and their feeding ecology is of acute interest in light of global change impacts on food-web functioning. Recently, quantitative polymerase chain reaction (qPCR) protocols have been developed, which can complement classic diet quantification methods, such as stable isotope or fatty acid analyses tools. Here, we present first results of feeding experiments assessing sex- and stage-specific food intake by the ubiquitous calanoid copepod Acartia tonsa by 18S targeted qPCR and microscopic grazing assessment. In triplicated mixed-diet feeding treatments, three suitable A. tonsa diets, the cryptophyte Rhodomonas balthica, the haptophyte Isochrysis galbana, and the diatom Thalassiosira weissflogii, were offered in equal biomass proportions under constant conditions. Prey uptake substantially varied between different algal species, as did the extent of sex- and stage-specificity of prey uptake. Male adult copepods had higher R. balthica gut contents than females, and nauplii contained more of this prey source than copepodites or adult copepods in mixed treatments. A trend towards higher amounts of ingested T. weissflogii in adult females than in males and in nauplii than in other stages was detected. Genetic gut content quantifications indicated low feeding on I. galbana, and no consistent sex- or stage-specific differences of I. galbana content in A. tonsa. Our results highlight diet-specific feeding differences between Acartia life stages and sexes, which can have implications on food-web dynamics and specific nutrient transfer to higher trophic levels in copepod populations of varying age composition under changing environmental parameters, such as rising temperatures and increasing ocean acidification.
Fishmeal with different levels of biogenic amines in Aquafeed: Comparison of feed protein quality, fish growth performance, and metabolism

The current study investigated the effects of fishmeal quality (low (LB) and high (HB) levels of endogenous biogenic amines) and feed extrusion temperatures (100 and 130 °C) on protein oxidation indicators and amino acids racemization (AAR) in extruded fish feed. Furthermore, the study investigated the accompanying effects on feeding the diets to juvenile rainbow trout (Oncorhynchus mykiss) on fish growth performance, in vivo amino acids (AAs) digestibility, and liver and plasma metabolites following an 8-week feeding trial. A principal component analysis (PCA) showed that better growth performance, secondary oxidation products, and racemized methionine correlated positively with a low content of biogenic amines, whereas the primary oxidation product, protein hydroperoxides, and in vivo AAs digestibility correlated positively with high content of biogenic amines. At an extrusion temperature of 100 °C, the growth performance of the fish decreased when the content of biogenic amines increased. In contrast, at an extrusion temperature of 130 °C, the growth performance was unaffected by the level of biogenic amines. The latter could be a consequence of the higher level of protein oxidation of LB fishmeal compared to HB fishmeal at this temperature. Higher levels of liver pyruvate and plasma lactate together with high level of betaine and AAs in both liver and plasma were associated with the LB fishmeal diets. The lower concentration of AAs
especially in liver of fish fed with HB fishmeal demonstrated that these AAs might not be supplied sufficiently for the
tricarboxylic acid cycle to generate energy and therefore a decreased growth was found in fish fed this diet. Furthermore,
the results indicated that biogenic amines and feed attractants such as betaine are more decisive for evaluating the quality
of fishmeal than protein quality parameters

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, BioMar AS, Aarhus University
Authors: Jasour, M. S. (Ekstern), Wagner, L. (Ekstern), Sundekilde, U. K. (Ekstern), Larsen, B. K. (Intern), Tolderlund
Rasmusen, H. (Ekstern), Harthøj Hjermitslev, N. (Ekstern), Hammershøj, M. (Ekstern), Dalsgaard, A. J. T. (Intern),
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Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
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BFI (2015): BFI-level 2
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Web of Science (2015): Indexed yes
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Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
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Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.263
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.008 SNIP 1.689
Fiskeri efter søfisk: regler, metoder og statistik

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2018

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Flabellum alabastrum deep sea cup coral meadows from West Greenland: Density, catchability and habitat suitability modelling

General information
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Organisations: Arctic Section, National Institute of Aquatic Resources, Section for Marine Living Resources, Natural History Museum of Denmark, Aarhus University
Authors: Jørgensbye, H. (Intern), Tendal, O. S. (Ekstern), Wegeberg, S. (Ekstern), Mosegaard, H. (Intern)
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Scopus rating (2016): CiteScore 2.76 SJR 1.45 SNIP 1.119
BFI (2015): BFI-level 1
Flavobacteria, a Never Ending Threat for Fish: a Review

Purpose of Review In this review, we summarized the most recent findings on the partial and full genome and the phylogenetic structure of genomovars, as well as on virulence factors, vaccine development, and treatment methods of the two fish pathogenic bacteria Flavobacterium psychrophilum and F. columnare. Both species have a widespread distribution and are the causative agents of devastating diseases of both farmed and wild fish. For minimizing the impact of these infections, knowledge on biology and epidemiology of these pathogens is essential. Recent Findings Recent investigations have demonstrated a wide variability with regard to strains and genotypes. For both pathogens, new host species and geographic areas have been identified. For some isolates, a certain degree of host specificity could be demonstrated. Attempts have been undertaken to standardize methods for testing bacteria for resistance to antibiotics. Further, newly developed vaccines and a number of new treatment methods yielded promising results, but fully convincing and generally accepted prophylactic or therapeutic methods are not yet available. Summary In summary, despite intense research in the two species and considerable increase in understanding the host-pathogen relationship, there is still no generally applicable method to reduce the devastating effect of these bacteria species on farmed and wild fish populations.

General information
State: Published
Organisations: National Institute of Aquatic Resources, National Veterinary Institute, Fish Diseases, University of Bern
FluoRAS Sensor - Online organic matter for optimising recirculating aquaculture systems

FluoRAS will develop a sensor that can save recycled fish farms 30% per year in water and energy consumption for water treatment, as well as optimize nitrogen removal. The sensor will be developed in a partnership between engineers (Krüger A / S) and researchers (DTU), and the product will be made available to the entire sector through Danish Aquaculture.

Global aquaculture production is expected to double within the next 15 years. Recycling technology has a great potential for supporting environmentally and economically sustainable production. However, the technology has some challenges in balancing both the maintenance of necessary water quality and water treatment costs. Loss of production due to poor water quality is expensive and can be avoided with correct sensor systems. Accumulation of dissolved organic matter and nutrients in the water reduce the effectiveness of UV treatment, is a source of nutrition for opportunistic pathogens, and reduces the effectiveness of the biofilter's removing ammonia. Modern recycling systems are therefore dependent on a network of online sensors that monitor and respond to changes in water quality, but currently there is a need for a sensor to monitor the accumulation of organic matter. FluoRAS aims to fill this gap in technology by developing an online fluorescence sensor. The sensor is based on non-destructive, online optical technology that does not require chemicals and can run continuously.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Hambly, A. (Intern), Stedmon, C. (Intern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Foraging response and acclimation of ambush feeding and feeding-current feeding copepods to toxic dinoflagellates

Copepods exposed to toxic algae in “black box” incubation experiments show highly varied responses, but the mechanisms cannot be revealed from such experiments and the implications to copepod and phytoplankton population dynamics consequently not evaluated. Here, we use direct video observations to examine the response and temporal acclimation (5 d) of two copepods with different foraging behaviors to toxic dinoflagellates. Feeding-current feeding Temora longicornis and ambush feeding Acartia tonsa were offered three strains of toxic Alexandrium tamarense and a nontoxic control Protoceratium reticulatum. We hypothesize (1) that ambush feeders are less affected by toxic algae than feeding-current feeders, (2) that copepods acclimate to the toxic algae, and (3) that phytoplankton cells previously exposed to copepod cues elicit stronger responses. Both copepod species consumed the toxic algae at a reduced rate and there was no difference in their net-response, but the mechanisms differed. T. longicornis responded in strain-specific
ways by reducing its feeding activity, by rejecting captured algae, or by regurgitating consumed cells. *A. tonsa* reduced its consumption rate, jump frequency, and jump distance on all strains of the toxic dinoflagellate, and most so on copepod-cue induced cells. There was limited acclimation to algal toxins, although some behavioral responses relaxed or intensified during the first one to several days. Mortality rates were low and the various responses, thus, all allow the copepods to survive harmful algal blooms. However, the implications to algal population dynamics are species/strains specific, with only prey selection providing the toxic algae with a competitive advantage.

**General information**

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Authors: Xu, J. (Intern), Nielsen, L. T. (Intern), Kiørboe, T. (Intern)  
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BFI (2016): BFI-level 2  
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73  
BFI (2013): BFI-level 2  
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 2  
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 2  
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59  
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BFI (2010): BFI-level 2  
Scopus rating (2010): SJR 2.38 SNIP 1.425  
Web of Science (2010): Indexed yes  
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Scopus rating (2008): SJR 2.381 SNIP 1.615  
Web of Science (2008): Indexed yes  
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Scopus rating (2005): SJR 2.302 SNIP 1.697
Forbavsende få søørreder fra Mossø

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern), Ravn, H. D. (Intern), Nielsen, J. (Intern)
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Foreningspuljen til vandløbsrestaurering - genskab gydeområder

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
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Forskerne bider sig fast i stenbideren

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Aarestrup, K. (Intern)
Publication date: 2018

Publication information
Gear technical contributions to an ecosystem approach in the Danish bottom set nets fisheries

The European Union is implementing a sustainable fisheries management framework called the Ecosystem Approach to Fisheries. With the main basis provided in the objectives of the Marine Strategy Framework Directive and the Common Fishing Policy (landing obligation). As fishing can affect other components and not just targeted species, with for example physical damage to habitats or discarding of non-target species, the ecosystem as a whole must be considered. Although the fleet has reduced since the mid-1990s, gill- and trammel nets still represent about 80% of the Danish fleet in number of vessels. Gill- and trammel nets have the advantage of low energy consumption and good size selectivity. However, there is limited knowledge about the ecosystem effects of bottom set nets. Focus was given to methodological development (Paper IV), catch pattern (Papers I, II and III) and habitat effects (Paper IV). Regarding catch pattern, one can intend to minimize the catch that is unwanted (Papers I and II), or to maximize the part of the catch that is wanted, e.g., by adjusting the fishing tactic (Paper I) or by improving catch quality of the target species (Paper III).

The limited information on passive gears is partly due to historical focus on active gears, but also because data collection and analysis calls for the development of appropriate innovative assessment methodologies to properly assess the new type of information which has to be gathered as part of an Ecosystem Approach to Fisheries. A stereo imaging method to assess in-situ the dynamic behavior of passive gears was identified, adapted, tested and used (Paper IV). Comparing bottom set nets fishing operations can be challenging as the measure of fishing effort depends on various factors such as the combination of netting characteristics, net length, or soak time. Statistical methods that have recently been developed were identified and used for estimating the relative catch efficiency between two different designs of a passive fishing gear (Paper I) or to standardize data to a wide range of effort variables by including the landed portion of the fishing operation with the use of discard ratios (Paper II).

Gear technologists can play a key role in searching for win-win solutions so that fishing can continue in an ecologically sustainable manner, i.e., avoiding unwanted catch and habitat damage. The selection properties of gillnets may be improved by changing the gear characteristics, e.g., mesh size or netting material, but in many cases the fisher’s operational tactic plays a preponderant role, as new selective technologies involving more complex gear are usually limited in passive fisheries. Gear technological considerations, i.e., gear design and operational tactics, can help to implement an Ecosystem Approach to the Danish bottom set nets fisheries. The effects of gear design, i.e., light and heavy nets, on habitat effects (Paper IV) and fisher’s tactic, i.e., soak duration or choice of target species, on catch pattern and quality (Papers I, II and III) were explored. In Paper I, the effect of fisher’s soak tactic on catch pattern in the Danish gillnet plaice fishery was investigated by estimating the length-dependent catch efficiency, or relative size selectivity, of three different soak patterns, i.e., 12h at day, 12h at night and 24h. By adjusting their soak tactic, i.e., 12h at day, fishers participating in the coastal summer plaice fishery for plaice can maximize their catch by catching more plaice at commercial size when they are more available to the gear, and limit handling time by catching less dab and crabs when they are less available to the gear.

In Paper II, discard ratios of regulated fish species under the landing obligation in the Danish bottom set nets fisheries for cod, plaice and sole in the North Sea were described using the discard data from observers at sea, and the effects of soak duration, depth, latitude and longitude on discards were investigated by the use of a beta distribution. Discard ratios ranged from 1.10 to 100%, with high variability between fishing operations, species and fisheries, discard of undersized individuals due to the use of small mesh sizes in the sole fishery being the main challenge identified. In the North Sea cod fishery, there was a decreased probability of cod discard with depth, with greater effect in the more recent years. In Paper III, the effect of soak time (12 and 24h) on catch quality, as well as if the registered damages on whole fish have an effect on processed products such as fillets, were investigated aboard a coastal gillnetter and at a specialized processing factory. Damage in fish was significantly more likely for whole than filleted fish, and significantly more likely for longer soak times. With the optimum soak time, gillnets can deliver good quality fish.

In Paper VI, a stereo imaging method was identified, adapted, tested and used to quantify in-situ the movement of the leadline of light and heavy gillnets, deployed on the bottom in sandy habitats, using the Danish gillnet coastal plaice fishery as a case study. The direct physical disruption of the seabed of gillnets was minimal as the leadline was moving when they are more available to the gear, and limit handling time by catching less dab and crabs when they are less available to the gear.

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Savina, E. (Intern), Krag, L. A. (Intern), Madsen, N. (Intern), Larsen, F. (Intern), Frandsen, R. (Intern)
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Publisher: National Institute of Aquatic Resources, DTU Aqua. Technical University of Denmark
Global biogeochemical provinces of the mesopelagic zone
Aim: Following the biogeographical approach implemented by Longhurst for the epipelagic layer, we propose here to identify a biogeochemical 3-D partition for the mesopelagic layer. The resulting partition characterizes the main deep environmental biotopes and their vertical boundaries on a global scale, which can be used as a geographical and ecological framework for conservation biology, ecosystem-based management and for the design of oceanographic investigations. Location: The global ocean. Methods: Based on the most comprehensive environmental climatology available to date, which is both spatially and vertically resolved (seven environmental parameters), we applied a combination of clustering algorithms (c-means, k-means, partition around medoids and agglomerative with Ward's linkage) associated with a nonparametric environmental model to identify the vertical and spatial delineation of the mesopelagic layer. Results: First, we show via numerical interpretation that the vertical division of the pelagic zone varies and, hence, is not constant throughout the global ocean. Indeed, a latitudinal gradient is found between the epipelagic-mesopelagic and mesopelagic-bathypelagic vertical limits. Second, the mesopelagic layer is shown here to be composed of 13 distinguishable Biogeochemical Provinces. Each province shows a distinct range of environmental conditions and characteristic 3-D distributions. Main conclusions: The historical definition of the mesopelagic zone is here revisited to define a 3-D geographical framework and characterize all the deep environmental biotopes of the deep global ocean. According to the numerical interpretation of mesopelagic boundaries, we reveal that the vertical division of the zone is not constant over the global ocean (200-1,000 m) but varies between ocean basin and with latitude. We also provide evidence of biogeochemical division of the mesopelagic zone that is spatially structured in a similar way than the epipelagic in the shallow waters but varies in the deep owing to a change of the environmental driving factors.
**Grazer-Induced transcriptomic and metabolomic response of the chain-forming diatom Skeletonema marinoi**

Diatoms and copepods are main actors in marine food webs. The prey-predator interactions between them affect bloom dynamics, shape marine ecosystems and impact the energy transfer to higher trophic levels. Recently it has been demonstrated that the presence of grazers may affect the diatom prey beyond the direct effect of grazing. Here, we investigated the response of the chain-forming centric diatom Skeletonema marinoi to grazer cues, including changes in morphology, gene expression and metabolomic profile. S. marinoi cells were incubated with Calanus finmarchicus or with Centropages typicus and in both cases responded by reducing the chain length, whereas changes in gene expression indicated an activation of stress response, changes in the lipid and nitrogen metabolism, in cell cycle regulation and in frustule formation. Transcripts linked to G protein-coupled receptors and to nitric oxide synthesis were differentially expressed suggesting involvement of these signalling transduction pathways in the response. Downregulation of a lipoxygenase in the transcriptomic data and of its products in the metabolomic data also indicate an involvement of oxylipins. Our data contribute to a better understanding of the gene function in diatoms, providing information on the nature of genes implicated in the interaction with grazers, a crucial process in marine ecosystems.

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Headwater streams in the EU Water Framework Directive: Evidence-based decision support to select streams for river basin management plans

Headwater streams are important contributors to aquatic biodiversity and may counteract negative impacts of anthropogenic stress on downstream reaches. In Denmark, the first river basin management plan (RBMP) included streams of all size categories, most being 2.5-5m wide (headwater streams). Currently, however, it is intensely debated whether the small size and low slopes, typical of Danish streams, in combination with degraded habitat conditions obstruct their ability to fulfill the ecological quality objectives required by the EU Water Framework Directive (WFD). The purpose of this study was to provide an analytically based framework for guiding the selection of headwater streams for RBMP. Specifically, the following hypotheses were addressed: i) stream slope, width, planform, and general physical habitat quality can act as criteria for selecting streams for the next generation of RBMPs, and ii) probability-based thresholds for reaching good ecological status can be established for some or all of these criteria, thus creating a sound, scientifically based, and clear selection process. The hypotheses were tested using monitoring data on Danish streams from the period 2004–2015. Significant linear relationships were obtained between the ecological quality ratio assessed by applying the Danish Stream Fauna Index (DSFIEQR) and stream slope, width, sinuosity, and DHI. The obtained models were used to produce pressure-response curves describing the probability of achieving good ecological status along gradients in these parameters. Next, threshold values for slope, width, sinuosity, and DHI were identified for selected probabilities of achieving minimum good ecological status. The obtained results can support managers and policy makers in prioritizing headwater streams for the 3rd RBMP. The approach applied is broadly applicable and can, for instance, help prioritization of restoration and conservation efforts in different types of ecosystems where the biota can be significantly linked to separate and quantifiable environmental characteristics.
Identifying choke species challenges for an individual demersal trawler in the North Sea, lessons from conversations and data analysis

A likely side-effect of introducing the landing obligation of the 2013 Common Fisheries Policy into mixed fisheries is the occurrence of the “choke species” problem. When discarding no longer is an option, leasing quota or changing fishing practices remain important tools to avoid choke species. Here, the scale and tactics linked to using avoidance behaviour to reduce choke species is investigated by analysing the fishing behaviour of a single demersal trawler in the North Sea. Analysis combined qualitative information collected from through interviews with the vessel owner and skipper, along with quantitative analysis on fisheries data. From the interviews, saithe and cod were identified as potential choke species and subsequent analysis focused on these two species. The analysis of catch and quota composition showed that cod would choke the fishery early if no catch-quota balancing options were available, resulting in a 87% reduction in revenue, while saithe could choke the fishery later, resulting in a 43% reduction in revenue. Avoidance behaviour was difficult to detect from fisheries data, which was explained by avoidance taking primarily place through very fine-scale tactical choices rather than large displacements. Catch composition showed that saithe is distributed more patchily than cod, with most hauls containing small amounts of saithe and a few hauls containing large amounts. In conclusion this paper supplies an view on the choke species problem seen from the perspective of an individual fisher and highlights the amount of real-time tactical decisions and trade-offs that need to be made when operating in mixed-fisheries.
Identifying salmon lice transmission characteristics between Faroese salmon farms

Sea lice infestations are an increasing challenge in the ever-growing salmon aquaculture sector and cause large economic losses. The high salmon production in a small area creates a perfect habitat for parasites. Knowledge of how salmon lice planktonic larvae disperse and spread the infection between farms is of vital importance in developing treatment management plans to combat salmon lice infestations. Using a particle tracking model forced by tidal currents, we show that Faroese aquaculture farms form a complex network. In some cases as high as 10% of infectious salmon lice released at one farm site enter a neighboring fjord containing another farm site. Farms were characterized as emitters, receivers or isolated, and we could identify two clusters of farms that were largely isolated from each other. The farm characteristics are a valuable input for the development of management plans for the entire Faroese salmon industry.
Implications of late-in-life density-dependent growth for fishery size-at-entry leading to maximum sustainable yield

Currently applied fisheries models and stock assessments rely on the assumption that density-dependent regulation only affects processes early in life, as described by stock–recruitment relationships. However, many fish stocks also experience density-dependent processes late in life, such as density-dependent adult growth. Theoretical studies have found that, for stocks which experience strong late-in-life density dependence, maximum sustainable yield (MSY) is obtained with a small fishery size-at-entry that also targets juveniles. This goes against common fisheries advice, which dictates that primarily adults should be fished. This study aims to examine whether the strength of density-dependent growth in actual fish stocks is sufficiently strong to reduce optimal fishery size-at-entry to below size-at-maturity. A size-structured model is fitted to three stocks that have shown indications of late-in-life density-dependent growth: North Sea plaice (Pleuronectes platessa), Northeast Atlantic (NEA) mackerel (Scomber scombrus), and Baltic sprat (Sprattus sprattus balticus). For all stocks, the model predicts exploitation at MSY with a large size-at-entry into the fishery, indicating that late-in-life density dependence in fish stocks is generally not strong enough to warrant the targeting of juveniles. This result lends credibility to the practise of predominantly targeting adults in spite of the presence of late-in-life density-dependent growth.

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Individual transferable quotas, does one size fit all?: Sustainability analysis of an alternative model for quota allocation in a small-scale coastal fishery

The introduction of vessel-based Individual Transferable Quotas (ITQs) in Danish demersal fisheries in 2007 caused significant structural changes in the fleet, towards fewer and larger vessels deploying otter trawls. Mainly smaller coastal vessels deploying Danish seines and gillnets reduced in numbers. The ecosystem effects of this structural change were investigated by comparing the sustainability of a local, small-scale, coastal fishery (Thorupstrand) using Danish seines and gillnets with that of demersal trawling by larger vessels using the same fishing grounds. The fisheries were compared using six ecological and socio-economic indicators: 1), discards (food web), 2), by-catch incidences (food web/biodiversity), 3), seabed impacts, 4), fuel use efficiency, 5), quality of fish landed (food provision), and 6), social and cultural gains and drawbacks (social and cultural features). Except for by-catch of vulnerable species, the fisheries using Danish seines and gillnets scored better in all indicators when compared to otter trawls. Additional commercial and cultural benefits of establishing a local fishery guild with share-owned quotas and land-based facilities were investigated. The results and lessons learned are discussed in the context of an ecosystem approach to fisheries management and the current reform of the common fisheries policy of the European Union.
Influence of swimming behavior of copepod nauplii on feeding of larval turbot (Scophthalmus maximus)

Feeding in larval fish is influenced by a range of factors and among these are the morphological and behavioral characteristics of their prey. We investigated the influence of the swimming behavior of two species of calanoid copepods, Acartia tonsa and Temora longicornis, on larval turbot feeding. The nauplii of these species represent two contrasting swimming behaviors: A. tonsa is a jump-sink type swimmer, while T. longicornis is a cruise swimming type. Three replicates of ten larvae aged 7 and 9 days post hatch (DPH) were observed feeding on one of the two copepod species using a 2-dimensional video setup. The results showed that the duration of aiming postures by turbot larvae was 2.3 times higher when turbot larvae approached T. longicornis as compared to A. tonsa nauplii, indicating that larvae can more easily position themselves, preparing for attack, when the prey is of the jump-sink type. The attack speed of turbot larvae feeding on A. tonsa decreased slightly from DPH 7 to DPH 9, whereas it increased when attacking T. longicornis nauplii. Capture success rate by turbot larvae feeding on A. tonsa was 58% and slightly higher, but not significantly different to capture success rate when feeding on T. longicornis (54%). We conclude that the differences between behavior and other characteristics of these prey species have only minor effect on larval fish feeding, suggesting that copepods species for live feed should be selected according to their ease to culture more than to their species-specific characteristics.
Influence of vegetable diets on physiological and Immune responses to thermal stress in Senegalese sole (Solea senegalensis)

The substitution of fish resources as ingredients for aquafeeds by those based on vegetable sources is needed to ensure aquaculture sustainability in the future. It is known that Senegalese sole (Solea senegalensis) accepts high dietary content of plant ingredients without altering growth or flesh quality parameters. However, scarce information is available regarding the long-term impact of vegetable diets (combining the inclusion of both vegetable protein and oils) on the stress response and immunity of this fish species. This study aims to evaluate the concomitant effect of the extended use of vegetable protein-based diets with fish oil (FO) replacement (0, 50 or 100%) by vegetable oils (VO), on the response to acute (10 min) or prolonged (4 days) stress, induced by thermal shock. Plasma levels of cortisol, glucose and lactate as well as hepatic levels of glucose, glycogen and lactate were evaluated as primary and secondary responses to stress, 6 and 18 months after feeding the experimental diets (6 and 18 MAF). The brain monoaminergic activity in telencephalon and hypothalamus, and non-specific immune parameters were also evaluated. As expected, thermal shock induced an increase in values of plasma parameters related to stress, which was more evident in acute than in prolonged stress.

Stress also affected lactate levels in the liver and the values of the alternative complement pathway-ACH50 in the plasma. Dietary substitution of FO induced an effect per se on some parameters such as decreased hepatic glucose and glycogen levels and peroxidase activity in plasma as well enhanced serotonergic activity in brain of non-stressed fish. The results obtained in some parameters indicate that there is an interaction between the use of vegetable diets with the physiological response to thermal stress, as is the case of the hepatic lactate, serotonergic neurotransmission in brain, and the activity of ACH50 in plasma. These results suggest that the inclusion of VO in plant protein based diets point to a slightly inhibited stress response, more evident for an acute than a prolonged stress.
Insect temperature-body size trends common to laboratory, latitudinal and seasonal gradients are not found across altitudes

Body size affects rates of most biological and ecological processes, from individual performance to ecosystem function, and is fundamentally linked to organism fitness. Within species, size at maturity can vary systematically with environmental temperature in the laboratory and across seasons, as well as over latitudinal gradients. Recent meta-analyses have revealed a close match in the magnitude and direction of these size gradients in various arthropod orders, suggesting that these size responses share common drivers. As with increasing latitude, temperature also decreases with increasing altitude. Although the general direction of body size clines along altitudinal gradients has been examined previously, to our knowledge altitude-body size (A-S) clines have never been synthesised quantitatively, nor compared with temperature-size (T-S) responses measured under controlled laboratory conditions. Here we quantitatively examine variation in intraspecific A-S clines among 121 insect species from 50 different global locations, representing 12 taxonomic orders. While some taxa were better represented in the literature than others, our analysis reveals extensive variation in the magnitude and direction of A-S clines. Following the assumption that temperature on average declines by 1°C per 150 m increase in altitude, order-specific A-S clines in the field appear to deviate from laboratory T-S responses. Specifically, the magnitude of A-S clines and T-S responses are more closely matched in some taxonomic orders (e.g. Diptera) than others (e.g. Orthoptera). These findings contrast with the strong co-variation observed between latitude-size clines and T-S responses, and between laboratory and seasonal T-S responses. The lack of clear size relationships with elevation, and hence temperature, is likely due to the counteracting effects of other major drivers with altitude, including season length and oxygen partial pressure. Switches in voltinism within species across altitude, and the dispersal of individuals across different elevations, may also obscure trends.
Integrated ecological-economic fisheries models - evaluation, review and challenges for implementation

Marine ecosystems evolve under many interconnected and area-specific pressures. In order to fulfill society's intensifying and diversifying needs whilst ensuring ecologically sustainable development, more effective marine spatial planning and broader-scope management of marine resources is necessary. Integrated ecological–socioeconomic fisheries models (IESFM) of marine systems are needed to evaluate impacts and sustainability of potential management actions and understand, and anticipate ecological, economic, and social dynamics at a range of scales from local to national and regional. To make these models most effective, it is important to determine how model characteristics and methods of communicating results influence the model implementation, the nature of the advice that can be provided and the impact on decisions taken by managers. This paper presents a global review and comparative evaluation of 35 IESFM’s applied to marine fisheries and marine ecosystem resources to identify the characteristics that determine their usefulness,
effectiveness and implementation. The focus is on fully integrated models that allow for feedbacks between ecological and human processes though not all the models reviewed achieve that

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Integration of fisheries into marine spatial planning: Quo vadis?

The relationship between fisheries and marine spatial planning (MSP) is still widely unsettled. While several scientific studies highlight the strong relation between fisheries and MSP, as well as ways in which fisheries could be included in MSP, the actual integration of fisheries into MSP often fails. In this article, we review the state of the art and latest progress in research on various challenges in the integration of fisheries into MSP. The reviewed studies address a wide range of integration challenges, starting with techniques to analyse where fishermen actually fish, assessing the drivers for fishermen’s behaviour, seasonal dynamics and long-term spatial changes of commercial fish species under various anthropogenic pressures along their successive life stages, the effects of spatial competition on fisheries and projections on those spaces that might become important fishing areas in the future, and finally, examining how fisheries could benefit from MSP. This paper gives an overview of the latest developments on concepts, tools, and methods. It becomes apparent that the spatial and temporal dynamics of fish and fisheries, as well as the definition of spatial preferences, remain major challenges, but that an integration of fisheries is already possible today.

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Authors: Janssen, H. (Ekstern), Bastardie, F. (Intern), Eero, M. (Intern), Hamon, K. (Ekstern), Hinrichsen, H. H. (Ekstern), Marchal, P. (Ekstern), Nielsen, J. R. (Intern), Pape, O. L. (Ekstern), Schulze, T. (Ekstern), Simons, S. (Ekstern), Teal, L. R. (Ekstern), Tidd, A. (Ekstern)
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Interplay between daily rhythmic serum-mediated bacterial killing activity and immune defence factors in rainbow trout (Oncorhynchus mykiss)

Circadian rhythm is emerging as an important regulator of immune functions. However, there is a paucity of information on the influence of this biological phenomenon in the antimicrobial factors in teleost fish. This study investigated the dynamics and interplay of serum-mediated bacterial killing activity and immune defence factors throughout the light:dark (LD) cycle.
in rainbow trout (Oncorhynchus mykiss). The juvenile fish came from two different emergence time fractions (i.e., late and early) that were believed to exhibit behavioural and physiological differences. Serum collected during the day from fish (mean ± SD: 39.8 ± 6.3 g) reared under 14L:10D photoperiod demonstrated bactericidal activity against Flavobacterium psychrophilum, Yersinia ruckeri and Aeromonas salmonicida subsp. salmonica of varying magnitude, but no significant differences between the emergence fractions were observed. A day-night comparison in the same batch of fish revealed time-of-day dependence in the bactericidal activity against F. psychrophilum and Y. ruckeri amongst emergence fractions. A group of fish (63.3 ± 4.7 g) from each fraction was entrained to 12L:12D photoperiod for 21 days to investigate whether serum bactericidal activity exhibit daily rhythm. Serum-mediated bacterial killing activity against F. psychrophilum and Y. ruckeri displayed significant daily rhythm in both emergence fractions, where the peak of activity was identified during the light phase. Moreover, several serum defence factors manifested variations during the LD cycle, where anti-protease (ANTI) and myeloperoxidase (MPO) activities exhibited significant daily oscillation. However, there were no remarkable differences in the daily changes of serum factors amongst emergence fractions. Acrophase analysis revealed that the peaks of activity of alkaline phosphatase (only in late fraction), ANTI, lysozyme (only in early fraction) and MPO were identified during the light phase and corresponded with the period when serum-mediated bacterial killing activity was also at its highest. The daily dynamics of bactericidal activity and immune defence factors displayed positive correlation, particularly between MPO and, the two pathogens (i.e., F. psychrophilum and Y. ruckeri). Taken together, the study revealed that serum-mediated bacterial killing activity and immune defence factors remarkably varied during the LD cycle in rainbow trout. In addition, the two emergence fractions displayed nearly comparable immunological profiles.
Length measurement methods of Atlantic mackerel (Scomber scombrus) and Atlantic horse mackerel (Trachurus trachurus) – current practice, conversion keys and recommendations

International monitoring of Atlantic mackerel (Scomber scombrus) and Atlantic horse mackerel (Trachurus trachurus), two commercial and ecologically epipelagic fish species in the North Atlantic, is currently done inconsistently. Depending on the country and institute, the length of a specimen is measured as either 'Fork Length', 'Pinched Tail Length' or 'Total Length'. This inconsistency increases the uncertainty of results from data analyses that are based on international data compilations. Here we provide conversion tables between all three methods for both species, based on field sampling in Greenlandic and Scottish waters. For both species, we recommend the use of 'Fork Length' or 'Pinched Tail Length' rather than 'Total Length'.

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Previous studies have shown that four commercially important demersal species, namely cod (Gadus morhua), haddock (Melanogrammus aeglefinus), whiting (Merlangius merlangus) and plaice (Pleuronectes platessa) spawn in distinct areas across the North Sea. Based on two comprehensive ichthyoplankton surveys in 2004 and 2009, the present study uses Generalized Additive Mixed Models (GAMMs) to delimit these spawning grounds using the distribution of recently spawned eggs, investigates their relationship to specific environmental conditions and examines egg dispersal during their development. Results indicate that presence/absence of early stage eggs is more related to temporal and topographic variables, while egg densities are closely linked with hydrography. Egg distribution patterns were relatively consistent during development and only changed near hatching. Compared to historic observations, the location of the spawning grounds appeared stable on the broad scale but centres of egg abundance varied between the surveyed years. Potential effects of long-term climate change and anthropogenic short-term disturbances, such as seismic surveys, on fish reproduction are discussed, pointing out the demand for multi-species studies on these issues.
Liver worm (Contracaecum osculatum) infection status in cod (Gadus morhua) along a transect from the Skagerrak to the eastern Baltic

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Mapping of marine sediments on the Greenland West Coast: contributions of fishers’ ecological knowledge
The rapidly changing climate is pushing the Greenland fishing footprint northwards. With bottom fisheries moving into hitherto unmapped areas, large knowledge gaps regarding the environment in which the fishery takes place ensue. Mapping sediment in these areas is a time consuming and expensive task. Recognizing that fishers have considerable local ecological knowledge can help bridge this knowledge gap. A workshop including ship masters and factory managers on factory trawlers was conducted in order to understand how their knowledge transpired when mapped. This knowledge was compared to historical data and recent bottom photos to develop a better understanding of the differences and similarities between the methods used. The fishers had a good knowledge of sediment types; further some fishers expressed that the topography has changed over time due to intensive trawling. Even though this fishery is undertaken in a high technology environment on large trawlers, the long-time experience of the fishers can contribute to large scale knowledge of marine landscapes. These results are useful when mapping sediments in the future and can also provide a basis for further investigations of changing topography due to trawling

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Marine copepods in the Baltic Sea – physiological responses and adaptation to low salinity

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Marine fisheries in the North East Atlantic: Case Study 4

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Metagenomic insights into zooplankton-associated bacterial communities

Zooplankton and microbes play a key role in the ocean's biological cycles by releasing and consuming copious amounts of particulate and dissolved organic matter. Additionally, zooplankton provide a complex microhabitat rich in organic and inorganic nutrients in which bacteria thrive. In this study, we assessed the phylogenetic composition and metabolic potential of microbial communities associated with crustacean zooplankton species collected in the North Atlantic. Using Illumina sequencing of the 16S rRNA gene we found significant differences between the microbial communities associated with zooplankton and those inhabiting the surrounding seawater. Metagenomic analysis of the zooplankton-associated microbial community revealed a highly specialized bacterial community able to exploit zooplankton as microhabitat and thus, mediating biogeochemical processes generally underrepresented in the open ocean. The zooplankton-associated bacterial community is able to colonize the zooplankton's internal and external surfaces by using a large set of adhesion mechanisms and to metabolize complex organic compounds released or exuded by the zooplankton such as chitin, taurine and other complex molecules. Moreover, the high number of genes involved in iron and phosphorus metabolisms in the zooplankton-associated microbiome suggests that this zooplankton-associated bacterial community mediates specific biogeochemical processes (through the proliferation of specific taxa) that are generally underrepresented in the ambient waters. This article is protected by copyright. All rights reserved.
Microplastic does not magnify the acute effect of PAH pyrene on predatory performance of a tropical fish (Lates calcarifer)

Microplastic (MP) leads to widespread pollution in the marine ecosystem. In addition to the physical hazard posed by ingestion of microplastic particles, concern is also on their potential as vector for transport of hydrophobic contaminants. We studied experimentally the single and interactive effects of microplastic and pyrene, a polycyclic aromatic hydrocarbon, on the swimming behaviour and predatory performance of juvenile barramundi (Lates calcarifer). Juveniles (18+ days post hatch) were exposed to MPs, or pyrene (100nM), or combination of both and feeding rate and foraging activity (swimming) were analyzed. Exposure to MPs alone did not significantly influence feeding performance of the juveniles, while a concentration-response series of pyrene showed strong effect on fish behaviour when concentrations were above 100 nM. In the test of combined MP and pyrene exposure we observed no effect on feeding while swimming speed showed a significant decrease. Thus, our results confirm that short-time exposure to pyrene impacts performance of fish juveniles, while additional exposure to microplastic influenced their activity but not their feeding rate at the given conditions. Further studies on microplastics and other pollutants outlining their combined effects on behaviour and survival of tropical fish are encouraged

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Modeling dispersal and spatial connectivity of macro-invertebrates in Danish waters: An agent-based approach

Marine organisms with planktonic life stages are subjected to extensive transport that results from the interactions between ocean currents and their behavioral responses to environmental changes in the course of their life. Questions remain on the identification of key drivers of dispersal and connectivity in marine populations as they can have multiple uses in the conservation and management of marine ecosystems. Here we investigate whether the open Kattegat, at the entrance to Baltic Sea, is the main source of recruitment to the benthos in associated estuaries and coastal sites through export of planktonic invertebrate larvae. We couple a 3D hydrodynamic ocean model (MIKE3FM) to an agent-based model and simulate the dispersal of macro-invertebrate populations in Danish waters. We use characteristic dispersal traits of the larval community (pelagic larval duration, spawning season, and settling behavior) and simulate dispersal processes within the muddy bottom habitats to derive recruitment rates and potential donor populations leading to population connectivity patterns on each site, one bay and two Danish fjords. We then use our recruitment results in the bay to compare them with field data on species diversity in the same area. A total of 48 different combinations of pelagic larval durations and spawning seasons of macro-invertebrates are simulated in two years 2004 and 2010. From these results, we conclude that the central and southern parts of the Danish waters are identified as important spawning grounds whereas the Kattegat does not seem to be the main provider of larvae into the selected sites. The model also predicts higher abundance and recruitment rates of macro-invertebrate larvae in 2010 compared to 2004. These results are supported by comparable species distribution data collected in the study area. Our results show the importance of an integrated modeling tool combining ocean circulation and biological traits to obtain a detailed description of dispersal and connectivity of macro-invertebrate community in the area, which can provide a more accurate baseline to manage marine biodiversity

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Modelling the recruitment of European eel (Anguilla anguilla) throughout its European range

European eel (Anguilla anguilla) recruitment has been declining at least since the early 1980s at the scale of its distribution area. Since the population is panmictic, its stock assessment should be carried out on a range-wide basis. However, assessing the overall stock during the continental phase remains difficult given its widespread distribution among heterogeneous and separate river catchments. Hence, it is currently considered by the International Council for the Exploration of the Sea (ICES) more feasible to use glass eel recruitment data to assess the status of the overall population. In this study, we used Glass Eel Recruitment Estimation Model (GEREM) to estimate annual recruitment (i) at the river catchment level, a scale for which data are available, (ii) at an intermediate scale (6 European regions), and (iii) at a larger scale (Europe). This study provides an estimate of the glass eel recruitment trend through a single index, which gathers all recruitment time-series available at the European scale. Results confirmed an overall recruitment decline to dramatically low levels in 2009 (3.5% of the 1960–1979 recruitment average) and highlighted a more pronounced decline in the North Sea area compared to elsewhere in Europe.
Molecular and Antigenic Characterization of Piscine orthoreovirus (PRV) from Rainbow Trout (Oncorhynchus mykiss)

Piscine orthoreovirus (PRV-1) causes heart and skeletal muscle inflammation (HSMI) in farmed Atlantic salmon (Salmo salar). Recently, a novel PRV (formerly PRV-Om, here called PRV-3), was found in rainbow trout (Oncorhynchus mykiss) with HSMI-like disease. PRV is considered to be an emerging pathogen in farmed salmonids. In this study, molecular and antigenic characterization of PRV-3 was performed. Erythrocytes are the main target cells for PRV, and blood samples that were collected from experimentally challenged fish were used as source of virus. Virus particles were purified by gradient ultracentrifugation and the complete coding sequences of PRV-3 were obtained by Illumina sequencing. When compared to PRV-1, the nucleotide identity of the coding regions was 80.1%, and the amino acid identities of the predicted PRV-3 proteins varied from 96.7% (λ1) to 79.1% (σ3). Phylogenetic analysis showed that PRV-3 belongs to a separate cluster. The region encoding σ3 were sequenced from PRV-3 isolates collected from rainbow trout in Europe. These sequences clustered together, but were distant from PRV-3 that was isolated from rainbow trout in Norway. Bioinformatic analyses of PRV-3 proteins revealed that predicted secondary structures and functional domains were conserved between PRV-3 and PRV-1. Rabbit antisera raised against purified virus or various recombinant virus proteins from PRV-1 all cross-reacted with PRV-3. Our findings indicate that despite different species preferences of the PRV subtypes, several genetic, antigenic, and structural properties are conserved between PRV-1 and-3.

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N-acetylcysteine manipulation fails to elicit an increase in glutathione in a teleost model

Levels of oxidative stress can be affected by a range of compounds including toxins and pharmaceuticals. Antioxidants are important protective compounds which counteract the damaging effects of oxidative stress. Glutathione (GSH) is one of the main antioxidants for many organisms and can be synthesized from administered N-acetylcysteine (NAC). NAC has therefore often been used in a wide range of taxa to manipulate levels of GSH. Our objective was to validate this approach in a wild temperate teleost fish model, the brown trout (Salmo trutta). We used intracoelomic injections of NAC in saline and vegetable shortening, at two different concentrations (100 and 400 mg/kg), with the appropriate controls and shams, under controlled laboratory settings. We found that NAC failed to elicit an increase in GSH over three time periods and concluded that NAC is not an effective method to enhance GSH levels in teleost fish using the concentrations and vehicles tested here. We emphasize the importance of validation studies across all new species/taxa when possible and suggest that more investigation is required with regard to NAC manipulation in fish if this approach is to be used.
Microplastic is considered a potential threat to marine life as it is ingested by a wide variety of species. Most studies on microplastic ingestion are short-term investigations and little is currently known about how this potential threat has developed over the last decades where global plastic production has increased exponentially. Here we present the first long-term study on microplastic in the marine environment, covering three decades from 1987 to 2015, based on a unique sample set originally collected and conserved for food web studies. We investigated the microplastic concentration in plankton samples and in digestive tracts of two economically and ecologically important planktivorous forage fish species, Atlantic herring (Clupea harengus) and European sprat (Sprattus sprattus), in the Baltic Sea, an ecosystem which is under high anthropogenic pressure and has undergone considerable changes over the past decades. Surprisingly, neither the concentration of microplastic in the plankton samples nor in the digestive tracts changed significantly over the investigated time period. Average microplastic concentration in the plankton samples was 0.21±0.15 particles m⁻³. Of 814 fish examined, 20% contained plastic particles, of which 95% were characterized as microplastic.
Ontogenetic development of attack behaviour by turbot larvae when exposed to copepod prey

Identification of fish larval behavioural traits permitting capture of specific live prey sizes is an important part of optimizing production of marine larvae. We investigated the capture success of turbot larvae (Scophthalmus maximus) at two development stages, 8 and 10 days post-hatch (DPH), when offered small nauplii (129–202 μm), large nauplii (222–278 μm) and copepodites (342–542 μm), of the calanoid copepod Acartia tonsa. At 8 DPH, turbot larvae had the highest capture success (67%) when offered small nauplii, with a lower capture success of large nauplii (27%) but totally lacked the capabilities to capture copepodites. At DPH 10, the larvae increased the capture success of large nauplii (47%) and achieved a few successful attacks on copepodites. Energetically, large nauplii were the most beneficial at both larval development stages. The swimming kinematics of the period prior to a strike by the larva on the copepod was examined, and the approach pattern of the larva was identified as a controlling mechanism for their strike distance, with the initial approach speed of larva at DPH 10 being significantly less than at DPH 8. In all successful attacks, the strike distance was less than 1.17 mm and was significantly lower than unsuccessful attacks. Since the approach pattern of the larva is linked to its capture success, it could be used as the basis for a feeding scheme based on the swimming performance of individual batches of turbot larvae.
Opgang af laks i Ribe Å i 2017

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Overarching sustainability objectives overcome incompatible directions in the Common Fisheries Policy

The lack of clarity in the objectives of the Common Fisheries Policy (CFP) must be addressed to create a more efficient balance across diverse ecological, economic and social dimensions. Particularly economic and social objectives present at an overarching level must be made explicit and addressed in lower level management measures, in order to link them to biological objectives and allow policy to build a balance across types of objectives. Selecting clear objectives is essential, particularly for policy impact assessment. The aim of this paper is to demonstrate how more specific high level objectives to managing fisheries can be derived from stakeholders. The paper first reviews the definition of objectives,
from a historical and conceptual perspective. Secondly, it discusses the issues of manageability and acceptability, and finally describes an articulation of the high level objectives derived from extensive stakeholder consultations at European and regional level. The results from workshops at the European level to identify objectives were further examined at regional level for the Baltic and North Seas in additional individual consultations. The German case addresses two seas (Baltic and North Seas), has a complex governance structure (due to federalism) and significant roles for the three types of actors (industry, government and environmental NGOs). The analysis suggests that establishing higher level sustainability objectives within the CFP can help diverse interest groups to develop a consensus on management actions to meet complex social goals.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Thünen Institute of Sea Fisheries, Marine Institute, Thünen Institute of Baltic Sea Fisheries, National University of Ireland
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- BFI (2008): BFI-level 1
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Ozonation control and effects of ozone on water quality in recirculating aquaculture systems

To address the undesired effect of chemotherapeutants in aquaculture, ozone has been suggested as an alternative to improve water quality. To ensure safe and robust treatment, it is vital to define the ozone demand and ozone kinetics of the specific water matrix to avoid ozone overdose. Different ozone dosages were applied to water in freshwater recirculating aquaculture systems (RAS). Experiments were performed to investigate ozone kinetics and demand, and to evaluate the effects on the water quality, particularly in relation to fluorescent organic matter. This study aimed at predicting a suitable ozone dosage for water treatment based on daily ozone demand via laboratory studies. These ozone dosages will be eventually applied and maintained at these levels in pilot-scale RAS to verify predictions. Selected water quality parameters were measured, including natural fluorescence and organic compound concentration changes during ozonation. Ozone reactions were described by first order kinetics. Organic matter, assessed as chemical oxygen demand and fluorescence, decreased by 25% (low O3), 30% (middle O3) and 53% (high O3), while water transmittance improved by 15% over an 8-day period. No fish mortality was observed. Overall, this study confirms that ozone can improve RAS water quality, provides a better understanding of the ozone decay mechanisms that can be used to define further safe ozone treatment margins, and that fluorescence could be used as a monitoring tool to control ozone. This study might be used as a tool to design ozone systems for full-scale RAS by analysing water sample from the specific RAS in the laboratory.

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Web of Science (2015): Indexed yes
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Performance and precision of double digestion RAD (ddRAD) genotyping in large multiplexed datasets of marine fish species

The development of Genotyping-By-Sequencing (GBS) technologies enables cost-effective analysis of large numbers of Single Nucleotide Polymorphisms (SNPs), especially in "non-model" species. Nevertheless, as such technologies enter a mature phase, biases and errors inherent to GBS are becoming evident. Here, we evaluated the performance of double digest Restriction enzyme Associated DNA (ddRAD) sequencing in SNP genotyping studies including high number of samples. Datasets of sequence data were generated from three marine teleost species (>5500 samples, >2.5×10^12 bases in total), using a standardized protocol. A common bioinformatics pipeline based on STACKS was established, with and without the use of a reference genome. We performed analyses throughout the production and analysis of ddRAD data in order to explore (i) the loss of information due to heterogeneous raw read number across samples; (ii) the discrepancy between expected and observed tag length and coverage; (iii) the performances of reference based vs. de novo approaches; (iv) the sources of potential genotyping errors of the library preparation/bioinformatics protocol, by comparing technical replicates. Our results showed use of a reference genome and a posteriori genotype correction
improved genotyping precision. Individual read coverage was a key variable for reproducibility; variance in sequencing depth between loci in the same individual was also identified as an important factor and found to correlate to tag length. A comparison of downstream analysis carried out with ddRAD vs single SNP allele specific assay genotypes provided information about the levels of genotyping imprecision that can have a significant impact on allele frequency estimations and population assignment. The results and insights presented here will help to select and improve approaches to the analysis of large datasets based on RAD-like methodologies.

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Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Padua, University of Santiago de Compostela, Aristotle University of Thessaloniki, University of Leuven, BMR Genomics, Queen's University Belfast, Science and Advice for Scottish Agriculture, University of Padova, University of Edinburgh, Laboratory of Biodiversity and Evolutionary Genomics, University of Leuven, Ch. de Bériotstraat 32 Box 2439, B-3000 Leuven, Belgium.
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Phytoplankton defence mechanisms: traits and trade-offs: Defensive traits and trade-offs
In aquatic ecosystems, unicellular algae form the basis of the food webs. Theoretical and experimental studies have demonstrated that one of the mechanisms that maintain high diversity of phytoplankton is through predation and the consequent evolution of defence mechanisms. Proposed defence mechanisms in phytoplankton are diverse and include physiological (e.g. toxicity, bioluminescence), morphological (e.g. silica shell, colony formation), and behavioural (e.g. escape response) traits. However, the function of many of the proposed defence mechanisms remains elusive, and the costs and benefits (trade-offs) are often unquantified or undocumented. Here, we provide an overview of suggested phytoplankton defensive traits and review their experimental support. Wherever possible we quantify the trade-offs from experimental evidence and theoretical considerations. In many instances, experimental evidence suggests that defences are costless. However, we argue that (i) some costs materialize only under natural conditions, for example, sinking losses, or dependency on the availability of specific nutrients, and (ii) other costs become evident only under resource-deficient conditions where a rivalry for limiting resources between growth and defence occurs. Based on these findings, we suggest two strategies for quantifying the costs of defence mechanisms in phytoplankton: (i) for the evaluation of defence costs that are realized under natural conditions, a mechanistic understanding of the hypothesized component processes is required; and (ii) the magnitude of the costs (i.e. growth reduction) must be assessed under conditions of resource limitation.
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Scopus rating (2014): SJR 6.032 SNIP 3.828 CiteScore 9.82
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ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
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Scopus rating (2008): SJR 5.267 SNIP 3.868
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Pike stocking for lake restoration

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Piscine orthoreovirus infection in Atlantic salmon (Salmo salar) protects against subsequent challenge with infectious hematopoietic necrosis virus (IHNV)
Infectious hematopoietic necrosis virus (IHNV) is endemic in farmed rainbow trout in continental Europe and in various salmonid fish species at the Pacific coast of North America. IHNV has never occurred in European Atlantic salmon (Salmo salar) farms, but is considered as a major threat for the European salmon industry. Another virus, Piscine orthoreovirus (PRV), is widespread in the sea phase of Atlantic salmon, and is identified as the causative agent of heart and skeletal muscle inflammation. The aim of this study was to investigate the interactions between a primary PRV infection and a secondary IHNV infection under experimental conditions. A PRV cohabitation challenge was performed with Atlantic salmon. At peak of PRV viremia the fish were challenged by immersion with an IHNV genogroup E isolate. Clinical signs and morbidity were monitored. Target organs were sampled at selected time points to assess viral loads of both pathogens. Antiviral immune response and presence of histopathological findings were also investigated. Whereas the PRV-negative/IHNV positive group suffered significant decrease in survival caused by IHNV, the PRV infected groups did not suffer any morbidity and showed negligible levels of IHNV infection. Antiviral response genes were induced, as measured in spleen samples, from PRV infected fish prior to IHNV challenge. In conclusion, PRV-infection protects Atlantic salmon against IHNV infection and morbidity, most likely by inducing a protective innate antiviral response.
Quantifying the influence of geography and environment on the northeast Atlantic mackerel spawning distribution

Mackerel (Scomber scombrus) in the northeast Atlantic have shown changes in distribution at certain times of the year, which have impacted their exploitation and management. In this study, mackerel spawning habitat over 21 recent years was characterised using generalised additive modelling, based on spatial egg density data collected every third year during targeted ichthyoplankton surveys. Mackerel spawning distribution was found to depend primarily on geographical variables (coordinates and bottom depth), with preferred spawning locations on the shelf-edge from the north of the Iberian peninsula to the west of Scotland, with a maximum west of Ireland. Environmental drivers had a lesser influence on egg distribution. Dome shaped relationships were found with temperature and mixed layer depth, with respective optimum at 13 degrees C and around -300m. The model was used to reconstruct maps of the potential habitat (areas where conditions were suitable, but not necessarily used, for spawning). Little changes were observed over the years in the potential habitat, suggesting that the expansion of the egg distribution (realised habitat) was not triggered by changes in the environmental variables investigated. Little evidence was found for density-dependent habitat selection. There was a tendency for mackerel to make more use of areas of lesser suitability in years with large stock size (1992 and 2010). This pattern, however, broke down in 2013, when stock size was the highest, as spawning occurred very south and concentrated in the most suitable habitat.
Recreational sea fishing in Europe in a global context—Participation rates, fishing effort, expenditure, and implications for monitoring and assessment

Marine recreational fishing (MRF) is a high-participation activity with large economic value and social benefits globally, and it impacts on some fish stocks. Although reporting MRF catches is a European Union legislative requirement, estimates are only available for some countries. Here, data on numbers of fishers, participation rates, days fished, expenditures, and catches of two widely targeted species were synthesized to provide European estimates of MRF and placed in the global context. Uncertainty assessment was not possible due to incomplete knowledge of error distributions; instead, a semi-quantitative bias assessment was made. There were an estimated 8.7 million European recreational sea fishers corresponding to a participation rate of 1.6%. An estimated 77.6 million days were fished, and expenditure was €5.9 billion annually. There were higher participation, numbers of fishers, days fished and expenditure in the Atlantic than the Mediterranean, but the Mediterranean estimates were generally less robust. Comparisons with other regions showed that European MRF participation rates and expenditure were in the mid-range, with higher participation in Oceania and the United States, higher expenditure in the United States, and lower participation and expenditure in South America and Africa. For both northern European sea bass (Dicentrarchus labrax, Moronidae) and western Baltic cod (Gadus morhua, Gadidae) stocks, MRF represented 27% of the total removals. This study highlights the importance of MRF and the need for bespoke, regular and statistically sound data collection to underpin European fisheries management. Solutions are proposed for future MRF data collection in Europe and other regions to support sustainable fisheries management.
Resilience in moving water: Effects of turbulence on the predatory impact of the lobate ctenophore Mnemiopsis leidyi: 
Mnemiopsis leidyi feeding in turbulence

Despite its delicate morphology, the lobate ctenophore Mnemiopsis leidyi thrives in coastal ecosystems as an influential zooplankton predator. Coastal ecosystems are often characterized as energetic systems with high levels of natural turbulence in the water column. To understand how natural wind-driven turbulence affects the feeding ecology of M. leidyi, we used a combination of approaches to quantify how naturally and laboratory generated turbulence affects the behavior, feeding processes and feeding impact of M. leidyi. Experiments using laboratory generated turbulence demonstrated that turbulence can reduce M. leidyi feeding rates on copepods and Artemia nauplii by >50%. However, detailed feeding data from the field, collected during highly variable surface conditions, showed that wind-driven turbulence did not affect the feeding rates or prey selection of M. leidyi. Additional laboratory experiments and field observations suggest that the feeding process of M. leidyi is resilient to wind-driven turbulence because M. leidyi shows a behavioral response to turbulence by moving deeper in the water column. Seeking refuge in deeper waters enables M. leidyi to maintain high feeding rates even under high turbulence conditions generated by wind driven mixing. As a result, M. leidyi exerted a consistently high predatory impact on prey populations during highly variable and often energetic wind-driven mixing conditions. This resilience adds to our understanding of how M. leidyi can thrive in a wide spectrum of environments around the world. The limits to this resilience also set boundaries to its range expansion into novel areas.

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Resting eggs in free living marine and estuarine copepods

Marine free living copepods can survive harsh periods and cope with seasonal fluctuations in environmental conditions using resting eggs (embryonic dormancy). Laboratory experiments show that temperature is the common driver for resting egg production. Hence, we hypothesize (i) that seasonal temperature variation, rather than variation in food abundance is the main driver for the occurrence of the resting eggs strategy in marine and estuarine copepod species; and (ii) that the thermal boundaries of the distribution determine where resting eggs are produced and whether they are produced to cope with warm or cold periods. We compile literature information on the occurrence of resting egg
production and relate this to spatio-temporal patterns in sea surface temperature and chlorophyll a concentration obtained from satellite observations. We find that the production of resting eggs has been reported for 42 species of marine free living copepods. Resting eggs are reported in areas with high seasonal variation in sea surface temperature (median range 11°C). Temporal variation in chlorophyll a concentrations, however, seems of less importance. Resting eggs are commonly produced to cope with both warm and cold periods and, depending on the species, they are produced at the upper or lower thermal boundaries of a species' distribution.

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Scopus rating (2009): SJR 0.922 SNIP 1.046
Web of Science (2009): Indexed yes
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Review of State-Space Models for Fisheries Science

Fisheries science is concerned with the management and understanding of the raising and harvesting of fish. Fish stocks are assessed using biological and fisheries data with the goal of estimating either their total population or biomass. Stock assessment models also make it possible to predict how stocks will respond to varying levels of fishing pressure in the future. Such tools are essential with overfishing now reducing stocks and employment worldwide, with in turn many serious social, economic, and environmental implications. Increasingly, a state-space framework is being used in place of deterministic and standard parametric stock assessment models. These efforts have not only had considerable impact on fisheries management but have also advanced the supporting statistical theory and inference tools as well as the required software. An application of such techniques to the North Sea cod stock highlights what should be considered best practices for science-based fisheries management.
Selection for life-history traits to maximize population growth in an invasive marine species
Species establishing outside their natural range, negatively impacting local ecosystems, are of increasing global concern. They often display life-history features characteristic for r-selected populations with fast growth and high reproduction rates to achieve positive population growth rates (r) in invaded habitats. Here, we demonstrate substantially earlier maturation at a 2 orders of magnitude lower body mass at first reproduction in invasive compared to native populations of the comb jelly Mnemiopsis leidyi. Empirical results are corroborated by a theoretical model for competing life-history traits that predicts maturation at the smallest possible size to optimize r, while individual lifetime reproductive success (R0), optimized in native populations, is near constant over a large range of intermediate maturation sizes. We suggest that high variability in reproductive tactics in native populations is an underappreciated determinant of invasiveness, acting as substrate upon which selection can act during the invasion process.
Sex-specific starvation tolerance of copepods with different foraging strategies

Planktonic copepods have sexual dimorphism that can lead to differences in starvation tolerance between genders. Additionally, mating may be energetically costly and thus reduce starvation tolerance. We investigated the influence of sexual dimorphism and mating on starvation tolerance of copepods with different feeding behaviours: Oithona nana (ambusher), Temora longicornis (feeding-current feeder) and Centropages typicus (cruiser). Males of C. typicus and O. nana had a starvation tolerance lower than females, whereas T. longicornis had a similar starvation tolerance between genders. Only O. nana males and females had reduced starvation tolerance when both genders were incubated together, which suggests that mating activities in ambushers have an energetic cost higher than in active feeding copepods. C:N ratios showed a non-significant difference between genders, which indicates that gender differences in starvation tolerance are not due to dissimilarities in lipid reserves. Gender differences in starvation tolerance can be partially explained by body size differences between sexes. This indicates a minor influence of mate-seeking behaviour on male starvation tolerance, likely due to reduced mate-searching behaviour under prolonged starvation. Our results demonstrate that sexual dimorphism can result in different starvation tolerance between copepod genders and that a negative effect of mating on starvation tolerance depends on the foraging strategy.
Shifts in the source and composition of dissolved organic matter in Southwest Greenland lakes along a regional hydro-climatic gradient

Dissolved organic matter (DOM) concentration and quality were examined from Arctic lakes located in three clusters across south-west (SW) Greenland, covering the regional climatic gradient: cool, wet coastal zone; dry inland interior; and
cool, dry ice-marginal areas. We hypothesized that differences in mean annual precipitation between sites would result in a reduced hydrological connectivity between lakes and their catchments and that this concentrates degraded DOM. The DOM in the inland lake group was characterized by a lower aromaticity and molecular weight, a low soil-like fluorescence, and carbon stable isotope (δ13C-DOC) values enriched by ~2‰ relative to the coastal group. DOC-specific absorbance (SUVA254) and DOC-specific soil-like fluorescence (SUVF1) revealed seasonal and climatic gradients across which DOM exhibited a dynamic we term "pulse-process": Pulses of DOM exported from soils to lakes during snow and ice melt were followed by pulses of autochthonous DOM inputs (possibly from macrophytes), and their subsequent photochemical and microbial processing. These effects regulated the dynamics of DOM in the inland lakes and suggested that if circumpolar lakes currently situated in cool wetter climatic regimes with strong hydrological connectivity have reduced connectivity under a drier future climate, they may evolve toward an end-point of large stocks of highly degraded DOC, equivalent to the inland lakes in the present study. The regional climatic gradient across SW Greenland and its influence on DOM properties in these lakes provide a model of possible future changes to lake C cycling in high-latitude systems where climatic changes are most pronounced.

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Short-term exposure to repeated chasing stress does not induce habituation in Senegalese sole, Solea senegalensis

Animals can habituate to certain repeated stressors and reduce the physiological response that such stressor evoked initially. Studies related to stress habituation in fish are scarce and the available data differ depending on the species and on the type, duration and severity of the stressor. The main objective of this study was to investigate the stress response of juvenile Senegalese sole (Solea senegalensis) submitted to repeated chasing stress for 3 days previous to the experiment in order to evaluate the occurrence of habituation to those stress conditions in this fish species. Thus, five different experimental groups were evaluated: not stressed fish (control, C), fish stressed only on the experimental day (ST/naïve), and fish stressed on the experimental day and on the 3 previous days: during the day (ST/Dt), at night (ST/Nt) or both (ST/Dt + Nt). Parameters related to primary and secondary responses to chasing were evaluated in plasma, liver and brain. Chasing in ST/naïve group induced incremented values of plasma cortisol, glucose and lactate but no changes in catecholamine levels compared to controls. In trained fish, higher cortisol but decreased glucose, lactate and catecholamine levels were observed after stress compared to controls and to ST/naïve groups. In the liver, stress did not induce any changes with respect to controls whereas ST/Dt and ST/Dt + Nt showed lower values of glucose and glycogen than stressed naïve fish. In the brain, ST/naïve group presented no significant changes in serotonergic activity. However, incremented serotonergic activity was detected in fish previously trained. Furthermore, dopaminergic activity decreased in diurnal trained and nocturnal trained groups with respect to ST/naïve fish. Crh expression in hypothalamus was higher in ST/naïve fish but not in fish submitted to repeated stress compared to controls. In summary, it seems that there was no habituation to the repeated acute stress protocol in Solea senegalensis in terms of serotonergic activity and cortisol release during the physiological stress response. However, the decreased levels of plasma catecholamines and energy metabolites, and of the hypothalamic crh mRNA abundance and dopaminergic activity, indicate a modulation of the stress response in trained fish. Altogether, the results suggest that either the chasing stressor was too strong or the training period too short for the animals to habituate, indicating that repeated chasing within short periods should be avoided when manipulating fish in order to keep proper welfare conditions in this species.
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Scopus rating (2009): SJR 0.941 SNIP 1.263
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Short-term feed and light deprivation reduces voluntary activity but improves swimming performance in rainbow trout Oncorhynchus mykiss

Rainbow trout Oncorhynchus mykiss (~180 g, 16 °C and <5 kg m−3) that were feed deprived and kept in total darkness showed a significant increase in critical swimming speed (Ucrit) between 1 and 12 days of deprivation (from 3.35 to 4.46 body length (BL) s−1) with no increase in maximum metabolic rate (MMR). They also showed a significant decrease in the estimated metabolic rate at 0 BL s−1 over 12 days which leads to a higher factorial aerobic metabolic scope at day 12 (9.38) compared to day 1 (6.54). Routine metabolic rates were also measured in ~90 g rainbow trout that were swimming freely in large circular respirometers at 16 °C. These showed decreasing consumption oxygen rates and reductions in the amount of oxygen consumed above standard metabolic rate (a proxy for spontaneous activity) over 12 days, though this happened significantly faster when they were kept in total darkness when compared to a 12:12-h light–dark (LD) photoperiod. Weight loss during this period was also significantly reduced in total darkness (3.33% compared to 4.98% total body weight over 12 days). Immunological assays did not reveal any consistent up- or downregulation of antipathogenic and antioxidant enzymes in the serum or skin mucus of rainbow trout between 1 and 12 days of feed and light deprivation. Overall, short periods of deprivation do not appear to significantly affect the performance of rainbow trout which appear to employ a behavioural energy-sparing strategy, albeit more so in darkness than under a 12:12-h LD regime.
Spatial ecology

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Spatio-temporal patterns in coral reef communities of the Spermonde Archipelago, 2012-2014, I: Comprehensive reef monitoring reveals two indices that reflect changes in reef health

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Spatio-temporal patterns in the coral reef communities of the Spermonde Archipelago, 2012–2014, II: Fish assemblages display structured variation related to benthic condition

The Spermonde Archipelago is a complex of ~70 mostly populated islands off Southwest Sulawesi, Indonesia, in the center of the Coral Triangle. The reefs in this area are exposed to a high level of anthropogenic disturbances. Previous studies have shown that variation in the benthos is strongly linked to water quality and distance from the mainland. However, little is known about the fish assemblages of the region and if their community structure also follows a relationship with benthic structure and distance from shore. In this study, we used eight islands of the archipelago, varying in distance from 1 to 55 km relative to the mainland, and 3 years of surveys, to describe benthic and fish assemblages and to examine the spatial and temporal influence of benthic composition on the structure of the fish assemblages. Cluster analysis indicated that distinct groups of fish were associated with distance, while few species were present across the entire range of sites. Relating fish communities to benthic composition using a multivariate generalized linear model confirmed that fish groups relate to structural complexity (rugosity) or differing benthic groups; either algae, reef builders (coral and crustose coralline algae) or invertebrates and rubble. From these relationships we can identify sets of fish species that may be lost given continued degradation of the Spermonde reefs. Lastly, the incorporation of water quality, benthic and fish indices indicates that local coral reefs responded positively after an acute disturbance in 2013 with increases in reef builders and fish diversity over relatively short (1 year) time frames. This study contributes an important, missing component (fish community structure) to the growing literature on the Spermonde Archipelago, a system that features environmental pressures common in the greater Southeast Asian region.
Stakeholder perceptions in fisheries management - Sectors with benthic impacts

The capture fishing sector causes direct and indirect impacts on benthic habitats and associated fauna and flora. Effectiveness of new mitigation measures depends on fishermen's perceptions; their acceptance of, and compliance to, those measures. Accordingly, by means of Advisory Councils (ACs), fisheries stakeholders are encouraged by the Common Fisheries Policy (CFP) reform to contribute to policy formulations. Still, the CFP reform remains unclear about how to possibly incorporate perceptions of specific conservation measures and objectives in practice. Against this background, this article aims at exploring a systematic multi-criteria approach that provides information about stakeholder preferences for objectives reflecting on what is more important to aim for ('what'), mitigation measures as strategies for reaching their objectives ('how'), and accountability options that can enhance trust in the people who carry out management ('who'). The approach applies a pairwise comparison approach to elucidate the stakeholder preferences, and to estimate the relative importance of the different options. It is conducted in the Black Sea, the Mediterranean Sea, the Baltic Sea, and the North Sea. The outcomes of the questionnaire survey succeed in transparently reflecting a diversity of preferences. It is advised that in order to inform the CFP, the ACs develop a user-friendly attractive online version of this approach that can reach multiple stakeholders across Europe and facilitate updates on a continuous basis. In this way the ACs could better facilitate bottom-up participation in fisheries management by representing a wide range of stakeholder perceptions.

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Authors: Soma, K. (Ekstern), Nielsen, J. R. (Intern), Papadopoulou, N. (Ekstern), Polet, H. (Ekstern), Zengin, M. (Ekstern), Smith, C. J. (Ekstern), Eigaard, O. R. (Intern), Sala, A. (Ekstern), Bonanomi, S. (Ekstern), van den Burg, S. W. (Ekstern), Piet, G. J. (Ekstern), Buisman, E. (Ekstern), Gümuş, A. (Ekstern)
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Stocking for pike population enhancement
Stress and disease resilience differences related to emergence time for first feeding in farmed rainbow trout (Oncorhynchus mykiss)

Salmonid individuals show a relatively high variability in the time required to abandon the gravel nest where they hatch, the so-called “emergence time”. Different behavioral and physiological traits have been shown to be associated to that emergence time in wild salmonids. In general, early- and late-emerging fish have traits resembling those of proactive and reactive stress coping styles, respectively. Proactive fish are considered to be more resilient to stress and probably to disease, so it was hypothesized that fish with different emergence time have different ability to resist repeated episodes of stress without suffering deleterious effects on their welfare or health status. In this study, rainbow trout eyed eggs were hatched and larvae were fractionated according to their emergence time (Early fraction: first 20 % of fish to emerge; Intermediate fraction: mid 20 %; Late fraction: last 20 %). When the fish were four months old, part of the fish were exposed to a daily repeated stress protocol for 15 days. The next day, both naïve and repeatedly-stressed fish were exposed to an acute stress challenge. Different plasma (cortisol, glucose, lactate) as well as CNS (serotonergic activity) stress markers were assessed to evaluate the stress resilience of the different fractions. Furthermore, an intraperitoneal infection challenge with Flavobacterium psychrophilum was carried out to assess the disease resilience of the different emergence fractions. Altogether, the results showed that fish from different fractions displayed different activation of the hypothalamus-pituitary-interrenal axis, pointing to a higher stress resilience in the fish with shorter emergence times. However, those differences were not reflected in the ability of the different fractions to grow and perform well in terms of growth, or in the ability to overcome the infection with the bacteria, which was similar for all the emergence fractions. This suggests that discriminating fish according to emergence time would probably have little effect in improving the performance and the welfare of farmed fish.
Sustainable use of marine resources through offshore wind and mussel farm co-location

Marine Spatial Planning (MSP) can offer significant benefits in terms of economic conservation strategies, optimizing spatial planning and minimizing the impact on the environment. In this paper, we focused on the application of multi-criteria evaluation (MCE) technique for co-locating offshore wind farms and open-water mussel cultivation. An index of co-location sustainability (SI) was developed based on the application of MCE technique constructed with physical and biological parameters on the basis of remote-sensing data. The relevant physical factors considered were wind velocity, depth range, concerning the site location for energy production, and sea surface temperature anomaly. The biological variables used were Chlorofill-a (as a measurement of the productivity) and Particle Organic Carbon (POC) concentration, in order to assess their influence on the probable benefits and complete the requirements of this management framework. This SI can be easily implemented to do a first order selection of the most promising areas to be more specifically studied in a second order approach based on local field data.
Swim and fly: escape strategy in neustonic and planktonic copepods

Copepods can respond to predators by powerful escape jumps that in some surface-dwelling forms may propel the copepod out of the water. We studied the kinematics and energetics of submerged and out-of-water jumps of two neustonic pontellid copepods, Anomalocera patersoni and Pontella mediterranea, and one pelagic calanoid copepod, Calanus helgolandicus (euxinus). We show that jumping out of the water does not happen just by inertia gained during the copepod's acceleration underwater, but also requires the force generated by the thoracic limbs when breaking through the water's surface to overcome surface tension, drag and gravity. The timing of this appears to be necessary for success. At the moment of breaking the water interface, the instantaneous velocity of the two pontellids reached 125 cm s⁻¹, while their maximum underwater speed (115 cm s⁻¹) was close to that of similarly sized C. helgolandicus (106 cm s⁻¹). The average specific power produced by the two pontellids during out-of-water jumps (1700-3300 W kg⁻¹ muscle mass) was close to that during submerged jumps (900-1600 W kg⁻¹ muscle mass) and, in turn, similar to that produced during submerged jumps of C. helgolandicus (1300 W kg⁻¹ muscle mass). The pontellids may shake off water adhering to their body by repeated strokes of the limbs during flight, which leads to a slight acceleration in the air. Our observations suggest that out-of-water jumps of pontellids are not dependent on any exceptional ability to perform this behavior but have the same energetic cost and are based on the same kinematic patterns and contractive capabilities of muscles as those of copepods swimming submerged.

General information

State: Published
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Scopus rating (2013): SJR 1.719 SNIP 1.323 CiteScore 2.75
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Temperature induced variation in gene expression of thyroid hormone receptors and deiodinases of European eel (Anguilla anguilla) larvae

Thyroid hormones (THs) are key regulators of growth, development, and metabolism in vertebrates and influence early life development of fish. TH is produced in the thyroid gland (or thyroid follicles) mainly as T4 (thyroxine), which is metabolized to T3 (3,5,3'-triiodothyronine) and T2 (3,5-diiodothyronine) by deiodinase (DIO) enzymes in peripheral tissues. The action of these hormones is mostly exerted by binding to a specific nuclear thyroid hormone receptor (THR). In this study, we i) cloned and characterized thr sequences, ii) investigated the expression pattern of the different subtypes of thr and dios, and iii) studied how temperature affects the expression of those genes in artificially produced early life history stages of European eel (Anguilla anguilla), reared in different thermal regimes (16, 18, 20 and 22°C) from hatch until first-feeding. We identified 2 subtypes of thr (thrα and thrβ) with 2 isoforms each (thrαA, thrαB, thrβA, thrβB) and 3 subtypes of deiodinases (dio1, dio2, dio3). All thr genes identified showed high similarity to the closely related Japanese eel (Anguilla japonica). We found that all genes investigated in this study were affected by larval age (in real time or at specific developmental stages), temperature, and/or their interaction. More specifically, the warmer the temperature the earlier the expression response of a specific target gene. In real time, the expression profiles appeared very similar and only shifted with temperature. In developmental time, gene expression of all genes differed across selected developmental stages, such as at hatch, during teeth formation or at first-feeding. Thus, we demonstrate that the expression of thr and dios show sensitivity to temperature and are involved in and during early life development of European eel.
Testing spatial heterogeneity with stock assessment models

This paper describes a methodology that combines meta-population theory and stock assessment models to gain insights about spatial heterogeneity of the meta-population in an operational time frame. The methodology was tested with stochastic simulations for different degrees of connectivity between sub-populations and applied to two case studies, North Sea cod (Gadus morua) and Northeast Atlantic sardine (Sardina pilchardus). Considering that the biological components of a population can be partitioned into discrete spatial units, we extended this idea into a property of additivity of sub-population abundances. If the additivity results hold true for putative sub-populations, then assessment results based on sub-populations will provide information to develop and monitor the implementation of finer scale/local management. The simulation study confirmed that when sub-populations are independent and not too heterogeneous with regards to productivity, the sum of stock assessment model estimates of sub-populations’ SSB is similar to the SSB estimates of the meta-population. It also showed that a strong diffusion process can be detected and that the stronger the connection between SSB and recruitment, the better the diffusion process will be detected. On the other hand it showed that weak to moderate diffusion processes are not easy to identify and large differences between sub-populations productivities may be confounded with weak diffusion processes. The application to North Sea cod and Atlantic sardine exemplified how much insight can be gained. In both cases the results obtained were sufficiently robust to support the regional analysis.

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, European Commission - Joint Research Center, Instituto Português do Mar e da Atmosfera, IFREMER, AZTI Technalia, Instituto Español de Oceanografía, Cefas
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Testing three common stocking methods: Differences in smolt size, migration rate and timing of two strains of stocked Atlantic salmon (Salmo salar)

The influence of three common stocking practices for two strains (Åtran and Burrishoole) of hatchery-reared Atlantic salmon, Salmo salar, on smolt size, migration probability and migration timing were investigated in situ. Using a common garden experiment, fish from these populations were released as fry, half-year olds and one-year olds. Our results indicate that fish released at the fry and half-year stage produce smaller smolts, and migrate later in the year than their counterparts released at one-year of age, for both the Åtran and the Burrishoole populations. While fry had the lowest probability of migration, half-year old releases had greater migration rates than one-year olds of the same strain. Additionally, Åtran fish tended to migrate earlier in the year than Burrishoole fish of the same age. Our findings highlight the variability that exists among individuals and populations due to inherited factors, and emphasize the importance of considering age of fish and time spent in the hatchery when stocking populations in the wild to maximize smolt output.

General information
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The future of fish passage science, engineering, and practice

Much effort has been devoted to developing, constructing and refining fish passage facilities to enable target species to pass barriers on fluvial systems, and yet, fishway science, engineering and practice remain imperfect. In this review, 17 experts from different fish passage research fields (i.e., biology, ecology, physiology, ecohydraulics, engineering) and from different continents (i.e., North and South America, Europe, Africa, Australia) identified knowledge gaps and provided a roadmap for research priorities and technical developments. Once dominated by an engineering-focused approach, fishway science today involves a wide range of disciplines from fish behaviour to socioeconomics to complex modelling of passage prioritization options in river networks. River barrier impacts on fish migration and dispersal are currently better understood than historically, but basic ecological knowledge underpinning the need for effective fish passage in many regions of the world, including in biodiversity hotspots (e.g., equatorial Africa, South-East Asia), remains largely unknown. Designing efficient fishways, with minimal passage delay and post-passage impacts, requires adaptive management and continued innovation. While the use of fishways in river restoration demands a transition towards fish passage at the community scale, advances in selective fishways are also needed to manage invasive fish colonization. Because of the erroneous view in some literature and communities of practice that fish passage is largely a proven technology, improved international collaboration, information sharing, method standardization and multidisciplinary training are needed. Further development of regional expertise is needed in South America, Asia and Africa where hydropower dams are currently being planned and constructed.
When microplastics pollute fish habitats, it may be ingested by fish, thereby contaminating fish with sorbed contaminants. The present study investigates how combinations of halogenated contaminants and microplastics associated with feed are able to alter toxicokinetics in European seabass and affect the fish. Microplastic particles (2%) were added to the feed either with sorbed contaminants or as a mixture of clean microplastics and chemical contaminants, and compared to feed containing contaminants without microplastics. For the contaminated microplastic diet, the accumulation of polychlorinated biphenyls (PCBs) and brominated flame retardants (BFRs) in fish was significantly higher, increasing up to 40 days of accumulation and then reversing to values comparable to the other diets at the end of accumulation. The significant gene expression results of liver (cyp1a, il1β, gstα) after 40 days of exposure indicate that microplastics might indeed exacerbate the toxic effects (liver metabolism, immune system, oxidative stress) of some chemical contaminants sorbed to microplastics. Seabass quickly metabolised BDE99 to BDE47 by debromination, probably mediated by deiodinase enzymes, and unlike other contaminants, this metabolism was unaffected by the presence of microplastics. For the other PCBs and BFRs, the elimination coefficients were significantly lower in fish fed the diet with contaminants sorbed to microplastic compared to the other diets. The results indicate that microplastics affects liver detoxification and lipid distribution, both of which affect the concentration of contaminants.
The lives and times of jellyfish: Modelling the population dynamics and ecological role of jellyfish in marine pelagic ecosystems

General information
State: Accepted/In press
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Publication date: 2018

The predictability of a lake phytoplankton community, over time-scales of hours to years

Forecasting changes to ecological communities is one of the central challenges in ecology. However, nonlinear dependencies, biotic interactions and data limitations have limited our ability to assess how predictable communities are. Here, we used a machine learning approach and environmental monitoring data (biological, physical and chemical) to assess the predictability of phytoplankton cell density in one lake across an unprecedented range of time-scales. Communities were highly predictable over hours to months: model R² decreased from 0.89 at 4 hours to 0.74 at 1 month, and in a long-term dataset lacking fine spatial resolution, from 0.46 at 1 month to 0.32 at 10 years. When cyanobacterial and eukaryotic algal cell densities were examined separately, model-inferred environmental growth dependencies matched laboratory studies, and suggested novel trade-offs governing their competition. High-frequency monitoring and machine learning can set prediction targets for process-based models and help elucidate the mechanisms underlying ecological dynamics.

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Swiss Federal Institute of Aquatic Science and Technology, University of Saskatchewan
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Publication date: 2018
Main Research Area: Technical/natural sciences
The role of shellfish aquaculture in reduction of eutrophication in an urban estuary

Mitigating coastal eutrophication is a global challenge. In many places where land-based management has reduced nutrient discharges, coastal waterbodies remain impaired. This study examined ‘bioextraction’ of nutrients from the water by oyster aquaculture in Long Island Sound, Connecticut, as an example of how aquaculture might complement land-based measures in urban estuaries. Eutrophication status, nutrient removal, and ecosystem service value were estimated through eutrophication assessment, application of hydrologic, circulation, and local- and ecosystem-scale models, and economic valuation. System-scale modeling estimated that current oyster aquaculture, via sequestration into tissue and shell only, removes an equivalent of 1.31%, and expanded production could remove 2.68%, of total annual land-based nitrogen inputs by aquaculture alone. Up-scaled local-scale results were similar to results from the system-scale modeling, suggesting that this upscaling method could be useful in waterbodies without circulation models. The minimum value of the ecosystem service of nitrogen removed by oyster production was estimated by means of an avoided costs method, which uses the cost of alternative nutrient management measures such as wastewater treatment and urban Best Management Practices to estimate the value of the removed nitrogen, to be $8.5 million per year, with maximum value at expanded production of $470 million per year. Removal and value estimates are conservative because they do not include removal by clams in Connecticut due to the lack of a clam model, or by oysters and clams in New York due to data limitations, nor denitrification losses. If oyster associated removal from all Connecticut and New York lease acres (5% of bottom area) and expanded production could remove 2.68%, of total annual land-based nitrogen inputs by aquaculture alone, nitrogen removal estimates increase to 10% – 30% of total annual inputs. The total N removal could be higher if removal by clams is included. Additional research is needed for inclusion of shellfish growers in nutrient trading programs. These optimistic results are specific to Long Island Sound but the modeling approach is transferable and can be used to evaluate possible contribution by shellfish aquaculture in other urban estuaries.

General information

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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, National Centers for Coastal Ocean Science, New University of Lisbon, NOAA, HDR Engineering Incorporated, New Hampshire Department of Environmental Services, Jackson Estuarine Laboratory, Northern Economics, Inc., East Coast Shellfish Growers Association, U.S. Environmental Protection Agency, Environmental Protection Agency Long Island Sound Office

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The skeptical optimist: challenges and perspectives for the application of environmental DNA in marine fisheries

Application of environmental DNA (eDNA) analysis has attracted the attention of researchers, advisors and managers of living marine resources and biodiversity. The apparent simplicity and cost-effectiveness of eDNA analysis make it highly attractive as species distributions can be revealed from water samples. Further, species-specific analyses indicate that eDNA concentrations correlate with biomass and abundance, suggesting the possibility for quantitative applications estimating abundance and biomass of specific organisms in marine ecosystems, such as for stock assessment. However, the path from detecting occurrence of an organism to quantitative estimates is long and indirect, not least as eDNA concentration depends on several physical, chemical and biological factors which influence its production, persistence and transport in marine ecosystems. Here, we provide an overview of basic principles in relation to eDNA analysis with potential for marine fisheries application. We describe fundamental processes governing eDNA generation, breakdown and transport and summarize current uncertainties about these processes. We describe five major challenges in relation to application in fisheries assessment, where there is immediate need for knowledge building in marine systems, and point to apparent weaknesses of eDNA compared to established marine fisheries monitoring methods. We provide an overview of emerging applications of interest to fisheries management and point to recent technological advances, which could improve analysis efficiency. We advise precaution against exaggerating the present scope for application of eDNA analysis in fisheries monitoring, but also argue that with informed insights into strengths and limitations, eDNA analysis can become an integrated tool in fisheries assessment and management.
The UV filtering potential of drop-casted layers of frustules of three diatom species

Diatoms are in focus as biological materials for a range of photonic applications. Many of these applications would require embedding a multitude of diatoms in a matrix (e.g. paint, crème or lacquer); however, most studies on the photonic and spectral properties of diatoms frustules (silica walls) have been carried out on single cells. In this study, for the first time, we test the spectral properties of layers of frustules of three diatom species (Coscinodiscus granii, Thalassiosira punctifera and Thalassiosira pseudonana), with special focus on transmission and reflectance in the UV range. The transmittance efficiency in the UV A and B range was: T. pseudonana (56–59%) > C. granii (53–54%) > T. punctifera (18–21%) for the rinsed frustules. To investigate the underlying cause of these differences, we performed X-ray scattering analysis, measurement of layer thickness and microscopic determination of frustule nanostructures. We further tested dried intact cells in the same experimental setup. Based on the sedata we discuss the relative importance of crystal structure properties, nanostructure and quantity of material on the spectral properties of diatom layers. Characterization of the UV protection performance of layers of diatom frustules is of central relevance for their potential use as innovative bio-based UV filters.

General information

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Tracking anguillid eels: five decades of telemetry-based research

Advances in telemetry technologies have provided new opportunities to reveal the often-cryptic spatial ecology of anguillid eels. Herein we review 105 studies published between 1972 and 2016 that used a variety of telemetry technologies to study the movements of eels in a variety of habitats. Eight anguillid species have been tracked in three main geographical locations: Western Europe, the north-eastern part of North America and Australasia. Telemetry has proven to be an effective method for determining patterns of yellow eel movements in continental waters. It has also been used extensively to investigate the migratory behaviour of maturing eels as they leave fresh water to reach the sea. Among recent findings is the observation that downstream migration in continental waters is quite discontinuous, characterised by extended...
stopovers. Reconstructed migration routes in the open ocean obtained from satellite tags have provided indications of
spawning areas, extensive vertical migrations and initial clues about the orientation mechanisms at sea. Telemetry studies
have also revealed apparent evidence of predation by marine mammals and fish at sea, suggesting a significant natural
source of mortality during the eel spawning migration. Finally, we discuss some limitations of telemetry technology and
future directions, as well as associated challenges, to the developing field of eel spatial ecology.

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Universite Laval,
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Scopus rating (2010): SJR 0.849 SNIP 0.87
Web of Science (2010): Indexed yes
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Scopus rating (2008): SJR 1.066 SNIP 1.007
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.062 SNIP 1.01
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.08 SNIP 1.037
Scopus rating (2005): SJR 0.994 SNIP 1.058
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.685 SNIP 0.847
Transgenerational interactions between pesticide exposure and warming in a vector mosquito

While transgenerational plasticity may buffer ectotherms to warming and pesticides separately, it remains unknown how combined exposure to warming and pesticides in the parental generation shapes the vulnerability to these stressors in the offspring. We studied the transgenerational effects of single and combined exposure to warming (4°C increase) and the pesticide chlorpyrifos on life history traits of the vector mosquito Culex pipiens. Parental exposure to a single stressor, either warming or the pesticide, had negative effects on the offspring: both parental exposure to warming and to the pesticide resulted in an overall lower offspring survival, and a delayed offspring metamorphosis. Parental exposure to a single stressor did, however, not alter the vulnerability of the offspring to the same stressor in terms of survival. Parental pesticide exposure resulted in larger offspring when the offspring experienced the same stressor as the parents. Within both the parental and offspring generations, warming made the pesticide more toxic in terms of survival. Yet, this synergism disappeared in the offspring of parents exposed to both stressors simultaneously because in this condition the pesticide was already more lethal at the lower temperature. Our results indicate that transgenerational effects will not increase the ability of this vector species to deal with pesticides in a warming world. Bifactorial transgenerational experiments are crucial to understand the combined impact of warming and pesticides across generations, hence to assess the efficacy of vector control in a warming world.
Unraveling the size-dependent optical properties of dissolved organic matter
The size-dependent optical properties of dissolved organic matter (DOM) from four Swedish lakes were investigated using High Performance Size Exclusion Chromatography (HPSEC) in conjunction with online characterization of absorbance (240–600 nm) and fluorescence (excitation: 275 nm, emission: 300–600 nm). The molecular size of chromophoric DOM (CDOM) was consistently higher than that of fluorescent DOM (FDOM), with an average difference of 0.37 kDa. The relative abundance of FDOM vs. CDOM ranged from 0.3 to 0.7 across lakes, and increased with decreasing average molecular size. Across sites, the CDOM spectral slopes of the large molecular size fraction were highly similar while the low molecular size fraction differed and contributed to different bulk spectral slopes. Our results indicate structural congruence of high molecular size DOM across systems while lake trophic status determined the characteristics of the low size range. Furthermore, the combination of HPSEC and parallel factor analysis (HPSEC-PARAFAC2) allowed the decomposition of DOM fluorescence chromatograms. Three humic-like components and one protein-like component with broadly overlapping molecular size distributions were identified. This overlap provides further evidence for the supramolecular assembly hypothesis since fluorophores, as revealed by PARAFAC2, occur in aggregates of overlapping molecular size. Our results further suggest a link between the molecular size of these fluorophores and the associated supramolecular assemblies. This study demonstrates the potential for HPSEC and novel mathematical approaches to provide unprecedented insights into the relationship between optical and chemical properties of DOM in aquatic systems.

General information
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Using collective intelligence to identify barriers to teaching 12–19 year olds about the ocean in Europe

Since the degradation of the marine environment is strongly linked to human activities, having citizens who appreciate the ocean’s influence on them and their influence on the ocean is important. Research has shown that citizens have a limited understanding of the ocean and it is this lack of ocean literacy that needs to change. This study maps the European landscape of barriers to teaching 12–19 year olds about the ocean, through the application of Collective Intelligence, a facilitation and problem solving methodology. The paper presents a metaanalysis of the 657 barriers to teaching about the ocean, highlighting how these barriers are interconnected and influence one another in a European Influence Map. The influence map shows 8 themes: Awareness and Perceived knowledge; Policies and Strategies; Engagement, formal education sector; the Ocean itself; Collaboration; Connections between humans and the ocean and the Blue Economy, having the greatest influence and impact on marine education. “Awareness and Perceived knowledge” in Stage 1, exerts the highest level of
overall influence in teaching 12–19 year olds about the ocean. This map and study serves as a roadmap for policy makers to implement mobilisation actions that could mitigate the barriers to teaching about the ocean. Examples of such actions include free marine education learning resources such as e-books, virtual laboratories or hands-on experiments. Thus, supporting educators in taking on the challenge of helping our youth realise that the ocean supports life on Earth is essential for education, the marine and human well-being

**General information**

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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, SUBMON, Spain, CEFAS Centre for Environment, Fisheries and Aquaculture Science, United Kingdom, Ciência Viva, Portugal, Marine Biological Association of the United Kingdom, University of Gothenburg, National University of Ireland, Hellenic Centre for Marine Research, Flanders Marine Institute  
Authors: Fauville, G. (Ekstern), McHugh, P. (Ekstern), Domegan, C. (Ekstern), Mäkitalo, Å. (Ekstern), Møller, L. F. (Intern), Papathanassiou, M. (Ekstern), Alvarez Chicote, C. (Ekstern), Lincoln, S. (Ekstern), Batista, V. (Ekstern), Copejans, E. (Ekstern), Crouch, F. (Ekstern), Gotensparre, S. (Ekstern)

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Web of Science (2015): Indexed yes  
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Scopus rating (2014): SJR 1.438 SNIP 1.56 CiteScore 3.09  
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BFI (2012): BFI-level 1  
Scopus rating (2012): SJR 1.339 SNIP 1.495 CiteScore 2.54  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 1.406 SNIP 1.263 CiteScore 2.07  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 1.289 SNIP 1.483  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 0.947 SNIP 1.142  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.838 SNIP 1.417  
Scopus rating (2007): SJR 0.927 SNIP 1.377  
Web of Science (2007): Indexed yes  
Scopus rating (2006): SJR 0.961 SNIP 2.043
What we once knew – Mapping of marine sediments on the Greenland west coast: Comparing fishers’ ecological knowledge with historical and recent sources

General information
State: Accepted/In press
Organisations: Arctic Section, National Institute of Aquatic Resources, Section for Marine Living Resources, Aarhus University
Authors: Jørgensbye, H. (Intern), Wegeberg, S. (Ekstern)
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
World Heritage Site fish faces extinction

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University, Aalborg University
Authors: Svendsen, J. C. (Intern), Alstrup, A. K. O. (Ekstern), Jensen, L. F. (Ekstern)
Pages: 174
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Nature
Volume: 556
ISSN (Print): 0028-0836
Ratings:
BFI (2018): BFI-level 3
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 13.33
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 14.38
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 14.22
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 14.96
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 14.01
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 13.96
A comparison of the survival and migration of wild and F1-hatchery-reared brown trout (Salmo trutta) smolts traversing an artificial lake

Supplementing salmonid populations by stocking is a widely-used method to improve catch or to rehabilitate populations. Though, most studies found that survival and fitness of hatchery-reared salmonids is inferior to wild fish. We compared survival, emigration patterns, migration speed and return rates from the sea of wild and 1-year old F1-hatchery-reared brown trout smolts in a Danish lowland stream that contains an artificial lake using passive integrated transponder telemetry in the years 2011–2013 and 2016. The majority of hatchery-reared smolts descended within 72 h after their release, whereas wild fish migration was mainly triggered by increased water discharge. Increased probability of a successful lake passage was found at higher discharge. Within years, the groups differed in lake passage time, but without a significant overall difference. Overall, there was no difference in lake survival (wild: 30%, hatchery-reared: 32%) between the two groups, but survival differed between years. Only a single fish (0.9%) of the hatchery-reared smolts tagged in 2011–2013 returned from the sea compared to 11 (6.4%) wild smolts tagged in that period, which questions the value of supplementary stocking of smolts for conservation purposes.
Food availability drives plastic self-repair response in a basal metazoan-case study on the ctenophore Mnemiopsis leidyi
A. Agassiz

Many marine invertebrates including ctenophores are capable of extensive body regeneration when injured. However, as for the invasive ctenophore Mnemiopsis leidyi, there is a constant subportion of individuals not undergoing whole body regeneration but forming functionally stable half-animals instead. Yet, the driving factors of this phenomenon have not been addressed so far. This study sheds new light on how differences in food availability affect self-repair choice and regeneration success in cydippid larvae of M. leidyi. As expected, high food availability favored whole-body regeneration. However, under low food conditions half-animals became the preferential self-repair mode. Remarkably, both regenerating and half-animals showed very similar survival chances under respective food quantities. As a consequence of impaired food uptake after injury, degeneration of the digestive system would often occur indicating limited energy storage capacities. Taken together, this indicates that half-animals may represent an alternative energy-saving trajectory which implies self-repair plasticity as an adaptive trade-off between high regeneration costs and low energy storage capacities. We conclude that self-repair plasticity could lead to higher population fitness of ctenophores under adverse conditions such as in ships' ballast water tanks which is postulated to be the major vector source for the species' spreading around the globe.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Norwegian University of Science and Technology, GEOMAR - Helmholtz Centre for Ocean Research Kiel, University of Florida
Authors: Bading, K. T. (Ekstern), Kaehlert, S. (Ekstern), Chi, X. (Ekstern), Jaspers, C. (Intern), Martindale, M. Q. (Ekstern), Javidpour, J. (Ekstern)
Publication date: 1 Dec 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Scientific Reports
Volume: 7
Issue number: 1
Article number: 16419
ISSN (Print): 2045-2322
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.057 SNIP 1.684 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.103 SNIP 1.544 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
Publishers version
DOIs:
10.1038/s41598-017-16346-w
Links:
Context-dependent individual behavioral consistency in Daphnia

The understanding of consistent individual differences in behavior, often termed “personality,” for adapting and coping with threats and novel environmental conditions has advanced considerably during the last decade. However, advancements are almost exclusively associated with higher-order animals, whereas studies focusing on smaller aquatic organisms are still rare. Here, we show individual differences in the swimming behavior of Daphnia magna, a clonal freshwater invertebrate, before, during, and after being exposed to a lethal threat, ultraviolet radiation (UVR). We show consistency in swimming velocity among both mothers and daughters of D. magna in a neutral environment, whereas this pattern breaks down when exposed to UVR. Our study also, for the first time, illustrates how the ontogenetic development in swimming and refuge-seeking behavior of young individuals eventually approaches that of adults. Overall, we show that aquatic invertebrates are far from being identical robots, but instead they show considerable individual differences in behavior that can be attributed to both ontogenetic development and individual consistency. Our study also demonstrates, for the first time, that behavioral consistency and repeatability, that is, something resembling “personality,” is context and state dependent in this zooplankter taxa.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Lund University, Linnaeus University
Authors: Heuschele, J. (Intern), Ekvall, M. T. (Ekstern), Bianco, G. (Ekstern), Hylander, S. (Intern), Hansson, L. (Ekstern)
Publication date: 1 Feb 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: Ecosphere (Washington, D.C.)
Volume: 8
Issue number: 2
Article number: e01679
ISSN (Print): 2150-8925
Ratings:
- Web of Science (2018): Indexed yes
- Web of Science (2017): Indexed yes
- Scopus rating (2016): CiteScore 2.61 SJR 1.333 SNIP 0.954
- Scopus rating (2015): SJR 1.444 SNIP 0.836 CiteScore 2.27
- Scopus rating (2014): SJR 1.41 SNIP 1.025 CiteScore 2.37
- Scopus rating (2013): SJR 2.049 SNIP 1.472 CiteScore 3.77
- Scopus rating (2012): SJR 1.552 SNIP 1.126
- Scopus rating (2011): SJR 0.966 SNIP 0.554
Original language: English
Animal personality, Behavioral type, Daphnia, UV radiation, Zooplankton
Electronic versions:
Publishers version
DOIs:
10.1002/ecs2.1679
Source: Scopus
Source-ID: 85014044290
Publication: Research - peer-review › Journal article – Annual report year: 2017

30 years of data reveal dramatic increase in abundance of brown trout following the removal of a small hydrodam

Humans and freshwater ecosystems have a long history of cohabitation. Today, nearly all major rivers of the world have an in-stream structure which changes water flow, substrate composition, vegetation, and fish assemblage composition. The realization of these effects and their subsequent impacts on population sustainability and conservation has led to a collective effort aimed to find ways to mitigate these impacts. Barrier removal has recently received greater interest as a potential solution to restore river connectivity, and reestablish high quality habitats, suitable for feeding, refuge and spawning of fish. In the present study, we present thirty years of data from electrofishing surveys obtained at two sites, both prior to and following the removal of a small-scale hydropower dam in Central Jutland, Denmark. We demonstrate that the dam removal has led to a dramatic increase in trout density, especially in young of the year. Surprisingly, we found that this increase was not just upstream of the barrier, where the ponded zone previously was, but also downstream of the barrier, despite little changes in habitat in that area. These
findings suggest that barrier removal may be the soundest conservation option to reinstate fish population productivity
3.400 laks vandrede op i Skjern Å i 2016

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Publication: Communication › Internet publication – Annual report year: 2017

4th NordicRAS Workshop on Recirculating Aquaculture Systems Aalborg, Denmark, 12-13 October 2017: Book of Abstracts

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Dalsgaard, A. J. T. (ed.) (Intern)
Number of pages: 56
Publication date: 2017

Publication information
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
ISBN (Print): 978-87-7481-241-8
ISBN (Electronic): 978-87-7481-240-1
Original language: English

Series: DTU Aqua Report
Number: 321-17
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Report – Annual report year: 2017

62 years of population dynamics of European perch (Perca fluviatilis) in a mesotrophic lake tracked using angler diaries: The role of commercial fishing, predation and temperature

Standardised angler diaries could produce useful proxy data for assessing fish population density and size distribution, but few rigorous studies about their utility exist. We use 62 years of angling diary data (1949–2010), from a large mesotrophic lake, to investigate population structure (abundance, mean size and record size) of European perch (Perca fluviatilis L.) in relation to the impact of three commercial fishers with different fishing strategies, pike (Esox lucius L.) predation and temperature. We found that anglers’ harvest rates of perch varied by a factor of 10 over time, indicating large variation in population abundance over decadal time scales. Our statistical analysis revealed that the anglers’ harvest rates of perch were related to pike CPUE (proxy of pike predation), temperature and commercial fishing directly through the harvest of perch and indirectly through the harvest of pike, the top predator of the lake. The size distribution and growth rates of perch caught by anglers also changed substantially during the study period, most likely controlled by density-dependent mechanisms as well as size-selective commercial harvest. The effect of selective harvest on size-structure was stronger than ecological density dependence. We conclude that commercial harvesting may exert strong impacts on the quality of the angling experiences, at least in the studied case. Moreover, our work showcases the value of detailed angler diaries to
study and monitor changes in freshwater fish populations, but it also underlines the need for supplementary data on biotic and abiotic factors to reach the full potential of angler diary data.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Oceans and Arctic, Humboldt-University of Berlin
Authors: Skov, C. (Intern), Jansen, T. (Intern), Arlinghaus, R. (Ekstern)
Pages: 71-79
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Fisheries Research
Volume: 195
ISSN (Print): 0165-7836
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.154 SNIP 1.135 CiteScore 1.7
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.022 SNIP 1.075
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.025 SNIP 1.274
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.906 SNIP 1.134
Acanthoecid choanoflagellates from the Atlantic Arctic Region - a baseline study
The examination and statistical analysis of loricate choanoflagellate material collected from Greenland waters during the period 1988-1998 represents a de facto baseline study of heterotrophic nanoflagellates from the Atlantic Arctic Region. The geographic sites sampled are Disko Bay (West Greenland) and the high-arctic North-East Water (NEW) and North Water (NOW) polynya. The analyses encompass close to 50 taxa. Some of these are described as new species, i.e. Acanthocorbis glacialis, A. reticulata and Diaphanoeca dilatanda. Two distinct clusters of species that are separated in time and space occur at all three sampling sites. A PCA analysis of NEW and NOW data points to that one community is linked to e.g. an early season high nutrient and low phytoplankton biomass scenario, whereas the other is predominant when nutrient levels are exhausted and the phytoplankton biomass high or declining. The material additionally allows for a comprehensive examination of e.g. the Cosmoeca ventricosa morphological variability encountered, as well as puts on record bimodal size variability within a number of species.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Thomsen, H. A. (Intern), Østergaard, J. B. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Heliyon
Volume: 3
Issue number: 7
Article number: e00345
ISSN (Print): 2405-8440
Ratings:
Scopus rating (2016): CiteScore 0.55 SJR 0.173 SNIP 0.423
Original language: English
Ecology, Microbiology
Electronic versions:
Publishers version
DOIs:
10.1016/j.heliyon.2017.e00345
Links:
Source: FindIt
Source-ID: 2372954961
Publication: Research - peer-review › Journal article – Annual report year: 2017

Achieving maximum sustainable yield in mixed fisheries: a management approach for the North Sea demersal fisheries
Achieving single species maximum sustainable yield (MSY) in complex and dynamic fisheries targeting multiple species (mixed fisheries) is challenging because achieving the objective for one species may mean missing the objective for another. The North Sea mixed fisheries are a representative example of an issue that is generic across most demersal fisheries worldwide, with the diversity of species
and fisheries inducing numerous biological and technical interactions. Building on a rich knowledge base for the understanding and quantification of these interactions, new approaches have emerged. Recent paths towards operationalizing MSY at the regional scale have suggested the expansion of the concept into a desirable area of "pretty good yield", implemented through a range around FMSY that would allow for more flexibility in management targets. This article investigates the potential of FMSY ranges to combine long-term single-stock targets with flexible, short-term, mixed-fisheries management requirements applied to the main North Sea demersal stocks. It is shown that sustained fishing at the upper bound of the range may lead to unacceptable risks when technical interactions occur. An objective method is suggested that provides an optimal set of fishing mortality within the range, minimizing the risk of total allowable catch mismatches among stocks captured within mixed fisheries, and addressing explicitly the trade-offs between the most and least productive stocks.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, IFREMER, Cefas, Wageningen IMARES, European Commission - Joint Research Center, Thünen Institute of Sea Fisheries
Authors: Ulrich, C. (Intern), Vermard, Y. (Ekstern), Dolder, P. J. (Ekstern), Brunel, T. (Ekstern), Jardim, E. (Ekstern), Holmes, S. J. (Ekstern), Kempf, A. (Ekstern), Mortensen, L. O. (Intern), Poos, J. (Ekstern), Rindorf, A. (Intern)
Pages: 566-575
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 2
ISSN (Print): 1054-3139
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
A combined experimental and simulation based approach to model the flow-front dynamics in the vacuum assisted resin transfer moulding process.

With more emphasis on the use of green energy, the size of the turbines and blades in the wind turbines is continuously increasing. With increasing blade size, the casting process becomes more complicated and the risk of faults increases. Production of such blades, made of fibre reinforced polymer composites, without the possibility of visual inspection of the infusion process calls for a sensor system (possibly virtual) for monitoring the process. This paper proposes a two-step modelling methodology to identify the parameters related to the flow-front that are essential for determining the current state of infusion process.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, National Institute of Aquatic Resources, Siemens Gamesa Renewable Energy
Pages: 28-35
Publication date: 2017

Host publication information
Title of host publication: Proceedings of LIMAS 2017
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 143900347
Publication: Research - peer-review › Article in proceedings – Annual report year: 2018

A comprehensive approach to assess feathermeal as an alternative protein source in aquafeed
The effect of partially replacing fishmeal in aquafeed with feathermeal (FTH) at three levels (0%: FTH0, 8%: FTH8, 24%: FTH24) and two extrusion temperatures (100 and 130 °C) were evaluated in rainbow trout (Oncorhynchus mykiss) with respect to growth performance, metabolism response, and oxidative status of the feed proteins. Multivariate data analyses revealed that FTH24 correlated positively with high levels of: oxidation products, amino acids (AA) racemization, glucogenic AAs level in liver, feed intake (FI), specific growth rate (SGR), and feed conversion ratio (FCR); and low AAs digestibility. Both FI and SGR were significantly increased when 8 and 24% feathermeal was included in the feed extruded at 100 °C, while there was a negative effect on FCR in fish fed FTH24. In conclusion, higher oxidation levels in FTH24 may give rise to metabolic alterations while lower levels of FTH may be considered as fishmeal substitute in aquafeed for rainbow trout.

General information
State: Published
Acute and long-term CO2 exposure reduces the performance of Atlantic salmon in RAS

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Khan, J. R. (Intern), Johansen, D. (Ekstern), Skov, P. V. (Intern)
Number of pages: 56
Pages: 47
Publication date: 2017

Host publication information
Title of host publication: 4th NordicRAS Workshop on Recirculating Aquaculture Systems. Aalborg, Denmark, 12-13 October 2017 : Book of Abstracts
Publisher: Technical University of Denmark, National Institute for Aquatic Resources
Editor: Dalsgaard, A. J. T.
ISBN (Print): 978-87-7481-241-8
ISBN (Electronic): 978-87-7481-240-1

Series: DTU Aqua Report
Number: 321-17
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Conference: NordicRAS Workshop on Recirculating Aquaculture Systems, Aalborg, Denmark, 12/10/2017 - 12/10/2017
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Publication: Research › Conference abstract in proceedings – Annual report year: 2017

Acute and semi-chronic toxicity of vanadium tested on copepods of the species Temora longicornis

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry, Technical University of Denmark
Authors: Kristiansen, M. H. (Ekstern), Iversen, N. H. (Ekstern), Koski, M. (Intern), Trapp, S. (Intern)
Number of pages: 1
Publication date: 2017

Host publication information
Title of host publication: Book of Abstracts Sustain 2017
Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
Article number: Sustain Abstract A-10
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Adaptive management in the context of barriers in European freshwater ecosystems

Many natural habitats have been modified to accommodate for the presence of humans and their needs. Infrastructures such as hydroelectric dams, weirs, culverts and bridges are now a common occurrence in streams and rivers across the world. As a result, freshwater ecosystems have been altered extensively, affecting both biological and geomorphological components of the habitats. Many fish species rely on these freshwater ecosystems to complete their lifecycles, and the presence of barriers has been shown to reduce their ability to migrate and sustain healthy populations. In the long run, barriers may have severe repercussions on population densities and dynamics of aquatic animal species. There is currently an urgent need to address these issues with adequate conservation approaches. Adaptive management provides a relevant approach to managing barriers in freshwater ecosystems as it addresses the uncertainties of dealing with natural systems, and accommodates for future unexpected events, though this approach may not be suitable in all instances. A literature search on this subject yielded virtually no output. Hence, we propose a step-by-step guide for implementing adaptive management, which could be used to manage freshwater barriers.
Adsorptive performance of granular activated carbon in aquaculture and aquaria: a simplified method

A principle concern for aquaculturists and aquarium hobbyists is the control and removal of dissolved organic matter. Granular activated carbon is a well-established medium for the adsorption of dissolved organic substances associated with these issues. The selection of activated carbon for aquaria and aquaculture is not well-established due to innate heterogeneity of these waters. The means to completely characterize adsorption between carbon sources are generally not available to end users provided their level of expertise and/or resources at their disposal. This study introduces a relatively simple method for characterizing activated carbon quality and filter performance utilizing readily available and relatively safe indicator compounds to test adsorptive capabilities between different sources of granular activated carbon. Methylene blue and a commercial mix of humic and tannic substances were used to comparatively test adsorptive performance between two filter groups (i.e. sources of granular activated carbon) by tracking spectral absorbance with non-linear regression statistics, and validating removal trends against mature aquaculture water. Greater adsorptive capacities were consistently observed in one filter group throughout the indicator testing battery. Similar findings were observed between the two indicator tests, thereby confirming the method. This method can be adopted by commercial aquaculture operations or aquarists to assist in comparatively screening particular types, particle sizes, and sources of granular activated carbon for specific water quality and engineering requirements.
A Hidden Markov Movement Model for rapidly identifying behavioral states from animal tracks

1. Electronic telemetry is frequently used to document animal movement through time. Methods that can identify underlying behaviors driving specific movement patterns can help us understand how and why animals use available space, thereby aiding conservation and management efforts. For aquatic animal tracking data with significant measurement error, a Bayesian state-space model called the first-Difference Correlated Random Walk with Switching (DCRWS) has often been used for this purpose. However, for aquatic animals, highly accurate tracking data of animal movement are now becoming more common.

2. We developed a new Hidden Markov Model (HMM) for identifying behavioral states from animal tracks with negligible error, which we called the Hidden Markov Movement Model (HMMM). We implemented as the basis for the HMMM the process equation of the DCRWS, but we used the method of maximum likelihood and the R package TMB for rapid model fitting.

3. We compared the HMMM to a modified version of the DCRWS for highly accurate tracks, the DCRWSnome, and to a common HMM for animal tracks fitted with the R package moveHMM. We show that the HMMM is both accurate and suitable for multiple species by fitting it to real tracks from a grey seal, lake trout, and blue shark, as well as to simulated data.

4. The HMMM is a fast and reliable tool for making meaningful inference from animal movement data that is ideally suited for ecologists who want to use the popular DCRWS implementation for highly accurate tracking data. It additionally provides a groundwork for development of more complex modelling of animal movement with TMB. To facilitate its uptake, we make it available through the R package swim.
Ålebliver i tusindvis udsat i vandløb, søer og kystnære områder

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern), Pedersen, M. I. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/07/aal-udsaetninger-i-2017?id=cead4d59-3ab0-4bc7-a5a9-e5c5b3e7b0f9&utm_source=newsletter&utm_media=mail&utm_campaign=

Ålevaelverne vækst muligheder i Sargassohavet

General information
Ålelarvenes vækstmuligheder i Sargassohavet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Munk, P. (Intern), Ayala, D. J. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Ålelarvers fødeoptagelse i Sargassohavet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, GEOMAR - Helmholtz Centre for Ocean Research Kiel, Københavns Universitet
Authors: Ayala, D. J. (Intern), Munk, P. (Intern), Lundgreen, R. B. C. (Intern), Traving, S. J. (Ekstern), Jaspers, C. (Intern), Riemann, L. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Alternative prophylaxis/disinfection in aquaculture - Adaptable stress induced by peracetic acid at low concentration and its application strategy in RAS
- Stress was monitored by measuring cortisol in water instead of in blood.
- Fish adapted to regular prophylaxis/disinfection with peracetic acid by showing reduced stress.
- A mathematic model was established to improve understanding of substance distribution in RAS.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Agricultural Research Service
Authors: Liu, D. (Ekstern), Pedersen, L. (Intern), Straus, D. L. (Ekstern), Kloas, W. (Ekstern), Meinelt, T. (Ekstern)
Pages: 82-85
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 474
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
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<td>SJR 1.08 SNIP 1.32 CiteScore 1.95</td>
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**Analysis of marine protected areas – in the Danish part of the North Sea and the Central Baltic around Bornholm: Part 1: The coherence of the present network of MPAs**

**General information**
State: Published
Analysis of marine protected areas – in the Danish part of the North Sea and the Central Baltic around Bornholm: Part 2: Ecological and economic value, human pressures, and MPA selection

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data, DHI Denmark, Geological Survey of Denmark and Greenland, Aarhus University, University of Copenhagen
Number of pages: 120
Publication date: 2017

Publication information
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
ISBN (Electronic): 978-87-7481-245-6
Original language: English
Series: DTU Aqua Report
Number: 325-2017
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Publication: Research › Report – Annual report year: 2018

Analysis of trait-based models in marine ecosystems.
The overarching theme for this thesis is spatial and temporal variations in ecosystems. The focus is on describing mechanisms that are responsible for generating the spatial and temporal patterns. The thesis contains two separate projects, each exploring a possible mechanism for pattern formation. In both projects, the model formulations result in partial integro-differential equations. The first project in the thesis considers temporal patterns in a size structured population. Size structure is relevant for species that goes through significant changes through their lifetime. The population’s response to regular temporal variations in the environment is investigated by introducing a periodic forcing in the system. This can for instance represent seasonal changes. The effect of an imposed forcing is explored both when the underlying unforced system has a stable equilibrium and when it has stable oscillatory dynamics. The numerical solutions show regular cycles where the period is equal to, or an integer multiple of, the forcing period and where the population can have one or more pulses of reproduction in each cycle. Additionally, the numerical results indicate quasi-periodic or chaotic solutions, period doubling bifurcations and coexisting attractors. The bifurcation structure is similar to results for...
comparable unstructured population models in the literature. This indicates that size structure does not affect the response to periodic forcing. The next project in the thesis considers spatio-temporal pattern formation in a predator–prey system where animals move towards higher fitness. Reaction-diffusion systems have been used extensively to describe spatio-temporal patterns in a variety of systems. However, animals rarely move completely at random, as expressed by diffusion. This has lead to models with taxis terms, describing individuals moving in the direction of an attractant. An example is chemotaxis models, where bacteria are attracted to a chemical substance. From an evolutionary perspective, it is expected that animals act as to optimize their fitness. Based on this principle, a predator–prey system with fitness taxis and diffusion is proposed. Here, fitness taxis refer to animals moving towards higher values of fitness, and the specific growth rates of the populations are used as a measure of the fitness values. To determine the conditions for pattern formation, a linear stability analysis is conducted. The analysis reveals that the fitness taxis leads to mechanisms for pattern formation, which are based on the prey gathering together. It turns out, that in some cases the problem is not well-posed and an ultraviolet catastrophe occurs, i.e., perturbations with infinitely short wavelength grow infinitely fast. To prevent this, the population dynamics are revised with a spatial feeding kernel, that defines a spatial range wherein a predator consumes prey. A linear stability analysis for the revised system reveals the ultraviolet catastrophe is avoided and the basic mechanisms for pattern formation are unchanged. Numerical solutions to the revised system are computed to visualize the patterns. The solutions encompass stationary spatial patterns in addition to traveling waves, standing waves and irregular solutions that might be spatio-temporal chaos. The modeling approach of fitness taxis presents a general way to express movement and it is concluded that the model provides a useful framework for describing generic mechanisms for pattern formation.

General information
State: Published
Organisations: Dynamical Systems, Department of Applied Mathematics and Computer Science, National Institute of Aquatic Resources, Centre for Ocean Life, University of Rostock
Authors: Heilmann, I. L. T. (Intern), Sørensen, M. P. (Intern), Starke, J. (Ekstern), Thygesen, U. H. (Intern), Andersen, K. H. (Intern)
Number of pages: 95
Publication date: 2017

Publication information
Publisher: DTU Compute
Original language: English
Series: DTU Compute PHD-2017
Volume: 453
ISSN: 0909-3192
Main Research Area: Technical/natural sciences
Electronic versions:
phd453_Heilmann_ILT.pdf

Relations
Projects:
Analysis of trait-based models in marine ecosystems.
Publication: Research › Ph.D. thesis – Annual report year: 2017

Angler apps as a source of recreational fisheries data: opportunities, challenges and proposed standards
Recreational fisheries surveys are limited in time and place in many countries. This lack of data limits scientific understanding and sustainable management. Smartphone applications (apps) allow anglers to record the details of their fishing trips and catches. In this study, we describe the opportunities and challenges associated with angler apps as a source of recreational fisheries data, and propose minimum standards for data collection via angler apps. Angler apps are a potentially valuable source of conventional and novel data that are both frequent and extensive, and an opportunity to engage anglers through data sharing and citizen science. Realizing this potential requires that we address significant challenges related to angler recruitment and retention, data quality and bias, and integration with existing fisheries programmes. We propose solutions to each of these challenges. Given that the angler app market is diverse, competitive and unpredictable, we emphasize minimum standards for data collection as a way to ensure large and reliable data sets that can be compared and integrated across apps. These standards relate to trips and catches, and angler demographics and behaviour, and should be supported through consultation and research. Angler apps have the potential to fundamentally change how anglers interact with the resource and with management.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, University of Minnesota, Cefas
Authors: Venturelli, P. A. (Ekstern), Hyder, K. (Ekstern), Skov, C. (Intern)
Pages: 578-595
A predation cost to bold fish in the wild

Studies of predator-mediated selection on behaviour are critical for our understanding of the evolution and maintenance of behavioural diversity in natural populations. Consistent individual differences in prey behaviour, especially in the
propensity to take risks ("boldness"), are widespread in the animal kingdom. Theory predicts that individual behavioural types differ in a cost-benefit trade-off where bolder individuals benefit from greater access to resources while paying higher predation-risk costs. However, explicitly linking predation events to individual behaviour under natural conditions is challenging and there is currently little data from the wild. We assayed individual behaviour and electronically tagged hundreds of fish (roach, Rutilus rutilus) before releasing them into their lake of origin, thereby exposing them to predation risk from avian apex predators (cormorants, Phalacrocorax carbo). Scanning for regurgitated tags at the cormorant roosting site provided data on individual predation events. We found that fish with higher boldness have a greater susceptibility to cormorant predation compared to relatively shy, risk-averse individuals. Our findings hereby provide unique and direct evidence of behavioural type-dependent predation vulnerability in the wild, i.e. that there is a predation cost to boldness, which is critical for our understanding of the evolution and maintenance of behavioural diversity in natural populations.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Lund University, University of Manchester, Swiss Federal Institute of Aquatic Science and Technology
Authors: Hulthén, K. (Ekstern), Chapman, B. (Ekstern), Nilsson, A. P. (Ekstern), Hansson, L. (Ekstern), Skov, C. (Intern), Brodersen, J. (Ekstern), Vinterstare, J. (Ekstern), Brönmark, C. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Scientific Reports
Volume: 7
Issue number: 1
Article number: 1239
ISSN (Print): 2045-2322
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.057 SNIP 1.684 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.103 SNIP 1.544 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Original language: English
Electronic versions:
Publishers version
DOIs:
10.1038/s41598-017-01270-w
Links:
https://www.nature.com/articles/s41598-017-01270-w
Source: FindIt
Source-ID: 2357948784
Publication: Research - peer-review › Journal article – Annual report year: 2017
We consider adaptive change of diet of a predator population that switches its feeding between two prey populations. We develop a novel fast-slow dynamical system to describe the dynamics of the three populations amidst continuous but rapid evolution of the predator's diet choice. The two extremes at which the predator's diet is composed solely of one prey correspond to two branches of the three-branch critical manifold of the fast slow system. By calculating the points at which there is a fast transition between these two feeding choices (i.e., branches of the critical manifold), we prove that the system has a two-parameter family of periodic orbits for sufficiently large separation of the time scales between the evolutionary and ecological dynamics. Using numerical simulations, we show that these periodic orbits exist, and that their phase difference and oscillation patterns persist, when ecological and evolutionary interactions occur on comparable time scales. Our model also exhibits periodic orbits that agree qualitatively with oscillation patterns observed in experimental studies of the coupling between rapid evolution and ecological interactions.
Aqualase, a yeast-based in-feed probiotic, modulates intestinal microbiota, immunity and growth of rainbow trout Oncorhynchus mykiss

Yeast probiotics have great promise, yet they received little attention in fish. This study investigated the influence of Aqualase, a yeast-based commercial probiotic composed of Saccharomyces cerevisiae and Saccharomyces elipsoedas, on health and performance of rainbow trout (Oncorhynchus mykiss). Probiotics were incorporated in the diets at three different inclusion levels (1%, 1.5% and 2%) and administered to the fish for a period of 8 weeks. After the feeding trial, intestinal total viable aerobic bacterial count was significantly higher in fish group that received 2% in-feed probiotics. In addition, a significant increase in at least 11% in intestinal lactic acid bacteria population was observed in all probiotic-fed groups. Total protein level and lysozyme activity in skin mucus were significantly elevated following probiotic feeding. Inhibitory potential of skin mucus against fish pathogens was significantly enhanced by at least 50% in probiotic-fed groups. Humoral and cellular immune parameters were influenced by probiotic feeding and the effects were dependent on inclusion level. Digestive physiology was affected by infeed probiotics through improvement of intestinal enzyme activities. All growth performance parameters were significantly improved following probiotic administration specifically at inclusion rate 1.5% and above. Taken together, the results revealed that Aqualase is a promising yeast-based probiotic for rainbow trout with the capability of modulating the intestinal microbiota, immunity and growth.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Sari University of Agricultural Sciences and Natural Resources, Iranian Fisheries Science Research Institute (IFSRI)
Authors: Adel, M. (Ekstern), Lazado, C. C. (Intern), Safari, R. (Ekstern), Yeganehe, S. (Ekstern), Zorriezahra, M. J. (Ekstern)
Pages: 1815-1826
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture Research
Volume: 48
Issue number: 4
ISSN (Print): 1355-557X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.23 SJR 0.555 SNIP 0.926
Artspecifik sporing og kvantificering af eDNA fra marine fisk i Østersøen

General information
State: Published
Authors: Knudsen, S. W. (Ekstern), Ebert, R. B. (Ekstern), Hesselsøe, M. (Ekstern), Kuntke, F. (Ekstern), Hassingboe, J. (Ekstern), Mortensen, P. B. (Ekstern), Thomsen, P. F. (Forskerdatabase), Hansen, B. K. (Intern), Eg Nielsen, E. (Intern), Møller, P. R. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
A spatiotemporal model for snow crab (Chionoecetes opilio) stock size in the southern Gulf of St. Lawrence

We develop a high-resolution spatiotemporal model of stock size and harvest rates for snow crab (Chionoecetes opilio) in the southern Gulf of St. Lawrence, which supports an economically important fishery off the east coast of Canada. It is a spatial and weekly model during 1997–2014 that utilizes within-season depletion based on catch per unit of effort (CPUE; kg·pot–1) and also biomass values from a survey designed specifically for this stock. The model is formulated in a state-space framework. The main contribution of the model is to provide a better understanding of fishery-dependent factors that affect CPUE. There is strong evidence of density dependence in the relationship with CPUE and stock biomass, in addition to a general increase in CPUE catchability over time that may be related to changes in gear soak time and spatial variation in catchability. We also find that a natural mortality rate of 0.4 provides a better fit to survey results. Model results suggest that there is no evidence of effort saturation in the fishery.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Fisheries and Oceans Canada, Memorial University of Newfoundland
Authors: Cadigan, N. G. (Ekstern), Wade, E. (Ekstern), Nielsen, A. (Intern)
Pages: 1808-1820
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 74
Issue number: 11
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Assessing and managing multiple risks in a changing world — The Roskilde recommendations

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Department of Civil Engineering, Section for Structural Engineering, Roskilde University, Stockholm University, University of Michigan, DHI Denmark, Simon Fraser University, Delft University of Technology, Enviresearch, Newcastle-upon-Tyne, Halmstad University, Aarhus University, Norwegian Institute for Water Research, University of Aveiro, U.S. Environmental Protection Agency, Norwegian Geotechnical Institute, Polish Academy of Sciences, Chapema Environmental Strategies, University of Gothenburg
Pages: 1-10
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Environmental Toxicology and Chemistry
Volume: 36
Issue number: 1
ISSN (Print): 0730-7268
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
Assessing and mitigating of bottom trawling. Final BENTHIS project Report (Benthic Ecosystem Fisheries Impact Study)

BENTHIS developed the scientific basis to quantify the impact of bottom trawling on the seafloor and the benthic ecosystem. Based on insight in how fishing gear affects the seafloor, an assessment framework was developed that provides indicators of impact and seafloor status on a continuous scale that can be applied in the context of the MSFD. The mechanistic approach allows us to set reference values of impact (status) to estimate the proportion of a region or habitat where the impact is below (status is above) the threshold. The methodology combines estimates of trawling intensity with the depth to which the fishing gear penetrates into the sea bed (penetration profile) and the sensitivity of the habitat. Habitat sensitivity is estimated from the longevity composition of the benthic community that is related to the recovery rate. The mortality imposed by trawling was shown to be related to penetration depth of the fishing gear. The framework was applied to explore which fisheries had the greatest impact and which habitats were impacted the most. Fishers concentrate their activities in only a part of their total fishing area. These core fishing grounds are characterised by a relative low status (high impact). Additional fishing in these core grounds have only a small impact. In the peripheral areas where fishing intensity is low, additional fishing will have a much larger impact. Hence, shifting trawling activities from the core fishing grounds to the peripheral areas will increase the overall impact. Shifting activities from the peripheral grounds to the core will reduce the overall impact. This asymmetry provides the possibility to reduce the impact at a minimal cost. It was shown that implementing a habitat credit management system can provide incentives to reduce fishing in peripheral areas at minimal cost. In collaboration with the fishing industry and gear manufacturers, technological innovations were studied to reduce the impact of trawling. Promising results were obtained showing that (semi-) pelagic otter doors can be applied to reduce bottom impact and at the same time reduce the fuel cost without affecting the catch rate of the target species. Replacing mechanical stimulation by tickler chains with electrical stimulation in the beam trawl fishery for sole, reduced footprint and penetration depth as well as the fuel cost. Electrical stimulation is also a promising innovation to reduce the bycatch and bottom contact in the beam trawl fishery for brown shrimps. Sea trials to replace bottom trawls with pots were inconclusive. Results suggest that creels may offer an alternative for small Nephrops fisheries in the Kattegat. In waters off Greece, the catch rates were very low. Sea trials with the blue mussel fishery showed that fishers could reduce their footprint by deploying acoustic equipment to detect mussel concentrations that allow the fishers to more precisely target the mussel beds and hence reduce fishing in areas with low mussel density. A review of the various case studies carried out in BENTHIS revealed the critical success factors for implementing technological innovations to mitigate trawling impact. While economic investment theory predict that economic profitability should lead to investment in innovative gears, it appeared that many other factors play a role in the successful uptake of new technology such as social, regulatory, technological and environmental factors. For the successful development and implementation of gear innovations, collaboration between fishers, gear manufacturers, policy makers, scientist and society is important.
Assessing pre- and post-zygotic barriers between North Atlantic eels (Anguilla anguilla and A. rostrata)

Elucidating barriers to gene flow is important for understanding the dynamics of speciation. Here we investigate pre- and post-zygotic mechanisms acting between the two hybridizing species of Atlantic eels: Anguilla anguilla and A. rostrata. Temporally varying hybridization was examined by analyzing 85 species-diagnostic single-nucleotide polymorphisms (SNPs; FST 0.95) in eel larvae sampled in the spawning region in the Sargasso Sea in 2007 (N=92) and 2014 (N=460). We further investigated whether genotypes at these SNPs were nonrandomly distributed in post-F1 hybrids, indicating selection. Finally, we sequenced the mitochondrial ATP6 and nuclear ATP5c1 genes in 19 hybrids, identified using SNP and restriction site associated DNA (RAD) sequencing data, to test a previously proposed hypothesis of cytonuclear incompatibility leading to adenosine triphosphate (ATP) synthase dysfunction and selection against hybrids. No F1 hybrids but only later backcrosses were observed in the Sargasso Sea in 2007 and 2014. This suggests that interbreeding between the two species only occurs in some years, possibly controlled by environmental conditions at the spawning grounds, or that interbreeding has diminished through time as a result of a declining number of spawners. Moreover, potential selection was found at the nuclear and the cytonuclear levels. Nonetheless, one glass eel individual showed a mismatch, involving an American ATP6 haplotype and European ATP5c1 alleles. This contradicted the presence of cytonuclear incompatibility but may be explained by that (1) cytonuclear incompatibility is incomplete, (2) selection acts at a later life stage or (3) other genes are important for protein function. In total, the study demonstrates the utility of genomic data when examining pre- and post-zygotic barriers in natural hybrids. Heredity advance online publication, 9 November 2016; doi:10.1038/hdy.2016.96.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aarhus University , Northwest Iceland Nature Research Centre, University of the Faroe Islands
Authors: Jacobsen, M. W. (Ekstern), Smedegaard, L. (Ekstern), Sørensen, S. R. (Intern), Pujolar, .. M. (Ekstern), Munk, P. (Intern), Jónsson, B. (Ekstern), Magnussen, E. (Ekstern), Hansen, M. M. (Ekstern)
Pages: 266-275
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Heredity
Volume: 118
Issue number: 3
ISSN (Print): 0018-067X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.56 SJR 2.03 SNIP 1.243
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.094 SNIP 1.298 CiteScore 3.47
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.162 SNIP 1.304 CiteScore 3.42
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.029 SNIP 1.149 CiteScore 3.44
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.088 SNIP 1.356 CiteScore 3.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.279 SNIP 1.289 CiteScore 3.58
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Assessment and recruitment status of Baltic Sea trout populations

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Pedersen, S. (Intern), Degerman, E. (Ekstern), Debowski, P. (Ekstern), Petereit, C. (Ekstern)
Pages: 423-441
Publication date: 2017

Host publication information
Title of host publication: Sea Trout: Science & Management : Proceedings of the 2nd International Sea Trout Symposium
Publisher: Troubador
Editor: Harris, G.
ISBN (Print): 9781788035354
Main Research Area: Technical/natural sciences
Conference: International Sea Trout Symposium, Dundalk, Ireland, 20/10/2015 - 20/10/2015

Assessment of drinking water quality at the tap using fluorescence spectroscopy
Treated drinking water may become contaminated while travelling in the distribution system on the way to consumers. Elevated dissolved organic matter (DOM) at the tap relative to the water leaving the treatment plant is a potential indicator of contamination, and can be measured sensitively, inexpensively and potentially on-line via fluorescence and absorbance spectroscopy. Detecting elevated DOM requires potential contamination events to be distinguished from natural fluctuations in the system, but how much natural variation to expect in a stable distribution system is unknown. In this study, relationships between DOM optical properties, microbial indicator organisms and trace elements were investigated for households connected to a biologically-stable drinking water distribution system. Across the network, humic-like fluorescence intensities showed limited variation (RSD = 3.5-4.4%), with half of measured variation explained by interactions with copper. After accounting for quenching by copper, fluorescence provided a very stable background signal (RSD

General information
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Section for Oceans and Arctic, Chalmers University of Technology, Gästrike Vatten AB, National Food Agency
A stochastic surplus production model in continuous time

Surplus production modelling has a long history as a method for managing data-limited fish stocks. Recent advancements have cast surplus production models as state-space models that separate random variability of stock dynamics from error in observed indices of biomass. We present a stochastic surplus production model in continuous time (SPiCT), which in addition to stock dynamics also models the dynamics of the fisheries. This enables error in the catch process to be reflected in the uncertainty of estimated model parameters and management quantities. Benefits of the continuous-time state-space model formulation include the ability to provide estimates of exploitable biomass and fishing mortality at any point in time from data sampled at arbitrary and possibly irregular intervals. We show in a simulation that the ability to analyse subannual data can increase the effective sample size and improve estimation of reference points relative to discrete-time analysis of aggregated annual data. Finally, subannual data from five North Sea stocks are analysed with particular focus on using residual analysis to diagnose model insufficiencies and identify necessary model extensions such as robust estimation and incorporation of seasonality. We argue that including all known sources of uncertainty, propagation of that uncertainty to reference points and checking of model assumptions using residuals are critical prerequisites to rigorous fish stock management based on surplus production models.
A trait-based approach to understanding marine communities composition, assembly and diversity

A species occurs and thrives in a community thanks to its capacity to grow, reproduce and feed in its surrounding environment. Understanding how and why some species thrive in particular areas has often been touched upon by studying the species composition of communities. Traditionally, communities are characterised by their taxonomic diversity, such as their species richness or the evenness in their abundances. However, there is growing evidence that it is not the taxonomic identity of the species per se that control its presence and abundance in a given environment but its characteristics. Species traits refer to quantitatively or qualitatively measurable characteristics of a species. Characterizing species by their key traits can permit an understanding of general mechanisms and unravel the processes affecting coexistence in communities. The aim of this thesis was to apply the trait-based approach to study the composition of marine communities located in the European Seas and relate their spatial patterns to environmental and anthropogenic pressures. The species composition of communities can be constrained by several processes, such as competition and the environment. Using a trait-based approach, we studied the diversity and the processes influencing the composition of demersal fish communities in the Baltic Sea. While species richness was sharply decreasing from the saline Kattegat to the brackish Gdansk Bay, trait richness tended to decrease at a lower rate. We found that the species co-occurring in the Eastern Baltic Sea were in general more ecologically similar, in terms of their traits, than expected by random chance alone with a strong influence of the environment and notably the salinity gradient on the distribution and trait composition of the communities. While traits are increasingly used in community ecology, they are often selected and used without a consistent framework. We made use of a theoretical framework that defines life history strategies as a combination of key traits and their trade-offs to investigate large-scale patterns and drivers of fish community composition across European Seas. We assembled an extensive number of surveys in the European seas and collected reproductive traits for more than 300 fish species present in these surveys. Based on their traits, fish species could be categorized into three strategies that reflect the evolutionary and environmental constraints acting on the species. The strategies’ prevalence exhibited strong geographical patterns which could be explained by spatial variability in annual sea surface temperature, temperature seasonality, depth and fishing intensity. Due to their tight
coupling to the environment, notably temperature and fishing, life history strategies could be a suitable tool to monitor and understand community changes in response to natural and anthropogenic stressors, including climate change. Spatial patterns of community mean traits and their relationship with the environment are generally assessed on a single taxonomic group. As a result, it is still unclear whether the relationship found for one taxonomic group can be generalised to other taxonomic groups that compose the ecosystem. Yet, understanding the responses of these different groups to environmental pressures is a prerequisite to conserve and manage ecosystems. We studied the spatial pattern of community traits of three key taxonomic groups in the North Sea: copepods, benthos, and fish. We extracted the community composition of these groups from three scientific surveys covering the entire North Sea and combined them with key life history traits common to all three groups: adult size, offspring size and fecundity. While many of the traits co-varied in space and notably demonstrated a latitudinal gradient, none of the traits had a consistent, either positive or negative, relationship across all taxa. The spatial trait-variability could be explained by taxon-specific habitat condition. Thus, trait responses to environmental gradient cannot be generalized across these marine taxonomic groups, pointing toward potential complex responses of multi-taxa communities to environmental changes.

This thesis highlights the value of using traits to understand why communities are composed of a specific set of species and how the mean traits of these communities varies along environmental and anthropogenic gradient. This thesis stresses the utility of the trait-based approach, due to its generality, to compare communities at different scales, from different regions as well as communities composed of different taxonomic entities. The trait-based approach still has a lot to offer to unravel the processes controlling the composition of communities and species distribution, and its use in marine ecology has yet to be extended to other domains, such as understanding the impacts of functional traits composition on the ecosystem functioning in the marine realm.

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- **Authors:** Pécuchet, L. (Intern), Lindegren, M. (Intern), Payne, M. (Intern)
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**A trait database for marine copepods**
The trait-based approach is gaining increasing popularity in marine plankton ecology but the field urgently needs more and easier accessible trait data to advance. We compiled trait information on marine pelagic copepods, a major group of zooplankton, from the published literature and from experts and organized the data into a structured database. We collected 9306 records for 14 functional traits. Particular attention was given to body size, feeding mode, egg size, spawning strategy, respiration rate, and myelination (presence of nerve sheathing). Most records were reported at the species level, but some phylogenetically conserved traits, such as myelination, were reported at higher taxonomic levels, allowing the entire diversity of around 10 800 recognized marine copepod species to be covered with a few records. Aside from myelination, data coverage was highest for spawning strategy and body size, while information was more limited for quantitative traits related to reproduction and physiology. The database may be used to investigate relationships between traits, to produce trait biogeographies, or to inform and validate trait-based marine ecosystem models. The data can be downloaded from PANGAEA, doi:10.1594/PANGAEA.862968

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Avoiding pitfalls in interdisciplinary education

As the world's social-environmental problems increasingly extend across boundaries, both disciplinary and political, there is a growing need for interdisciplinarity, not only in research per se, but also in doctoral education. We present the common pitfalls of interdisciplinary research in doctoral education, illustrating approaches towards solutions using the Nordic Centre for Research on Marine Ecosystems and Resources under Climate Change (NorMER) research network as a case study. We provide insights and detailed examples of how to overcome some of the challenges of conducting interdisciplinary research within doctoral studies that can be applied within any doctoral/postdoctoral education programme, and beyond. Results from a self-evaluation survey indicate that early-career workshops, annual meetings and research visits to other institutions were the most effective learning mechanisms, whereas single discipline-focused courses and coursework were among the least effective learning mechanisms. By identifying the strengths and weaknesses of components of NorMER, this case study can inform the design of future programmes to enhance interdisciplinarity in doctoral education, as well as be applied to science collaboration and academic research in general.
Microbial water quality in recirculating aquaculture systems (RAS) is important for successful RAS operation but difficult to assess and control. There is a need to identify factors affecting changes in the bacterial dynamics – in terms of abundance and activity – to get the information needed to manage microbial stability in RAS. This study aimed to quantify bacterial activity in the water phase in six identical, pilot scale freshwater RAS stocked with rainbow trout (Oncorhynchus mykiss) during a three months period from start-up. Bacterial activity and dynamics were investigated by the use of a patented method, BactiQuant®. The method relies on the hydrolysis of a fluorescent enzyme-substrate and is a rapid technique for quantifying bacterial enzyme activity in a water sample. The results showed a forty-fold increase in bacterial activity within the first 24 days from start-up. Average BactiQuant® values (BQV) were below 1000 at Day 0 and stabilized around 40,000 BQV after four weeks from start. The study revealed considerable variation in initial BQV levels between identically operated and designed RAS; over time these differences diminished. Total ammonia nitrogen, nitrite and nitrate levels were very similar in all six RAS and were neither related to nor affected by BQV. Chemical oxygen demand (COD) and biological oxygen demand (BOD5) were highly reproducible parameters between RAS with a stable equilibrium dynamic over time. This study showed that bacterial activity was not a straightforward predictable parameter in the water phase as e.g. nitrate-N would be in identical RAS, and showed unexpected sudden changes/fluctuations within specific RAS. However, a bacterial activity stabilization phase was observed as systems matured and reached equilibrium, suggesting a successive transition from fragile to robust microbial community compositions.
Bacterial community composition and potential driving factors in different reef habitats of the Spermonde Archipelago, Indonesia

Coastal eutrophication is a key driver of shifts in bacterial communities on coral reefs. With fringing and patch reefs at varying distances from the coast the Spermonde Archipelago in southern Sulawesi, Indonesia offers ideal conditions to study the effects of coastal eutrophication along a spatially defined gradient. The present study investigated bacterial community composition of three coral reef habitats: the water column, sediments, and mucus of the hard coral genus Fungia, along that cross shelf environmental and water quality gradient. The main research questions were: (1) How do water quality and bacterial community composition change along a coastal shelf gradient? (2) Which water quality parameters influence bacterial community composition? (3) Is there a difference in bacterial community composition among the investigated habitats? For this purpose, a range of key water parameters were measured at eight stations in distances from 2 to 55 km from urban Makassar. This was supplemented by sampling of bacterial communities of important microbial habitats using 454 pyrosequencing. Findings revealed that the population center Makassar had a strong effect on the concentrations of Chlorophyll a, suspended particulate matter (SPM), and transparent exopolymer particles (TEP), which were all significantly elevated at the inshore compared to the other seven sites. Shifts in the bacterial communities were specific to each sampled habitat. Two OTUs, belonging to the genera Escherichia/Shigella (Gammaproteobacteria) and Raistonia (Betaproteobacteria), respectively, both dominated the bacterial community composition of the both size fractions of the water column and coral mucus. The sampled reef sediments were more diverse, and no single OTUs was dominant. There was no gradual shift in bacterial classes or OTUs within the sampled habitats. In addition, we observed very distinct communities between the investigated habitats. Our data show strong changes in the bacterial community composition at the inshore site for water column and sediment samples. Alarmingly, there was generally a high prevalence of potentially pathogenic bacteria across the entire gradient.

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Behavior is a major determinant of predation risk in zooplankton

Zooplankton exhibit different small-scale motile behaviors related to feeding and mating activities. These different motile behaviors may result in different levels of predation risk, which may partially determine the structure of planktonic communities. Here, we experimentally determined predation mortality associated with (1) feeding activity (ambush feeders vs. feeding-current vs. cruising feeders) and (2) mate-finding behavior (males vs. females). The copepods Oithona nana, O. davisae (ambush feeders), Temora longicornis (feeding-current feeder), and Centropages hamatus (cruising feeder) were used as prey for different predatory copepods. Copepods with “active” feeding behaviors (feeding-current and cruising feeders) showed significantly higher mortality from predation (~2–8 times) than similarly sized copepods with low motility feeding behavior (ambush feeders). Copepod males, which have a more active motile behavior than females (mate-seeking behavior), suffered a higher predation mortality than females in most of the experiments. However, the predation risk for mate-searching behavior in copepods varied depending on feeding behavior with ambush feeders consistently having the greatest difference in predation mortality between genders (~4 times higher for males than for females). This gender-specific predation pressure may partially explain field observations of female-biased sex ratios in ambush feeding copepods (e.g., Oithonidae).

Overall, our results demonstrate that small-scale motile behavior is a key trait in zooplankton that significantly affects predation risk and therefore is a main determinant of distribution and composition of zooplankton communities in the ocean.
Behavioural changes of Atlantic cod (Gadus morhua) after marine boulder reef restoration: Implications for coastal habitat management and Natura 2000 areas

While marine reefs are degraded globally, the responses of fish to marine reef restoration remain uncertain, particularly in temperate waters. This study measured the effect of marine boulder reef restoration on the behaviour of Atlantic cod, Gadus morhua L., in a Natura 2000 area using acoustic telemetry. Cod were tagged and released in the study area before and after the restoration and tracked continuously for six months. A larger fraction of the released fish remained in the study area after restoration (94%) than before (53%). Moreover, throughout the study period, cod spent significantly more hours per day and prolonged their residence time in the study area after the restoration. The study indicates that marine reefs subjected to boulder extraction can be restored and function as favourable cod habitats. Temperate marine boulder reef restoration represents a valuable management tool to improve habitats for temperate fish species.
Bigger is not better: cortisol-induced cardiac growth and dysfunction in salmonids

Stress and elevated cortisol levels are associated with pathological heart growth and cardiovascular disease in humans and other mammals. We recently established a link between heritable variation in post-stress cortisol production and cardiac growth in salmonid fish too. A conserved stimulatory effect of the otherwise catabolic steroid hormone cortisol is probably implied, but has to date not been established experimentally. Furthermore, whereas cardiac growth is associated with failure of the mammalian heart, pathological cardiac hypertrophy has not previously been described in fish. Here, we show that rainbow trout (Oncorhynchus mykiss) treated with cortisol in the diet for 45 days have enlarged hearts with lower maximum stroke volume and cardiac output. In accordance with impaired cardiac performance, overall circulatory oxygen-transporting capacity was diminished as indicated by reduced aerobic swimming performance. In contrast to the well-known adaptive/physiological heart growth observed in fish, cortisol-induced growth is maladaptive. Furthermore, the observed heart growth was associated with up-regulated signature genes of mammalian cardiac pathology, suggesting that signalling pathways mediating cortisol-induced cardiac remodelling in fish are conserved from fish to mammals. Altogether, we show that excessive cortisol can induce pathological cardiac remodelling. This is the first study to report and integrate the etiology, physiology and molecular biology of cortisol-induced pathological remodelling in fish.

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Billedmosaik til kortlægning af udbredelse af jomfruhummer

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Organisations: National Institute of Aquatic Resources, Arctic Section, Section for Marine Living Resources, Section for Maritime Service
Authors: Lundgren, B. (Intern), Stage, B. (Intern), Pedersen, E. M. (Intern), Lisbjerg, D. (Intern)
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Biologiske undersøgelser i Karrebæk fjord i 2017

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Biomasser af alger og hårdbundsfauna samt produktion af fiskeføde på et naturligt stenrev

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Blood O2 affinity of a large polar elasmobranch, the Greenland shark Somniosus microcephalus

The Greenland shark (Somniosus microcephalus. Bloch & Schneider 1801) is a polar elasmobranch that is hypothesised to possess a unique metabolic physiology due to its extreme large size, the cold waters it inhabits and its slow swimming lifestyle. Our results therefore provide the first insight into the metabolic physiology of this unique shark, with a focus on blood O2 affinity. An evaluation of blood O2 affinity at 2 °C using tonometry revealed a P50 of 11.7 mmHg at a PCO2 of 2.25 mmHg and a Bohr effect (binding sensitivity of blood to pH, ϕ = Δlog P50/ΔpH) of −0.26. A comparative evaluation of blood O2 affinity across elasmobranch fishes suggests that S. microcephalus has a high blood O2 affinity (i.e., low P50) and a small Bohr effect but these are common traits in sluggish elasmobranch fishes, with little evidence for any relationship of blood O2 affinity to the low metabolic rates, low environmental temperatures, or large body mass of S. microcephalus. After gathering this physiology data, a subsidiary aim attempted to understand whether a warming scenario would impose a negative effect on blood O2 binding. Incubating blood to a slightly elevated temperature of 7 °C resulted in a small but significant reduction of blood O2 affinity, but no significant change in the Bohr effect. The Hill’s cooperativity coefficient (nH) was also small (1.6–2.2) and unaffected by either PCO2 or temperature. The moderate sensitivity of Greenland shark blood O2 affinity to warming potentially implies little vulnerability of functional O2 supply to the temperature changes associated with the regular vertical movements of this species or warming of polar seas resulting from directional climate change.
Bridging food webs, ecosystem metabolism, and biogeochemistry using ecological stoichiometry theory

Although aquatic ecologists and biogeochemists are well aware of the crucial importance of ecosystem functions, i.e., how biota drive biogeochemical processes and vice-versa, linking these fields in conceptual models is still uncommon. Attempts to explain the variability in elemental cycling consequently miss an important biological component and thereby impede a comprehensive understanding of the underlying processes governing energy and matter flow and transformation. The fate of multiple chemical elements in ecosystems is strongly linked by biotic demand and uptake; thus, considering elemental stoichiometry is important for both biogeochemical and ecological research. Nonetheless, assessments of ecological stoichiometry (ES) often focus on the elemental content of biota rather than taking a more holistic view by examining both elemental pools and fluxes (e.g., organismal stoichiometry and ecosystem process rates). ES theory holds the promise to be a unifying concept to link across hierarchical scales of patterns and processes in ecology, but this has not been fully achieved. Therefore, we propose connecting the expertise of aquatic ecologists and biogeochemists with ES theory as a common currency to connect food webs, ecosystem metabolism, and biogeochemistry, as they are inherently concatenated by the transfer of carbon, nitrogen, and phosphorous through biotic and abiotic nutrient transformation and fluxes. Several new studies exist that demonstrate the connections between food web ecology, biogeochemistry, and ecosystem metabolism. In addition to a general introduction into the topic, this paper presents examples of how these fields can be combined with a focus on ES. In this review, a series of concepts have guided the discussion: (1) changing biogeochemistry affects trophic interactions and ecosystem processes by altering the
elemental ratios of key species and assemblages; (2) changing trophic dynamics influences the transformation and fluxes of matter across environmental boundaries; (3) changing ecosystem metabolism will alter the chemical diversity of the non-living environment. Finally, we propose that using ES to link nutrient cycling, trophic dynamics, and ecosystem metabolism would allow for a more holistic understanding of ecosystem functions in a changing environment.

**General information**

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Bridging the gap between morphological species and molecular barcodes - Exemplified by loricate choanoflagellates

Translating the vast amounts of molecular barcodes from global surveys of microbial eukaryotes into ecological insight depends critically on a well-curated reference database with adequate taxonomic coverage. In this respect, the choanoflagellates resemble other eukaryotic lineages: reasonable coverage at higher taxonomic levels, but missing diversity at the species level. The acanthecids (loricate) choanoflagellates are well-characterized morphologically, with over 115 species described, but less than 10% with any sequence data. Because lorica shape is species-specific, the acanthecids represent an opportunity to link morphological with molecular data within a lineage of eukaryotes. To match morphospecies to sequences, we sampled the Kattegat and the Isefjord in Denmark in September 2014 and February 2015. We identified 45 morphospecies and sequenced ribosomal DNA of nine previously unsequenced species, roughly doubling the number of acanthecid species with sequence data, including the first data representing five genera: Bicosta, Calliacantha, Cosmoeca, Crinolina and Pleurasiga. Our phylogenetic analysis is mainly congruent with morphology-based systematics. Five of the newly sequenced species match a previously unidentified barcode from Tara Oceans, providing access to the global distribution of species isolated from Danish waters. One species, Calliacantha natans, is the second most globally abundant choanoflagellate present in Tara Oceans. Our project translating new ribosomal DNA sequences to distributions of described species on a global scale supports the approach linking morphology to molecular barcodes for microbial eukaryote ecology.
Calanus hyperboreus and the lipid pump
Lipid-fuelled overwintering by copepods can be a regionally important contribution to carbon sequestration in the deep oceans. Here, we estimate the contribution for Calanus hyperboreus, found in abundance in the northern reaches of the North Atlantic and Arctic Ocean. Estimates for regions with high overwintering populations, Fram Strait, Greenland Sea and Iceland Sea lie between 3.5 gC m$^{-2}$ yr$^{-1}$ and 6.0 gC m$^{-2}$ yr$^{-1}$ at depths of 1000–3000 m, comparable to the flux of detrital organic carbon at commensurate depths. Apart from the variation in the abundance of overwintering populations, these estimates are most sensitive to mortality rates. We present a general model based on metabolic theory and isomorphism that can be used to constrain estimates for data poor species in other parts of the global ocean.
Carbon bioavailability in a high Arctic fjord influenced by glacial meltwater, NE Greenland

The land-to-ocean flux of organic carbon is increasing in glacierized regions in response to increasing temperatures in the Arctic (Hood et al., 2015). In order to understand the response of the coastal ecosystem metabolism to the organic carbon input it is essential to determine the bioavailability of the different carbon sources in the system. We quantified the bacterial turnover of organic carbon in a high Arctic fjord system (Young Sound, NE Greenland) during the ice-free period (July-October 2014) and assessed the quality and quantity of the 3 major organic carbon sources; (1) local phytoplankton production (2) runoff from land-terminating glaciers and a lowland river and (3) inflow from the ocean shelf. We found that despite relatively low concentrations of DOC in the rivers, the bioavailability of the river–DOC was significantly higher than in the fjord, and characterized by high cell-specific bacterial production and low C:N ratios. In contrast, the DOC source entering via inflow of coastal shelf waters had high DOC concentrations with high C:N and low specific bacterial production. The phytoplankton production in the fjord could not sustain the bacterial carbon demand, but was still the major source of organic carbon for bacterial growth. We assessed the bacterial community composition and found that communities were specific for the different water types i.e., the bacterial community of the coastal inflow water could be traced mainly in the subsurface water, while the glacial river community strongly dominated the surface water in the fjord.

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Carryover of CH3Hg from feed to sea bass and salmon
Contamination of food generally has a negative impact on the quality and may imply a risk to human health. Mercury (Hg) is one of the most hazardous compounds in our environment and is released from the earth’s crust by both natural and anthropogenic processes. The mercury species CH3Hg is highly toxic, because affects the function of enzymes, easily crosses the blood-brain and the placenta barriers and is toxic to the nervous system (especially the developing brain). It bioaccumulates and biomagnifies through the aquatic food chain. Methymercury is the most common mercury species in fish and humans are also mainly exposed to methymercury from consumption of fish and other seafood. The aims of the present controlled fish feeding trials were to study the carryover from feed to fish fillets (at low spike levels (1x background level of methymercury) and to determine toxicokinetic parameters. The
study included Atlantic salmon (Salmo salar), which is one of the main farmed seafood products consumed in Europe and with production in Northern Europe as well as European seabass (Dicentrarchus labrax) produced in Southern Europe, where it is a highly consumed seafood product. The weight gain of the fish, their feed intake, feed and fish fillet contaminant level were determined to model the uptake and elimination of methylmercury. The toxicokinetics for feed with low levels of methylmercury (41-75 ng/g) showed high assimilation and low elimination.

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While nutrient concentrations in the ambient environment have been shown to influence growth in juvenile plaice through influence on their prey, we here inspect the potential linkage between distributional changes in plaice and the decline in nutrient loading. We compare plaice observations in coastal areas in the eastern North Sea, which have experienced large changes in eutrophication, with observations for the Dogger Bank, a large sandbank in a shallow offshore area of the North Sea. The Dogger Bank was used as a reference location assuming this area has been less influenced from coastal eutrophication but similar regional climate conditions, and here we found no changes in the abundances of juvenile plaice. The increase in the use of offshore habitats as nursery areas by juvenile plaice in the North Sea appears not related to water depth per se but driven by specific processes dominating in near-shore areas and may be related to changes in nutrient loadings. This point to the importance of separating more general depth-related factors from conditions specific for near-shore areas, such as nutrient loadings in coastal waters and export offshore. The concurrent changes in environment and in distribution of juvenile plaice may have implications for environmental and fisheries management.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Department of Electrical Engineering, Section for Marine Ecology and Oceanography, Japan International Research Centre for Agricultural Sciences  
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Changes in food web function and diversity due to non-indigenous species

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Oceans and Arctic, Åbo Academy University, University of Erlangen-Nuremberg
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Changes in reproductive life history and resource allocation impacting population dynamics of Baltic cod

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Monitoring and Data, Section for Ecosystem based Marine Management, Institute Management
Authors: Tomkiewicz, J. (Intern), Huwer, B. (Intern), Cordón, C. T. F. (Intern), Storr-Paulsen, M. (Intern), Eero, M. (Intern), Köster, F. (Intern)
Publication date: 2017
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Publication: Research › Conference abstract for conference – Annual report year: 2017
Characterising and predicting the distribution of Baltic Sea flounder during the spawning season

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Publication: Research › Conference abstract for conference – Annual report year: 2017

Characterizing and predicting the distribution of Baltic Sea flounder (*Platichthys flesus*) during the spawning season

Identification of essential fish habitats (EFH), such as spawning habitats, is important for nature conservation, sustainable fisheries management and marine spatial planning. Two sympatric flounder (*Platichthys flesus*) ecotypes are present in the Baltic Sea, pelagic and demersal spawning flounder, both displaying ecological and physiological adaptations to the low-salinity environment of this young inland sea. In this study we have addressed three main research questions: 1) What environmental conditions characterize the spatial distribution and abundance of adult flounder during the spawning season? 2) What are the main factors defining the habitats of the two flounder ecotypes during the spawning season? 3) Where are the potential spawning areas of flounder? We modelled catch per unit of effort (CPUE) of flounder from gillnet surveys conducted over the southern and central Baltic Sea in the spring of 2014 and 2015 using generalized additive models. A general model included all the stations fished during the survey while two other models, one for the demersal and one for the pelagic spawning flounder, included only the stations where each flounder ecotype should dominate. The general model captured distinct ecotype-specific signals as it identified dual salinity and water depth responses. The model for the demersal spawning flounder revealed a negative relation with the abundance of round goby (*Neogobius melanostomus*) and a positive relation with Secchi depth and cod abundance. Vegetation and substrate did not play an important role in the choice of habitat for the demersal ecotype. The model for the pelagic spawning flounder showed a negative relation with temperature and bottom current and a positive relation with salinity. Spatial predictions of potential spawning areas of flounder showed a decrease in habitat availability for the pelagic spawning flounder over the last 20 years in the central part of the Baltic Sea, which may explain part of the observed changes in populations' biomass. We conclude that spatiotemporal modelling of habitat availability can improve our understanding of fish stock dynamics and may provide necessary biological knowledge for the development of marine spatial plans.

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Web of Science (2016): Indexed yes
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Scopus rating (2015): SJR 1.008 SNIP 1.007 CiteScore 2.09
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.977 SNIP 1.024 CiteScore 2.15
Choosing the observational likelihood in state-space stock assessment models

Data used in stock assessment models result from combinations of biological, ecological, fishery, and sampling processes. Since different types of errors propagate through these processes it can be difficult to identify a particular family of distributions for modelling errors on observations a priori. By implementing several observational likelihoods, modelling both numbers- and proportions-at-age, in an age based state-space stock assessment model, we compare the model fit for each choice of likelihood along with the implications for spawning stock biomass and average fishing mortality. We propose using AIC intervals based on fitting the full observational model for comparing different observational likelihoods. Using data from four stocks, we show that the model fit is improved by modelling the correlation of observations within years. However, the best choice of observational likelihood differs for different stocks, and the choice is important for the short-term conclusions drawn from the assessment model; in particular, the choice can influence total allowable catch advise based on reference points.

General information

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Sex is found in all major eukaryotic groups of organisms. It has been known for some time that the choanoflagellates also possess the genes involved in meiosis and a full sexual cycle was also recently accounted for in Salpingoeca rosetta. With reference to the loricate choanoflagellates the current status is that only circumstantial evidence, from wild material of Bicosta spinifera, exists in favour of documenting division patterns that go beyond plain asexual division, and that has the potential to represent stages in a sexual life cycle. Here we present further evidence from wild material documenting possible morphotype changes that might similarly indicate the existence of complex life cycles. In this particular case, it revolves around the existence of so-called ‘combination loricas’ (i.e. two loricas that occur physically united), representing consistent species combinations from the genera Acanthocorbis and Stephanoeca.
Climate change implications for fisheries and aquaculture

General information
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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Department of Ichthyology and Fisheries Science, Plymouth Marine Laboratory
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Main Research Area: Technical/natural sciences
Publication: Research - peer-review » Book chapter – Annual report year: 2017
Climate-mediated changes in marine ecosystem regulation during El Niño

The degree to which ecosystems are regulated through bottom-up, top-down or direct physical processes represents a long-standing issue in ecology, with important consequences for resource management and conservation. In marine ecosystems, the role of bottom-up and top-down forcing has been shown to vary over spatio-temporal scales, often linked to highly variable and heterogeneously distributed environmental conditions. Ecosystem dynamics in the Northeast Pacific have been suggested to be predominately bottom-up regulated. However, it remains unknown to what extent top-down regulation occurs, or whether the relative importance of bottom-up and top-down forcing may shift in response to climate change. In this study, we investigate the effects and relative importance of bottom-up, top-down and physical forcing during changing climate conditions on ecosystem regulation in the Southern California Current System (SCCS) using a generalized food web model. This statistical approach is based on non-linear threshold models and a long-term data set (~60 year) covering multiple trophic levels from phytoplankton to predatory fish. We found bottom-up control to be the primary mode of ecosystem regulation. However, our results also demonstrate an alternative mode of regulation represented by interacting bottom-up and top-down forcing, analogous to wasp-waist dynamics, but occurring across multiple trophic levels and only during periods of reduced bottom-up forcing (i.e., weak upwelling, low nutrient concentrations and primary production). The shifts in ecosystem regulation are caused by changes in ocean-atmosphere forcing and triggered by highly variable climate conditions associated with El Niño. Furthermore, we show that biota respond differently to major El Niño events during positive or negative phases of the Pacific Decadal Oscillation (PDO), as well as highlight potential concerns for marine and fisheries management by demonstrating increased sensitivity of pelagic fish to exploitation during El Niño. This article is protected by copyright. All rights reserved.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of California, San Diego
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Scopus rating (2014): SJR 4.636 SNIP 2.693 CiteScore 8.33
Web of Science (2014): Indexed yes
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BFI (2011): BFI-level 2
Scopus rating (2011): SJR 4.385 SNIP 2.23 CiteScore 6.86
Codend selectivity in a commercial Danish anchor seine

Danish seining (or anchor seining) is a fishing technique that is gaining increasing attention because it is considered to be a fuel-efficient fishing method with low environmental impact. However, scientific documentation of the selectivity characteristics of Danish seines is lacking, and the gear generally is grouped with bottom trawls and Scottish seines in fisheries management legislation. In this study, we developed a codend cover to estimate the selectivity of a standard commercial Danish seine codend for four fish species. The data for the dominant species, dab (Limanda limanda) and plaice (Pleuronectes platessa), was best described by models that combine two or three logistic models, which indicated that more than one selection process was at work. Selectivity of cod (Gadus morhua) was best described by a Richard curve and selectivity of red gurnard (Chelidonichthys lucernus) by a logistic curve. The estimated selectivity curve of dab indicated, contrary to cod and plaice, low retention of individuals below MLS. Confidence limits for larger length classes of cod and red gurnard were relatively wide. For plaice, the estimated selection factor, which is the length with 50% retention divided by mesh size, was comparable to literature values from trawl studies. The average value for cod was similar for Danish and Scottish seines, but lower for trawls. The results are discussed in the context of fisheries management with focus on the landing obligation of the new Common Fisheries Policy.
Combined effects of chronic exposure to suspended solid load and increased unionized ammonia concentrations on the physiology and growth performance of rainbow trout (Oncorhynchus mykiss)

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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Fisheries Research Station of Baden-Württemberg, University of Veterinary Medicine, Technical University of Munich
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Combining litter observations with a regional ocean model to identify sources and sinks of floating debris in a semi-enclosed basin: The Adriatic Sea

Visual ship transect surveys provide crucial information about the density, and spatial distribution of floating anthropogenic litter in a basin. However, such observations provide a 'snapshot' of local conditions at a given time and cannot be used to deduce the provenance of the litter or to predict its fate, crucial information for management and mitigation policies. Particle tracking techniques have seen extensive use in these roles, however, most previous studies have used simplistic initial conditions based on bulk average inputs of debris to the system. Here, observations of floating anthropogenic macro debris in the Adriatic Sea are used to define initial conditions (number of particles, location, and time) in a Lagrangian particle tracking model. Particles are advected backward and forward in time for 60 days (120 days total) using surface velocities from an operational regional ocean model. Sources and sinks for debris observed in the central and southern Adriatic in May 2013 and March 2015 included the Italian coastline from Pescara to Brindisi, the Croatian island of Mljet, and the coastline from Dubrovnik through Montenegro to Albania. Debris observed in the northern Adriatic originated from the Istrian peninsula to the Italian city of Termoli, as well as the Croatian island of Cres and the Kornati archipelago. Particles spent a total of roughly 47 days afloat. Coastal currents, notably the eastern and western Adriatic currents, resulted in large alongshore displacements. Our results indicate that anthropogenic macro debris originates largely from coastal sources near population centers and is advected by the cyclonic surface circulation until it strands on the southwest (Italian) coast, exits the Adriatic, or recirculates in the southern gyre.

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Florida Atlantic University, Consiglio Nazionale delle Ricerche, Jerusalem College of Technology, National Institute of Oceanography and Experimental Geophysics, Universita Politecnica delle Marche
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Community cascades in a marine pelagic food web controlled by the non-visual apex predator Mnemiopsis leidyi

Trophic cascades are a ubiquitous feature of many terrestrial and fresh-water food webs, but have been difficult to demonstrate in marine systems with multispecies trophic levels. Here we describe significant trophic cascades in an open coastal planktonic ecosystem exposed to an introduced top predator. The ctenophore Mnemiopsis leidyi was monitored for an 8-year period concurrent with measures of the food web structure of the plankton and strong trophic cascades were evident. In the 5 years when M. leidyi were found, their target prey (grazing copepods) were reduced 5-fold and the primary producers doubled their biomass when released from the grazing pressure. The increased phytoplankton biomass could unequivocally be assigned to grazing release since concurrent measurements of primary production did not differ between years with or without M. leidyi. Copepod biomass prior to the mass occurrence of the ctenophore was important. The years without M. leidyi had significantly higher biomass of copepods in July, the month preceding the outburst of the ctenophore. The profound changes of the pelagic ecosystem faced with a non-selective apex predator shows that marine communities are not exceptions from trophic cascade mechanisms.
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
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Web of Science (2009): Indexed yes
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Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.035 SNIP 1.101
Scopus rating (2003): SJR 1.315 SNIP 1.299
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.239 SNIP 1.068
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.234 SNIP 1
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Scopus rating (2000): SJR 1.226 SNIP 1.049
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Community ecology in 3D: Tensor decomposition reveals spatio-temporal dynamics of large ecological communities

Understanding spatio-temporal dynamics of biotic communities containing large numbers of species is crucial to guide ecosystem management and conservation efforts. However, traditional approaches usually focus on studying community dynamics either in space or in time, often failing to fully account for interlinked spatio-temporal changes. In this study, we demonstrate and promote the use of tensor decomposition for disentangling spatio-temporal community dynamics in long-term monitoring data. Tensor decomposition builds on traditional multivariate statistics (e.g. Principal Component Analysis) but extends it to multiple dimensions. This extension allows for the synchronized study of multiple ecological variables measured repeatedly in time and space. We applied this comprehensive approach to explore the spatio-temporal dynamics of 65 demersal fish species in the North Sea, a marine ecosystem strongly altered by human activities and climate change. Our case study demonstrates how tensor decomposition can successfully (i) characterize the main spatio-temporal patterns and trends in species abundances, (ii) identify sub-communities of species that share similar spatial distribution and temporal dynamics, and (iii) reveal external drivers of change. Our results revealed a strong spatial structure in fish assemblages persistent over time and linked to differences in depth, primary production and seasonality. Furthermore, we simultaneously characterized important temporal distribution changes related to the low frequency temperature variability inherent in the Atlantic Multidecadal Oscillation. Finally, we identified six major sub-communities composed of species sharing similar spatial distribution patterns and temporal dynamics. Our case study demonstrates the application and benefits of using tensor decomposition for studying complex community data sets usually derived from large-scale monitoring programs.

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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Hamburg, Thünen Institute of Sea Fisheries, Leibniz Center for Tropical Marine Ecology (ZMT), Bremen
Authors: Frelat, R. (Ekstern), Lindegren, M. (Intern), Dencker, T. S. (Intern), Floeter, J. (Ekstern), Fock, H. O. (Ekstern), Sguotti, C. (Ekstern), Stäbler, M. (Ekstern), Otto, S. A. (Ekstern), Möllmann, C. (Ekstern)
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Scopus rating (2015): SJR 1.414 SNIP 1.131 CiteScore 3.32
Web of Science (2015): Indexed yes
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
Competition for the fish - fish extraction from the Baltic Sea by humans, aquatic mammals and birds

Populations of fish eating mammals (primarily seals) and birds have increased in the Baltic Sea and there is concern that their consumption reduces fish stocks and has negative impact on the fishery. Based primarily on published data on fisheries’ landings and abundances, consumption and diets of birds and seals around year 2010, we compare consumption of commercial fish species by seals (1*10^5 metric tons per year) and birds (1*10^5 tons) to the catch in the commercial and recreational fishery (7*10^5 tons), and when applicable at the geographical resolution of ICES subdivisions. The large populations of herring (Clupea harengus), sprat (Sprattus sprattus) and cod (Gadus morhua), primarily inhabit off-shore areas and are mainly caught by the fishery. Predation by birds and mammals likely has little impact on these stocks. For these species, seals and birds may be negatively impacted by competition from the fishery. In the central and southern Baltic, seals and birds consume about as much flatfish as is caught by the fishery and competition is possible. Birds and seals consume 2-3 times as much coastal fish as is caught in the fishery. Many of the coastal species are not much targeted by the fishery (e.g. eelpout Zoarces viviparus, roach Rutilus rutilus and ruffe Gymnocephalus cernua), while other species used by wildlife are important to the fishery (e.g. perch Perca fluviatilis and whitefish Coregonus spp.) and competition between wildlife and the fishery is likely, at least locally. Estimated wildlife consumption of pike (Esox lucius), sea trout (Salmo trutta) and pikeperch (Sander lucioperca) varies among ICES subdivisions and the degree of competition for these species will likely differ among areas. Our results indicate that competition between wildlife and fisheries need to be addressed in basic ecosystem research, management and conservation. This requires improved quantitative data on wildlife diets, abundances and fish production.

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Stockholm University, Swedish University of Agricultural Sciences, Swedish Museum of Natural History, Natural Resources Institute Finland, State Research Institute on Lake and River Fishery, University of Tartu, Åbo Academy University
Authors: Hansson, S. (Ekstern), Bergström, U. (Ekstern), Bonsdorff, E. (Ekstern), Häkönén, T. (Ekstern), Jepsen, N. (Intern), Kautsky, L. (Ekstern), Lundström, K. (Ekstern), Lunneryd, S. (Ekstern), Overgaard, M. (Ekstern), Salminen, J. (Ekstern), Sendek, D. (Ekstern), Vetemaa, M. (Ekstern)
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Computational Fluid Dynamics of Choanoflagellate Filter-Feeding

Choanoflagellates are unicellular aquatic organisms with a single flagellum that drives a feeding current through a funnel-shaped collar filter on which bacteria-sized prey are caught. Using computational fluid dynamics (CFD) we model the beating flagellum and the complex filter flow of the choanoflagellate Diaphanoeca grandis. Our CFD simulations based on the current understanding of the morphology underestimate the experimentally observed clearance rate by more than an order of magnitude. The beating flagellum is simply unable to draw enough water through the fine filter. Our observations motivate us to suggest a radically different filtration mechanism that requires a flagellar vane (sheet), and addition of a wide vane in our CFD model allows us to correctly predict the observed clearance rate.
Connecting single-stock assessment models through correlated survival

Fisheries management is mainly conducted via single-stock assessment models assuming that fish stocks do not interact, except through assumed natural mortalities. Currently, the main alternative is complex ecosystem models which require extensive data, are difficult to calibrate, and have long run times. We propose a simple alternative. In three case studies each with two stocks, we improve the single-stock models, as measured by Akaike information criterion, by adding correlation in the cohort survival. To limit the number of parameters, the correlations are parameterized through the corresponding partial correlations. We consider six models where the partial correlation matrix between stocks follows a band structure ranging from independent assessments to complex correlation structures. Further, a simulation study illustrates the importance of handling correlated data sufficiently by investigating the coverage of confidence intervals for estimated fishing mortality. The results presented will allow managers to evaluate stock statuses based on a more accurate evaluation of model output uncertainty. The methods are directly implementable for stocks with an analytical assessment and do not require any new data sources.
Connectivity and Dispersal of Salmon Lice in a Tidal Energetic Island System: Faroe Islands

Larvae of the eye fluke, Diplostomum, emerge from snails and infect fish by penetrating skin or gills, then move to the lens where they may impair the vision of the fish. For the fluke to reproduce, a bird must eat the infected fish, and it has been suggested that they therefore actively manipulate the fish’s behaviour to increase the risk of predation. We found that round gobies Neogobius melanostomus, a species that was recently introduced to the Kalmar Sound of the Baltic Sea, had an eye fluke prevalence of 90–100%. We investigated how the infection related to behavioural variation in round gobies. Our results showed that the more intense the parasite-induced cataract, the weaker the host’s response was to simulated avian attack. The eye flukes did not impair other potentially important anti-predator behaviours, such as shelter use, boldness and the preference for shade. Our results are in accordance with the suggestion that parasites induce changes in host behaviour that will facilitate transfer to their final host.

Consequences of eye fluke infection on anti-predator behaviours in invasive round gobies in Kalmar Sound

Larvae of the eye fluke, Diplostomum, emerge from snails and infect fish by penetrating skin or gills, then move to the lens where they may impair the vision of the fish. For the fluke to reproduce, a bird must eat the infected fish, and it has been suggested that they therefore actively manipulate the fish’s behaviour to increase the risk of predation. We found that round gobies Neogobius melanostomus, a species that was recently introduced to the Kalmar Sound of the Baltic Sea, had an eye fluke prevalence of 90–100%. We investigated how the infection related to behavioural variation in round gobies. Our results showed that the more intense the parasite-induced cataract, the weaker the host’s response was to simulated avian attack. The eye flukes did not impair other potentially important anti-predator behaviours, such as shelter use, boldness and the preference for shade. Our results are in accordance with the suggestion that parasites induce changes in host behaviour that will facilitate transfer to their final host.
Conservation physiology can inform threat assessment and recovery planning processes for threatened species

Conservation physiology has emerged as a discipline with many success stories. Yet, it is unclear how conservation physiology is currently integrated into the activities of bodies such as the IUCN and other agencies/organizations/bodies which undertake international, national, or regional species threat assessments and work with partners to develop recovery plans. Here we argue that conservation physiology has much to offer for the threat assessment process and outline the ways in which this can be operationalized. For instance, conservation physiology is effective at revealing causal relationships and mechanisms that explain observed patterns (e.g., population declines). Identifying the causes of
population declines is a necessary precursor to reverse or mitigate such threats. Conservation physiology can also identify complex interactions and support modeling activities that consider emerging threats. When a population or species is deemed “threatened” and recovery plans are needed, physiology can be used to predict how organisms will respond to the conservation intervention and future threats. For example, if a recovery plan was focused on translocation, understanding how to safely translocate organisms would be necessary, as would ensuring that the recipient habitat provides the necessary environmental characteristics to meet the fundamental physiological needs/tolerances of that organism. Our hope is that this paper will clarify ways in which physiological data can play an important role in the conservation activities of bodies like the IUCN that are engaged in threat assessment and recovery of endangered organisms. Although we focus on activities at the international scale, these same concepts are relevant and applicable to national and regional bodies.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University, University of Ottawa
Authors: Birnie-Gauvin, K. (Intern), Walton, S. (Ekstern), Delle Palme, C. A. (Ekstern), Manouchehri, B. A. (Ekstern), Venne, S. (Ekstern), Lennox, R. J. (Ekstern), Chapman, J. M. (Ekstern), Bennett, J. R. (Ekstern), Cooke, S. J. (Ekstern)
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- Scopus rating (2016): CiteScore 1.95 SJR 0.78 SNIP 0.771
- Web of Science (2016): Indexed yes
- Scopus rating (2015): SJR 0.873 SNIP 0.829 CiteScore 1.83
- Web of Science (2015): Indexed yes
- Scopus rating (2014): SJR 1.157 SNIP 1.307 CiteScore 2.24
- Scopus rating (2013): SJR 1.339 SNIP 1.169 CiteScore 2.49
- ISI indexed (2013): ISI indexed no
- Web of Science (2013): Indexed yes
- Scopus rating (2012): SJR 1.143 SNIP 1.108 CiteScore 2.26
- ISI indexed (2012): ISI indexed no
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- Scopus rating (2011): SJR 1.526 SNIP 1.282 CiteScore 2.46
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**Contrasting coping styles meet the wall: A dopamine driven dichotomy in behavior and cognition**

Individual variation in the ability to modify previously learned behavior is an important dimension of trait correlations referred to as coping styles, behavioral syndromes or personality. These trait clusters have been shaped by natural selection, and underlying control mechanisms are often conserved throughout vertebrate evolution. In teleost fishes, behavioral flexibility and coping style have been studied in the high (HR) and low-responsive (LR) rainbow trout lines. Generally, proactive LR trout show a behavior guided by previously learned routines, while HR trout show a more flexible behavior relying on environmental cues. In mammals, routine dependent vs. flexible behavior has been connected to variation in limbic dopamine (DA) signaling. Here, we studied the link between limbic DA signaling and individual variation in flexibility in teleost fishes by a reversal learning approach. HR/LR trout were challenged by blocking a learned escape route, previously available during interaction with a large and aggressive conspecific. LR trout performed a higher number.
of failed escape attempts against the transparent blockage, while HR trout were more able to inhibit the now futile escape impulse. Regionally discrete changes in DA neurochemistry were observed in micro dissected limbic areas of the telencephalon. Most notably, DA utilization in the dorsomedial telencephalon (DM, a suggested amygdala equivalent) remained stable in HR trout in response to reversal learning under acute stress, while increasing from an initially lower level in LR trout. In summary, these results support the view that limbic homologs control individual differences in behavioral flexibility even in non-mammalian vertebrates.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Norwegian Institute for Water Research, University of Algarve, Uni Research AS, Norwegian University of Life Sciences
Authors: Höglund, E. (Ekstern), Silva, P. I. D. M. E. (Intern), Vindas, M. A. (Ekstern), Øverli, Ø. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Frontiers in Neuroscience
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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.85 SJR 1.88 SNIP 1.087
Scopus rating (2015): SJR 2.022 SNIP 1.093 CiteScore 3.72
Scopus rating (2014): SJR 2.04 SNIP 1.097 CiteScore 3.84
Scopus rating (2013): SJR 2.068 SNIP 1.089 CiteScore 3.61
Scopus rating (2012): SJR 1.718 SNIP 1.004 CiteScore 3.25
Scopus rating (2011): SJR 1.707 SNIP 1.268
Scopus rating (2010): SJR 1.326 SNIP 0.709
Original language: English
NEUROSCIENCES, RAINBOW-TROUT, NEURAL PLASTICITY, ANIMAL PERSONALITIES, INDIVIDUAL VARIATION, TELEOST FISHES, DANIO-RERIO, STRESS, FLEXIBILITY, RECEPTORS, AMYGDALA, personality, monoamines, limbic system, teleosts, cognitive flexibility
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Source: FindIt
Source-ID: 2372911813
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**Coping styles in farmed fish: consequences for aquaculture**
Individual differences in physiological and behavioural responses to stressors are increasingly recognised as adaptive variation and thus raw material for evolution and fish farming improvements including selective breeding. Such individual variation has been evolutionarily conserved and is present in all vertebrate taxa including fish. In farmed animals, the interest in consistent trait associations, that is coping styles, has increased dramatically over the last years because many studies have demonstrated links to performance traits, health and disease susceptibility and welfare. This study will review (i) the main behavioural, neuroendocrine, cognitive and emotional differences between reactive and proactive coping styles in farmed fish; (ii) the methodological approaches used to identify coping styles in farmed fish, including individual (group) mass-screening tests; and (iii) how knowledge on coping styles may contribute to improved sustainability of the aquaculture industry, including welfare and performance of farmed fish. Moreover, we will suggest areas for future research, where genetic basis (heritability/epigenetic) of coping styles, and the neuroendocrine mechanisms behind consistent as well as flexible behavioural patterns are pinpointed as central themes. In addition, the ontogeny of coping styles and the influence of age, social context and environmental change in coping styles will also be discussed

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Universidade do Algarve, IFREMER, Universidad Autonoma de Barcelona, University of Tromsø, Institute of Marine Research, University of Agder, Norwegian
Cormorant predation overlaps with fish communities and commercial-fishery interest in a Swedish lake

The increase of the fish-eating cormorant (Phalacrocorax carbo sinensis) in Europe has resulted in conflicts with fisheries. In Lake Roxen, Sweden, cormorants are blamed for causing a decrease in fishery catches. To study and describe the potential effects that cormorants may have had on fish in the lake, their diet was analysed in relation to fish catches in gill-net surveys and fishery catches. Estimates of predation were achieved by ‘tag and recovery’ on eel, pikeperch and perch. Cormorants predated on the most common species and sizes, which were mainly smaller perch, ruffe and roach (mean sizes of 9, 8 and 13 cm respectively). Tag recoveries from perch, eel and pike-perch detected predation estimates of 14, 7 and 15% respectively. From a highly eutrophic state, the lake has shown improvements in water quality and a development towards larger predatory fish was expected, but the results from gill-net surveys did not show this. Results indicated that cormorants and fisheries may both be responsible, but because cormorants remove more fish, they may be the main factor for the lack of recovery of large predatory fish. Their predation keeps recruitment high, but the number of fish that reach large sizes remains low.
Crosstalk between innate immunity and circadian rhythm: Do fish immune defences have a sense of time?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Nanyang Technological University
Authors: Lazado, C. C. (Intern), Lund, I. (Intern), Skov, P. V. (Intern), Jokumsen, A. (Intern), Gesto, M. (Intern), Huy, N. Q. (Ekstern), Pedersen, P. B. (Intern)
Publication date: 2017
Event: Poster session presented at Aquaculture Europe 2017, Dubrovnik, Croatia.
Main Research Area: Technical/natural sciences

Bibliographical note
Poster in International Conference: Aquaculture Europe 17, October 17-20, 2017, Dubrovnik, Croatia
Crude fucoidan content in two North Atlantic kelp species, Saccharina latissima and Laminaria digitata - seasonal variation and impact of environmental factors

Fucoidans are sulphated fucose-rich polysaccharides predominantly found in the cell walls of brown algae. The bioactive properties of fucoidans attract increasing interest from the medico-pharmaceutical industries and may drive an increase in demand of brown algae biomass. In nature, the biochemical composition of brown algae displays a seasonal fluctuation driven by environmental factors and endogenous rhythms. To cultivate and harvest kelps with high yields of fucoidans, knowledge is needed on seasonal variation and impact of environmental conditions on the fucoidan content of brown algae. The relations between the fucoidan content and key environmental factors (irradiance, nutrient availability, salinity and exposure) were examined by sampling natural populations of the common North Atlantic kelps, Saccharina latissima and Laminaria digitata, over a full year at Hanstholm in the North Sea and Aarhus in the Kattegat. In addition, laboratory experiments were carried out isolating the effects of the single factors. The results demonstrated that (1) seasonal variation alters the fucoidan content by a factor of 2 to 2.6; (2) interspecific differences exist in the concentrations of crude fucoidan (% of dry matter): L. digitata (11%) > S. latissima (6%); and (3) the effects of single environmental factors were not consistent between species or between different conspecific populations. The ambiguous response to single environmental factors complicates prospective directions for manipulating an increased content of fucoidan in a cultivation scenario and emphasizes the need for knowledge on performance of local kelp ecotypes.

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, National Institute of Aquatic Resources, Danish Shellfish Centre, Aarhus University, Danish Technological Institute, University of Hamburg
Authors: Bruhn, A. (Ekstern), Janicek, T. (Ekstern), Manns, D. M. (Intern), Nielsen, M. M. (Intern), Balsby, T. J. S. (Ekstern), Meyer, A. S. (Intern), Rasmussen, M. B. (Ekstern), Hou, X. (Ekstern), Saake, B. (Ekstern), Göke, C. (Ekstern), Bjerre, A. (Ekstern)
Pages: 3121-3137
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Scopus rating (2016): CiteScore 2.46
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BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.88
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.78
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.68
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Cryptic *Sebastes norvegicus* species in Greenland waters revealed by microsatellites

Identification of cryptic species can have profound implications in fishery management, conservation and biodiversity contexts. In the North Atlantic, the genus *Sebastes* is currently represented by four species, although additional cryptic species have been assumed. The connectivity of the gene-pools within the genus in Greenland waters, in particular, remains largely unexplored. Using a panel of 13 microsatellite markers for 720 fish, we explored the species complex of *Sebastes norvegicus* in Greenland waters. Genetic analyses provided evidence for three cryptic species in samples that were morphologically identified as *S. norvegicus*. They were termed *S. norvegicus*-A, *S. norvegicus*-B, and *S. norvegicus* giants. A few phenotypic features exist to identify adult *S. norvegicus* giants, but no characteristics have been identified for the two other cryptic species. The proposed cryptic species should be recognized in the management regime to ensure sustainable exploitation and conservation of *Sebastes* species in Greenland waters.

**General information**

State: Published

Organisations: Arctic Section, National Institute of Aquatic Resources, Section for Oceans and Arctic, Institute of Marine Research, University of Washington, Greenland Institute of Natural Resources, UiT The Arctic University of Norway

Authors: Saha, A. (Ekstern), Hauser, L. (Ekstern), Hedeholm, R. (Ekstern), Planque, B. (Ekstern), Fævolden, S. (Ekstern), Boje, J. (Intern), Johansen, T. (Ekstern)

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Scopus rating (2016): CiteScore 2.63

Web of Science (2016): Indexed yes
Danish seine – Ecosystem effects of fishing

In 2014, the project "Danish seine – Ecosystem effects of fishing" got initiated in order to establish a better scientific understanding around Danish anchor seining and its effects on the environment. By comparing catch profiles of Danish seiners and demersal otter trawlers, we could show that the Danish seine is an efficient gear to catch flatfish, but is not as flexible as trawlers in terms of fishing areas because it is restricted to relatively flat areas. Furthermore, selectivity characteristics of the codend and other parts of the gear were investigated. We attached a large cover around the codend and a novel arrangement of 12 small mesh bags on different parts of the seine net to collect fish and invertebrates that would escape under commercial conditions. By doing so, we could estimate codend selectivity parameters for relevant species, which were relatively similar to estimates for trawls, and found that the majority of fish attempted to escape through the seine codend. For invertebrates, we observed high escapement rates from gear parts forward of the codend, indicating that there are effects that are ignored in conventional selectivity studies which primarily focus on codend catches. In another set of sea trials, we attached GPS loggers and various self-invented observation systems to the gear to monitor and describe the fishing process in detail. Animations showing the fishing operation with a Danish seine were created, including information about net opening, net spread, tensile forces between net and ropes and rope behavior. We documented that the majority of fish enters the seine net very late, that fishermen can conduct efficient seine fishing although they do not use any gear monitoring sensors, and that impacts of seine ropes on the sea floor were limited to slight smoothening effects. The PhD project increased the basic scientific understanding of Danish seining and developed methods and equipment than can be used to collect more detailed information in the future. The broad information established here provide data that is of high relevance for tomorrow’s discussions about the fisheries in European waters
including the implementation of the new Common Fisheries Policy and its landing obligation.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data
Authors: Noack, T. (Intern), Krag, L. A. (Intern), Wieland, K. (Intern)
Number of pages: 138
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Publisher: Technical University of Denmark, National Institute of Aquatic Resources
Main Research Area: Technical/natural sciences
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Danish seine – Ecosystem effects of fishing
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Aalborg University
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Deliverable 6.5: Management plans for case studies
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Organisations: National Institute of Aquatic Resources, Aalborg University
Authors: Nielsen, K. N. (Ekstern), Agnarsson, S. (Ekstern), Ballesteros, M. A. (Ekstern), Bartolino, V. (Ekstern), Baudron, A. (Ekstern), Bauer, B. (Ekstern), Colloca, F. (Ekstern), Pór Elvarsson, B. (Ekstern), Horbowy, J. (Ekstern), Hegland, T. J. (Ekstern), Maximov, V. (Ekstern), Nenciu, M. (Ekstern), Pope, J. G. (Intern), Monsalve, M. P. R. (Ekstern), Rahikainen, M. (Ekstern), M. Rincón, M. (Ekstern), Ruiz, J. (Ekstern), Viðarsson, J. (Ekstern), Sárbo, G. (Ekstern), T. Tomczak (SU), M. (Ekstern), Zahira, T. (Ekstern)
Number of pages: 158
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Deliverable No. 6.6: Synthesis of DSF work
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State: Published
Organisations: National Institute of Aquatic Resources, Aalborg University
Authors: Nielsen, K. N. (Ekstern), Agnarsson, S. (Ekstern), Ballesteros, M. A. (Ekstern), Bartolino, V. (Ekstern), Baudron, A. (Ekstern), Bauer, B. (Ekstern), Colloca, F. (Ekstern), Pór Elvarsson, B. (Ekstern), Horbowy, J. (Ekstern), Hegland, T. J. (Ekstern), Maximov, V. (Ekstern), Nenciu, M. (Ekstern), Pope, J. G. (Intern), Monsalve, M. P. R. (Ekstern), Rahikainen, M. (Ekstern), M. Rincón, M. (Ekstern), Ruiz, J. (Ekstern), Viðarsson, J. (Ekstern), Sárbo, G. (Ekstern), Sinerchia, M. (Ekstern)
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General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Section for Freshwater Fisheries Ecology, Section for Ecosystem based Marine Management
Authors: MacKenzie, B. (Intern), Aarestrup, K. (Intern), Christoffersen, M. (Intern)
Publication date: 2017

Denitirification in saltwater recirculating aquaculture systems (RAS) using an up-flow sludge bed reactor (USB)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Aquaculture
Authors: Herreros, M. M. (Intern), Letelier-Gordo, C. O. (Intern)
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Den skeptiske optimist: Udfordringer og perspektiver i anvendelse af eDNA til marin monitering og fiskeriforvaltning

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Eg Nielsen, E. (Intern), Bekkevold, D. (Intern), Hansen, B. K. (Intern)
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Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
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Den skjulte sommerproduktion i Nordsøen

General information
Development and testing of a separator frame in a Norway lobster Nephrops norvegicus fishery

Norway lobster Nephrops norvegicus fisheries are often characterized by high bycatch and discard rates. However, fisheries species exhibit differences in vertical behaviour that can be used to develop selective devices. We developed a separator frame that can be inserted into the forward part of a cod-end to divide it into a bottom cod-end and a top cod-end. In the top cod-end we inserted a 3-m-long window constructed of 274-mm mesh. The separator frame was tested from a commercial vessel in the Kattegat and Skagerrak area. Small mesh net bags were used to collect the catch going through the separator frame and ending up in the bottom cod-end, the top cod-end, or penetrating the window. The majority of Norway lobster and flatfish entered the bottom cod-end, and most gadoids entered the top cod-end. A relatively high proportion of gadoids and flatfish that entered the top cod-end penetrated the window. The separation was size dependant for some of the investigated species.

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State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Aalborg University, University of Oslo
Authors: Madsen, N. (Intern), Holst, R. (Ekstern)
Pages: 929-938
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Main Research Area: Technical/natural sciences
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Journal: Fisheries Science
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.9 SJR 0.349 SNIP 0.725
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.376 SNIP 0.578 CiteScore 0.7
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.483 SNIP 0.778 CiteScore 1.04
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.521 SNIP 0.838 CiteScore 0.99
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.515 SNIP 0.819 CiteScore 0.99
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.498 SNIP 0.743 CiteScore 0.94
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.471 SNIP 0.702
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.432 SNIP 0.719
Development and test of selective sorting grids used in the Norway lobster (Nephrops norvegicus) fishery

Due to generally high discard rates in Norway lobster (Nephrops norvegicus) fisheries, a discard ban coming up and to the cod recovery plan in several areas, selective sorting grids have been tested in many areas and are specified by legislation for use in the Kattegat and Skagerrak area bordering Norway, Denmark and Sweden. Grids are very selective, but they can lead to loss of landable Norway lobster and valuable fish species. To improve retention of these species, we developed three new grids using made by polyurethane to make them flexible: One grid had horizontal bars, one had vertical bars, and one had vertical bars and a guiding funnel in front of the grid. Four unselective net bags were used to collect the catch escaping through different parts of the grid or escaping without passing through the grid. Water flow around the grid bars was measured in a flume tank. The three grids were tested from a commercial trawler in the Kattegat and Skagerrak area. Underwater filming was conducted to assess grid performance and fish behavior. Results showed that a bottom hole in the lower part of the grid allowed species in the lower part of the gear to pass and retained in the bag behind the hole. More flatfish passed the grid with horizontal bars compared to that with vertical bars, but the retention rate was still low. Use of the guiding funnel increased the contact with the grid considerably for both target and unwanted species. In all three grid designs, there were losses of Norway lobster above minimum landing size.

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aalborg University, University of Oslo, SINTEF
Authors: Madsen, N. (Intern), Holst, R. (Ekstern), Frandsen, R. (Intern), Hansen, K. (Ekstern)
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Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Fisheries Research
Volume: 185
ISSN (Print): 0165-7836
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.154 SNIP 1.135 CiteScore 1.7
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.022 SNIP 1.075
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.025 SNIP 1.274
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.906 SNIP 1.134
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.944 SNIP 1.023
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.076 SNIP 1.314
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.299 SNIP 1.22
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.934 SNIP 0.891
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.611 SNIP 0.836
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.546 SNIP 0.865

Original language: English
DOIs:
Source: FindIt
Source-ID: 2346839134
Publication: Research - peer-review › Journal article – Annual report year: 2016

Die Geister der Meere

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Jaspers, C. (Intern)
Pages: 10-14
Publication date: 2017
Diel vertical interactions between Atlantic cod Gadus morhua and sprat Sprattus sprattus in a stratified water column

Information about species interactions at a spatial scale comparable to the perceptive abilities of the involved species is crucial for establishment of predictive food consumption models at the population level. Nevertheless, such information is sparse due to methodological constraints. We studied the diel vertical dynamics of species interactions between Atlantic cod Gadus morhua and its major clupeid prey, sprat Sprattus sprattus, at a location in the Bornholm Basin of the central Baltic Sea during late winter. This was accomplished by combining acoustic information on diel vertical fish distribution, time of ingestion of individual sprat estimated from cod stomach content data and observed vertical profiles of salinity, temperature and oxygen content. Predation by cod took place primarily at dusk and dawn during ascent and descent of sprat associated with school dissolution and formation, respectively. Cod resided close to the bottom outside these temporal predation windows. Sprat schools were located at the same depth as cod in the daylight hours, whereas at night dispersed sprat were situated higher in the water column. These vertical dynamics could be explained by fitness optimization using bioenergetics and trade-offs between temperature, oxygen saturation of the water and predation risk. This study forms a first step towards providing a mechanistic background for the predatory impact of cod at the basin scale and beyond.
Dietary l-tryptophan leaves a lasting impression on the brain and the stress response

Comparative models suggest that effects of dietary tryptophan (Trp) on brain serotonin (5-hydroxytryptamine; 5-HT) neurochemistry and stress responsiveness are present throughout the vertebrate lineage. Moreover, hypothalamic 5-HT seems to play a central role in control of the neuroendocrine stress axis in all vertebrates. Still, recent fish studies suggest long-term effects of dietary Trp on stress responsiveness, which are independent of hypothalamic 5-HT. Here, we investigated if dietary Trp treatment may result in long-lasting effects on stress responsiveness, including changes in plasma cortisol levels and 5-HT neurochemistry in the telencephalon and hypothalamus of Atlantic salmon. Fish were fed diets containing one, two or three times the Trp content in normal feed for 1 week. Subsequently, fish were reintroduced to control feed and were exposed to acute crowding stress for 1 h, 8 and 21 d post Trp treatment. Generally, acute crowding resulted in lower plasma cortisol levels in fish treated with 3×Trp compared with 1×Trp- and 2×Trp-treated fish. The same general pattern was reflected in telencephalic 5-HTergic turnover, for which 3×Trp-treated fish showed decreased values compared with 2×Trp-treated fish. These long-term effects on post-stress plasma cortisol levels and concomitant 5-HT turnover in the telencephalon lends further support to the fact that the extrahypothalamic control of the neuroendocrine stress response is conserved within the vertebrate lineage. Moreover, they indicate that trophic/structural effects in the brain underlie the effects of dietary Trp treatment on stress reactivity.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Norwegian Institute for Water Research, Norwegian University of Life Sciences, University of Copenhagen, Uppsala University, Uni Research AS, BioMar AS
Authors: Höglund, E. (Ekstern), Øverli, Ø. (Ekstern), Åberg Andersson, M. (Intern), Silva, P. I. D. M. E. (Intern), Laursen, D. C. (Intern), Moltesen, M. M. (Intern), Krogdahl, Å. (Ekstern), Schjolden, J. (Ekstern), Winberg, S. (Ekstern), Vindas, M. A. (Ekstern), Mayer, I. (Ekstern), Hillestad, M. (Ekstern)
Pages: 1351-1357
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: British Journal of Nutrition
Volume: 117
Issue number: 10
ISSN (Print): 0007-1145
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.46 SJR 1.983 SNIP 1.533
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.583 SNIP 1.446 CiteScore 3.52
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.468 SNIP 1.278 CiteScore 3.18
Diet composition and food consumption rate of harbor porpoises (Phocoena phocoena) in the western Baltic Sea
Stomach content composition and prey-specific consumption rates of juvenile and adult harbor porpoises (Phocoena phocoena) were estimated from a data set including 339 stomachs collected over a 32 yr period (1980–2011) in the western Baltic Sea. The stomach contents were mainly hard parts of fish prey and in particular otoliths. The bias originating from differential residence time of otoliths in the stomachs was addressed by use of a recently developed...
approach. Atlantic cod and herring were the main prey of adults, constituting on average 70% of the diet mass. Juvenile porpoises also frequently consumed gobies. Here, the mass contribution by gobies was on average 25%, which was as much as cod. Other species such as whiting, sprat, eelpout, and sandeels were of minor importance for both juveniles and adults. The diet composition differed between years, quarters, and porpoise acquisition method. Yearly consumption rates for porpoises in the western Baltic Sea were obtained in three scenarios on the daily energy requirements of a porpoise in combination with an estimate including the 95% CIs of the porpoise population size. Cod of age groups 1 and 2 and intermediate-sized herring suffered the highest predation from porpoises.
Differences in biological traits composition of benthic assemblages between unimpacted habitats

There is an implicit requirement under contemporary policy drivers to understand the characteristics of benthic communities under anthropogenically-unimpacted scenarios. We used a trait-based approach on a large dataset from across the European shelf to determine how functional characteristics of unimpacted benthic assemblages vary between different sedimentary habitats.

Assemblages in deep, muddy environments unaffected by anthropogenic disturbance show increased proportions of downward conveyors and surface deposit-feeders, while burrowing, diffusive mixing, scavenging and predation traits assume greater numerical proportions in shallower habitats. Deep, coarser sediments are numerically more dominated by sessile, upward conveyors and suspension feeders. In contrast, unimpacted assemblages of coarse sediments in shallower regions are proportionally dominated by the diffusive mixers, burrowers, scavengers and predators. Finally, assemblages of gravelly sediments exhibit a relatively greater numerical dominance of non-bioturbators and asexual reproducers. These findings may be used to form the basis of ranking habitats along a functional sensitivity gradient.
Scopus rating (2012): SJR 0.93 SNIP 1.241 CiteScore 2.4
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 0.896 SNIP 1.07 CiteScore 2.17
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.833 SNIP 0.851
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 0.831 SNIP 0.901
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.993 SNIP 1.067
Scopus rating (2007): SJR 0.888 SNIP 0.838
Scopus rating (2006): SJR 1.355 SNIP 1.236
Scopus rating (2005): SJR 0.763 SNIP 0.847
Scopus rating (2004): SJR 1.3 SNIP 1.506
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.82 SNIP 0.942
Scopus rating (2002): SJR 0.717 SNIP 1.271
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.662 SNIP 0.722
Scopus rating (2000): SJR 1.114 SNIP 1.088
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.689 SNIP 0.763

Original language: English
DOIs:
10.1016/j.marenvres.2017.01.004
Source: PublicationPreSubmission
Source-ID: 128511706
Publication: Research - peer-review › Journal article – Annual report year: 2017

Discard survival assessment of plaice (Pleuronectes platessa) and lemon sole (Microstomus kitt) caught by demersal otter trawling in Skagerrak

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Noack, T. (Intern), Karlsen, J. D. (Intern), Savina, E. (Intern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Bibliographical note
ICES CM 2017/J:206
Publication: Research › Conference abstract for conference – Annual report year: 2017

Discharge-dependent recruitment in stream-spawning brown trout

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, National Museum of Natural Sciences
Authors: Lobón-Cerviá, J. (Ekstern), Rasmussen, G. H. (Intern), Mortensen, E. (Ekstern)
Number of pages: 808
Pages: 299-318
Publication date: 2017

Host publication Information
Title of host publication: Brown Trout: Biology, Ecology and Management
Publisher: Wiley
Disentangling the counteracting effects of water content and carbon mass on zooplankton growth
Zooplankton vary widely in carbon percentage (carbon mass as a percentage of wet mass), but are often described as either gelatinous or non-gelatinous. Here we update datasets of carbon percentage and growth rate to investigate whether carbon percentage is a continuous trait, and whether its inclusion improves zooplankton growth models. We found that carbon percentage is continuous, but that species are not distributed homogenously along this axis. To assess variability of this trait in situ, we investigated the distribution of biomass across the range of carbon percentage for a zooplankton time series at station L4 off Plymouth, UK. This showed separate biomass peaks for gelatinous and crustacean taxa, however, carbon percentage varied 8-fold within the gelatinous group. Species with high carbon mass had lower carbon percentage, allowing separation of the counteracting effects of these two variables on growth rate. Specific growth rates, g (d⁻¹) were negatively related to carbon percentage and carbon mass, even in the gelatinous taxa alone, suggesting that the trend is not driven by a categorical difference between these groups. The addition of carbon percentage doubled the explanatory power of growth models based on mass alone, demonstrating the benefits of considering carbon percentage as a continuous trait.

General information
State: Published
Organisations: Centre for Ocean Life, Technical University of Denmark, Plymouth Marine Laboratory, University of Plymouth, Queen Mary University of London
Authors: Mcconville, K. (Ekstern), Atkinson, A. (Ekstern), Fileman, E. S. (Ekstern), Spicer, J. I. (Ekstern), Hirst, A. G. (Intern)
Pages: 246-256
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 39
Issue number: 2
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
Dispersal potential of the round goby – how plastic are they

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Behrens, J. (Intern)
Publication date: 2017
Event: Abstract from CeMEB 18th Assembly, Tjärnö, Sweden.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2017

Distinctly different behavioral responses of a copepod, Temora longicornis, to different strains of toxic dinoflagellates, Alexandrium spp
Zooplankton responses to toxic algae are highly variable, even towards taxonomically closely related species or different strains of the same species. Here, the individual level feeding behavior of a copepod, Temora longicornis, was examined which offered 4 similarly sized strains of toxic dinoflagellate Alexandrium spp. and a non-toxic control strain of the dinoflagellate Protoceratium reticulatum. The strains varied in their cellular toxin concentration and composition and in lytic activity. High-speed video observations revealed four distinctly different strain-specific feeding responses of the copepod during 4 h incubations: (i) the ‘normal’ feeding behavior, in which the feeding appendages were beating almost constantly to produce a feeding current and most (90%) of the captured algae were ingested; (ii) the beating activity of the feeding appendages was reduced by ca. 80% during the initial 60 min of exposure, after which very few algae were captured and ingested; (iii) capture and ingestion rates remained high, but ingested cells were regurgitated; and (iv) the copepod continued beating its appendages and captured cells at a high rate, but after 60 min, most captured cells were rejected. The various prey aversion responses observed may have very different implications to the prey and their ability to form
blooms: consumed but regurgitated cells are dead, captured but rejected cells survive and may give the prey a competitive advantage, while reduced feeding activity of the grazer may be equally beneficial to the prey and its competitors. These behaviors were not related to lytic activity or overall paralytic shellfish toxins (PSTs) content and composition and suggest that other cues are responsible for the responses.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Copenhagen, Alfred Wegener Institut-Helmholtz Zentrum für Polar- und Meeresforschung, East China Sea Fisheries Research Institute, Chinese Academy of Fisheries Sciences
Authors: Xu, J. (Intern), Hansen, P. J. (Ekstern), Nielsen, L. T. (Intern), Krock, B. (Ekstern), Tillmann, U. (Ekstern), Kiørboe, T. (Intern)
Pages: 1-9
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Harmful Algae
Volume: 62
ISSN (Print): 1568-9883
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.98 SJR 1.04 SNIP 1.243
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.612 SNIP 1.439 CiteScore 3.56
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.542 SNIP 1.712 CiteScore 3.66
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.202 SNIP 1.444 CiteScore 3.38
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.211 SNIP 1.487 CiteScore 3.57
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.767 SNIP 1.686 CiteScore 3.53
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.369 SNIP 1.704
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.218 SNIP 1.299
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.15 SNIP 1.447
Scopus rating (2007): SJR 1.197 SNIP 1.218
Scopus rating (2006): SJR 1.226 SNIP 1.528
Scopus rating (2005): SJR 1.454 SNIP 2.016
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.582 SNIP 1.012
Scopus rating (2003): SJR 0.886 SNIP 0.888
Original language: English
Aquatic Science, Plant Science, Feeding behavior, Goniodomin A, Lytic activity, Paralytic shellfish toxins

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, East China Sea Fisheries Research Institute, Chinese Academy of Fisheries Sciences, University of Copenhagen
Authors: Xu, J. (Intern), Hansen, P. J. (Ekstern), Nielsen, L. T. (Intern), Kiørboe, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Distributions of dissolved organic matter in the central Arctic Ocean

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Reader, H. (Intern), Stedmon, C. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Do spatio-temporal spawning closures promote the recovery of cod in the Baltic Sea?

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Institute Management, Section for Monitoring and Data
Authors: Eero, M. (Intern), Hinrichsen, H. H. (Ekstern), Huwer, B. (Intern), Köster, F. (Intern), Mosegaard, H. (Intern), Storr-Paulsen, M. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

DTU Aquas kursister i vandløbsrestaurering 2016 bliver forældre til foråret

**General information**
Dynamics of grazer induced toxin production in Pseudo-nitzschia and the physiological effect on Calanus copepods

General information
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, University of Copenhagen, University of Gothenburg, Alfred-Wegener-Institute für Polar und Meeresforschung
Authors: Harðardóttir, S. (Intern), Hjort-Jensen, D. M. (Ekstern), Eklund, J. (Ekstern), Wohlrap, S. (Ekstern), Krock, B. (Ekstern), Selander, E. (Ekstern), Nielsen, T. G. (Intern), John, U. (Ekstern), Lundholm, N. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Dynamics of phytoplankton blooms in turbulent vortex cells

Turbulence and coherent circulation structures, such as submesoscale and mesoscale eddies, convective plumes and Langmuir cells, play a critical role in shaping phytoplankton spatial distribution and population dynamics. We use a framework of advection-reaction-diffusion equations to investigate the effects of turbulent transport on the phytoplankton population growth and its spatial structure in a vertical two-dimensional vortex flow field. In particular, we focus on how turbulent flow velocities and sinking influence phytoplankton growth and biomass aggregation. Our results indicate that conditions in mixing and growth of phytoplankton can drive different vertical spatial structures in the mixed layer, with the depth of the mixed layer being a critical factor to allow coexistence of populations with different sinking speed. With increasing mixed layer depth, positive growth for sinking phytoplankton can be maintained with increasing turbulent flow velocities, allowing the apparently counter-intuitive persistence of fast sinking phytoplankton populations in highly turbulent and deep mixed layers. These dynamics demonstrate the role of considering advective transport within a turbulent vortex and can help to explain observed phytoplankton biomass during winter in the North Atlantic, where the overturn of deep convection has been suggested to play a critical role in phytoplankton survival.

General information
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Section for Oceans and Arctic, Centre for Ocean Life, University of Bergen
Authors: Lindemann, C. (Ekstern), Visser, A. (Intern), Mariani, P. (Intern)
Publication date: 2017
Dynamiske brugerstyrede havkort til værdiløft af dansk industrifiskeri (GUDP-VIND)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Oceans and Arctic, Section for Marine Ecology and Oceanography, AnchorLab, Danish Meteorological Institute, Danish Fishermen's Producers' Organization
Authors: Mosegaard, H. (Intern), Pedersen, E. M. (Intern), Sparrevohn, C. R. (Ekstern), Lund, H. S. (Ekstern), Skov, O. (Ekstern), Dueholm, M. (Ekstern), She, J. (Ekstern), Christensen, A. (Intern), Stage, B. (Intern), Worsøe Clausen, L. (Intern), Deurs, M. V. (Intern), Bekkevold, D. (Intern), Andersen, N. G. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Early engagement of stakeholders with individual-based modelling can inform research for improving invasive species management: the round goby as a case study

Individual-based models (IBMs) incorporating realistic representations of key range-front processes such as dispersal can be used as tools to investigate the dynamics of invasive species. Managers can apply insights from these models to take effective action to prevent further spread and prioritize measures preventing establishment of invasive species. We highlight here how early-stage IBMs (constructed under constraints of time and data availability) can also play an important role in defining key research priorities for providing key information on the biology of an invasive species in order that subsequent models can provide robust insight into potential management interventions. The round goby, Neogobius melanostomus, is currently spreading through the Baltic Sea, with major negative effects being reported in the wake of its invasion. Together with stakeholders, we parameterize an IBM to investigate the goby’s potential spread pattern throughout the Gulf of Gdansk and the Baltic Sea. Model parameters were assigned by integrating information obtained through stakeholder interaction, from scientific literature, or estimated using an inverse modeling approach when not available. IBMs can provide valuable direction to research on invasive species even when there is limited data and/or time available to parameterize/fit them to the degree to which we might aspire in an ideal world. Co-development of models with stakeholders can be used to recognize important invasion patterns, in addition to identifying and estimating unknown environmental parameters, thereby guiding the direction of future research. Well-parameterized and validated models are not required in the earlier stages of the modeling cycle where their main utility is as a tool for thought.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Aberdeen, University of Basel
Authors: Samson, E. (Ekstern), Hirsch, P. E. (Ekstern), Palmer, S. C. (Ekstern), Behrens, J. (Intern), Travis, J. M. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Ecology and the Environment
Volume: 5
Article number: 149
ISSN (Print): 1540-9295
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.85 SJR 4.779 SNIP 3.631
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 5.233 SNIP 3.238 CiteScore 3.34
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 4.607 SNIP 3.227 CiteScore 4.32
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 4.172 SNIP 2.776 CiteScore 3.67
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 4.388 SNIP 3.058 CiteScore 3.73
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 4.503 SNIP 3.395 CiteScore 3.71
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 3.466 SNIP 2.804
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.874 SNIP 2.656
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.184 SNIP 1.998
Scopus rating (2007): SJR 2.096 SNIP 2.057
Eastern Baltic cod recruitment revisited—dynamics and impacting factors

The Eastern Baltic cod abundance started rapidly to increase in the mid-2000s as evidenced by analytical stock assessments, due to increased recruitment and declining fishing mortality. Since 2014, the analytical stock assessment is not available, leaving the present stock status unclear and casting doubts about the magnitude of the recent increase in recruitment. Earlier studies identified main factors impacting on cod reproductive success to be related to the loss of two out of three spawning areas in the 1980s caused by lack of major Baltic inflows with a concurrent reduction in salinity and oxygen. Other important factors include prey availability for first-feeding larvae, egg predation by sprat and herring and cannibalism on juveniles, all in one way or the other related to the prevailing hydrographic conditions. These factors cannot explain increased reproductive success in the last decade, as the period was characterized by an absence of large-scale Baltic inflows since 2003 and persistent anoxic conditions in the bottom water of the deep Baltic basins. This questions the perception of the increased recruitment in later years and challenges our present understanding of cod recruitment dynamics in the Baltic Sea. In this contribution, we review evidence from the recent literature supplemented by information from latest research cruises to elucidate whether cod reproductive success indeed has increased during the last decade, and we suggest the key processes responsible for the recent dynamics in cod recruitment and outline directions for future research.
Marine protected areas (MPAs) are a cornerstone of marine conservation. Globally, the number and coverage of MPAs are increasing, but MPA implementation lags in many human-dominated regions. In areas with intense competition for space and resources, evaluation of the effects of MPAs is crucial to inform decisions. In the human-dominated Mediterranean Sea, fully protected areas occupy only 0.04% of its surface. We evaluated the impacts of full and partial protection on biomass and density of fish assemblages, some commercially important fishes, and sea urchins in 24 Mediterranean MPAs. We explored the relationships between the level of protection and MPA size, age, and enforcement. Results revealed significant positive effects of protection for fisheries target species and negative effects for urchins as their predators benefited from protection. Full protection provided stronger effects than partial protection. Benefits of full protection for fish biomass were only correlated with the level of MPA enforcement; fish density was higher in older, better enforced, and -interestingly- smaller MPAs. Our finding that even small, well-enforced, fully protected areas can have significant ecological effects is encouraging for "crowded" marine environments. However, more data are needed to evaluate sufficient MPA sizes for protecting populations of species with varying mobility levels.
Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod Acartia tonsa

To meet the oncoming requirements for lower sulphur emissions, shipping companies can install scrubbers where the exhaust is sprayed with seawater and subsequently discharged to the sea. The discharge water has a pH around 3 and contains elevated concentrations of vanadium, nickel, lead and hydrocarbons. We investigated 1) the threshold concentrations of scrubber discharge water for survival, feeding and reproduction of the copepod Acartia tonsa, 2) whether the effects depend on the exposure route and 3) whether exposure to discharge water can be detected in field-collected organisms. A direct exposure to discharge water increased adult copepod mortality and reduced feeding at metal concentrations which were orders of magnitude lower than the lethal concentrations in previous single-metal studies. In contrast, reproduction was not influenced by dietary uptake of contaminants. Scrubber water constituents could have synergistic effects on plankton productivity and bioaccumulation of metals, although the effects will depend on their dilution in the marine environment.
Ecological effects of scrubber water discharge on coastal plankton: Potential synergistic effects of contaminants reduce survival and feeding of the copepod *Acartia tonsa*

**General information**
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- **Organisations:** National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Environmental Engineering, Environmental Chemistry
- **Authors:** Koski, M. (Intern), Stedmon, C. (Intern), Trapp, S. (Intern)
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**Effectiveness of fully documented fisheries to estimate discards in a participatory research scheme**

A key challenge for fisheries science and management is the access to reliable and verifiable catch data. In science, the challenge is to collect reliable, precise and traceable data to provide sound advice. In management, the challenge is that catch documentation is necessary to enforce regulations. Currently, catch inspection at sea, self-reporting through e-log and on-board observers are the primary methods to document catches at sea. However, at-sea control and on-board observers are costly and have limited coverage, while self-reporting is susceptible to fraud and provides limited coverage. New cost-effective methods are currently emerging involving Remote Electronic Monitoring (REM) and on-board cameras. Previous studies have tested REM with promising results. However, evaluation of the potential biases of REM is needed before full benefits can be obtained. We deployed REM with on-board cameras on 14 fishing vessels and were able to inspect 56% of 1523 hauls made in the 6 month trial period, using an estimated 582 man-hours of video audit. The results showed an overall good agreement between the fishers self-reported discards and the video inspectors discard estimates. However, there was large variation in precision between individual vessels and species. Additionally, trial setup and process errors were shown to have a large effect on the precision of the video inspectors discard estimates. Nevertheless, despite challenges, REM was evaluated to have the potential to streamline monitoring and scientific documentation in a medium-size fishing fleet.
Effect of exposure on salmon lice Lepeophtheirus salmonis population dynamics in Faroese salmon farms

We assessed variations in salmon lice Lepeophtheirus salmonis population dynamics in Faroese salmon farms in relationship to their physical exposure to local circulation patterns and flushing with adjacent waters. Factors used in this study to quantify physical exposure are estimates of the freshwater exchange rate, the tidal exchange rate and dispersion by tidal currents. Salmon farms were ranked according to the rate of increase in the average numbers of salmon lice per fish. In a multiple linear regression, physical exposure together with temperature were shown to have a significant effect on the rate of lice infection. The sites with low exposure revealed higher rates of self-infection and internally driven outbreak dynamics, while high-exposure sites showed lower rates of self-infection, tending towards externally driven
outbreak dynamics. The low-exposure sites also appeared to have a lower threshold of salmon stocking numbers for outbreaks of infection. The study presents a simple method of characterizing salmon farming fjords in terms of their different exposure levels and how they relate to potential self-infection at these sites.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Aquaculture Research Station of the Faroes
Authors: Patursson, E. J. (Ekster), Simonsen, K. (Ekster), Visser, A. (Intern), Patursson, Ø. (Ekster)
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Scopus rating (2015): SJR 0.867 SNIP 0.867 CiteScore 2.25
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.861 SNIP 1.047 CiteScore 2.25
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 1.253 SNIP 1.495 CiteScore 2.45
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Scopus rating (2012): SJR 0.729 SNIP 1.108 CiteScore 1.19
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**Effect of fisher's soak tactic on catch pattern in the Danish gillnet plaice fishery**

Soak duration in the gillnet fisheries can vary from a few hours to several days. The industry reports a variation of soak tactics between target species, but also between seasons for the same species. These are determined by the robustness of the target species and the catch of unwanted species. Different soak tactics were compared to estimate the role that the choice of a soak tactic plays in the catch efficiency of both target and unwanted species. In the Danish summer gillnet fishery targeting plaice (Pleuronectes platessa), nets are deployed approximately 12 h (h) during day. Unwanted species are common dab (Limanda limanda) and edible crab (Cancer pagurus). The commercially used 12 h deployment during day was compared to 12 h deployment during night and 24 h deployment. On average, there were about 1.5 more catches of commercial size plaice (above 27 cm), and 2 and 4 times less catches of the unwanted dab and edible crab, respectively, for 12 h at day compared to the other soak tactics (12 h at night or 24 h). Gillnetters participating in the coastal summer fishery for plaice follow the theoretical optimal soak tactic. The commercially used 12 h deployment during
day maximises the catch of commercial sized plaice and limits handling time by catching less unwanted dab and crabs.
Effect of nanosilver on metabolism in rainbow trout (Oncorhynchus mykiss): An investigation using different respirometric approaches

Nanosilver (nAg) has been incorporated into many consumer products, including clothing and washing machines, because of its antimicrobial properties. Consequently, the potential for its release into aquatic environments is of significant concern. Documented toxic effects on fish include altered gene expression, gill damage, and impaired gas exchange, as well as mortality at high nAg concentrations. The present study reports the effects of nAg on the metabolism of rainbow trout (Oncorhynchus mykiss). Fish were exposed to environmentally relevant concentrations (0.28 ± 0.02 μg/L) and higher (47.60 ± 5.13 μg/L) for 28 d, after which their standard metabolic rate (SMR), forced maximum metabolic rate (MMRf), and spontaneous maximum metabolic rate (MMRs) were measured. There was no effect observed in SMR, MMRf, or MMRs, suggesting that nAg is unlikely to directly affect fish metabolism. On average, MMRs tended to be greater than MMRf, and most MMRs occurred when room lighting increased. The timing of MMRf chase protocols was found to affect both MMRf and SMR estimates, in that chasing fish before respirometric experiments caused higher MMRf estimates and lower SMR estimates. Although compounded effects involving nAg and other environmental stressors remain unknown, the present study indicates that the tested range of nAg is unlikely to constrain fish metabolism.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Manitoba, Lakehead University, Fisheries and Oceans Canada
Authors: Murray, L. (Ekstern), Rennie, M. D. (Ekstern), Svendsen, J. C. (Intern), Enders, E. C. (Ekstern)
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Scopus rating (2016): CiteScore 2.74 SJR 1.19 SNIP 1.031
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Scopus rating (2015): SJR 1.446 SNIP 1.055 CiteScore 3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Effect of some common West African farm-made feeds on the oxygen consumption and ammonia excretion rates of Nile tilapia, Oreochromis niloticus

General information
State: Published
Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Kwame Nkrumah University of Science and Technology
Authors: Obirikorang, K. A. (Ekstern), Amisah, S. (Ekstern), Skov, P. V. (Intern)
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Effects of acoustic telemetry transmitters on gill ventilation rate and haematocrit levels of round goby Neogobius melanostomus

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management
Effects of changes in stock productivity and mixing on sustainable fishing and economic viability

Within the new FMSY European paradigm, this paper shows how a combination of changes in fish stock mixing, non-stationarity in productivity, and constraints on unit stock concepts undermine the effective management of fisheries, especially when management reference points are not adjusted accordingly. Recent changes in stock structures, conditions and stock mixing between eastern and western Baltic cod can jeopardize the reliability of stock assessments and of the fishery economy. We modelled how different management, individual vessel decision-making, and stock growth and mixing scenarios have induced alternative individual vessel spatial effort allocation and economic performance by affecting fishing costs and by changing the relative stock abundance and size distribution. Stock mixing heavily influences profit and stock abundance for stocks that have experienced increased fishing mortality (F) levels. Western cod F has increased from a higher total allowed catches (TAC) advised in the medium-term due to the westward migration of eastern cod while eastern cod F has increased from reduced growth in the east. Greater pressures on western cod and decreased eastern cod growth and conditions greatly reduce the overall cod spawning stock biomass, thus changing the landing size composition and associated fishery profits. As a cumulative effect, fishing efforts are redirected towards western areas depending on management (quotas). However, total profits are less affected when traditional fishing opportunities and switching possibilities for other species and areas are maintained. Our evaluation indicates that current management mechanisms cannot correct for potential detrimental effects on cod fisheries when effort re-allocation changes landing origins. By investigating different economic starting conditions we further show that Baltic cod mis-management could have resulted in unintended unequal (skewed) impacts and serious consequences for certain fleets and fishing communities compared with others. Our management strategy evaluation is instrumental in capturing non-linear effects of different recommendations on sustainability and economic viability, and we show that fixed F-values management is likely not an attainable or sufficient goal in ensuring the sustainability and viability of fisheries and stocks given changing biological conditions.
Effects of Cortisol on Short and Long Term Diet and Morphology

Glucocorticoids such as cortisol are released during stressful events. However, many of the effects of cortisol on animals in the wild are still poorly documented. We evaluated the effects of artificially elevated cortisol on diet and morphology over the short term (2 weeks) and long term (4 months) using a wild population of juvenile semi-anadromous brown trout (Salmo trutta) in Denmark. We caught, tagged and manipulated juvenile fish while in their natal freshwater streams in the fall. Manipulations consisted of an exogenous intracoelomic injection of cortisol suspended in vegetable shortening (designed to mimic an extreme physiological challenge), a sham group (injection of vegetable shortening) and a control group (tagged only). We then recaptured fish 2 weeks later and again after 4 months. We assessed diet using stable isotopes from plasma (short term) and scales (long term), and morphology using geometric morphometrics. Cortisol affected carbon stable isotope signatures but had minimal effects on nitrogen isotopes and morphology. Irrespective of treatment, carbon and nitrogen stable isotope values increased over time. This study shows that cortisol can have both short and long term effects on individuals in the wild.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University
Authors: Peiman, K. S. (Ekstern), Birnie-Gauvin, K. (Intern), Larsen, M. H. (Intern), Colborne, S. (Ekstern), Aarestrup, K. (Intern), Cooke, S. J. (Ekstern)
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Journal: Integrative and Comparative Biology
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Effects of dietary digestible protein and energy levels on growth performance, feed utilization, and body composition of juvenile permit, *Trachinotus falcatus* (Linnaeus, 1758)

A 9-wk study was conducted to evaluate the effect of dietary protein and energy on growth performance of juvenile permit, *Trachinotus falcatus*, growing from approximately 30 to 150g. Nine experimental diets were formulated to contain three levels of crude protein (400, 450, and 500g/kg dry matter [DM]); and three levels of crude lipid (100, 200, and 300g/kg DM) in a 3 x 3 factorial design. Growth rate and feed efficiency were significantly improved with increasing dietary protein levels from 400 to 500g/kg and with dietary lipid levels from 100 to 200g/kg. Fish body protein content was positively correlated with dietary ratio of digestible protein (DP) to digestible energy (DE) (P<0.01, R²=0.83), while body lipid was negatively correlated with dietary DP/DE (R²=0.55, P<0.05) but positively correlated with dietary DE levels (R²=0.66, P<0.01).

Results showed a protein-sparing effect, as protein retention was significantly increased by increasing dietary lipid level. In conclusion, the diet containing DP of 392.7g/kg and DE of 18.8 MJ/kg (DM), corresponding to a DP/DE of 20.9g/MJ, is suggested as an optimal feed for growth and feed efficiency in juvenile permit.
Effects of dietary Gracilaria sp. and Alaria sp. supplementation on growth performance, metabolic rates and health in meagre (Argyrosomus regius) subjected to pathogen infection

Effects of dietary seaweed supplementation on basal physiology and health biomarkers were assessed in meagre (Argyrosomus regius) subjected to bacterial infection, using Photobacterium damselae subsp. Piscicida (Phdp) as the etiologic agent. Three test diets were prepared by supplementing a basal control formulation (44 % protein, 16 % lipid, 22 kJ g−1 energy) with 0 % seaweed (control), 5 % Gracilaria sp. or 5 % Alaria sp. During the growth trial, 180 fish (39.70 ± 0.33 g) were daily fed for 69 days with the experimental diets. After the growth trial, 60 fish from each dietary treatment were divided into two groups, infected and non-infected. The infected group was injected intraperitoneally with a saline solution (HBSS) with 2.91 x 103 CFU Phdp g−1 fish, whereas the non-infected group was injected with HBSS without Phdp. Dietary seaweed supplementation did not affect fish growth performance. Standard and routine metabolic rates, and aerobic metabolic scope did not vary significantly among dietary treatments. Conversely, maximum metabolic rate was significantly higher in fish fed Alaria sp. diet when compared to control group. Non-infected fish had higher hematocrit levels than the infected group, regardless of diet. Lactate levels were significantly higher in fish fed Alaria sp. diet when compared to control, with no interaction between diet and infection. Lipid peroxidation was significantly higher in fish fed control diet than supplemented diets. Infected groups had lower antioxidant enzymes activities when compared to non-infected. An interaction between infection and diet was found for glutathione peroxidase and reduced glutathione activities. The current study suggests that dietary seaweed supplementation modulates metabolic rates and biomarker responses in meagre, which may confer advantages in coping with biotic stressors.

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Universidade do Porto, Polytechnic Institute of Leiria, ALGAPLUS
Authors: Peixoto, M. J. (Ekstern), Salas-Leitón, E. (Ekstern), Brito, F. (Ekstern), Svendsen, J. C. (Intern), Baptista, T. (Ekstern), Pereira, R. (Ekstern), Abreu, H. (Ekstern), Reis, P. A. (Ekstern), Gonçalves, J. F. M. (Ekstern), de Almeida Ozório, R. O. (Ekstern)
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  - Web of Science (2014): Indexed yes
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  - ISI indexed (2013): ISI indexed yes
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  - Scopus rating (2012): CiteScore 2.68
  - ISI indexed (2012): ISI indexed yes
  - Web of Science (2012): Indexed yes
Effects of elevated pH on marine copepods in mass cultivation systems: practical implications

Female tolerance to pH (8.0–9.5) by six marine copepods, Oithona similis, Temora longicornis, Acartia spp., Centropages typicus, Pseudocalanus elongatus and Eurytemora affinis was investigated to identify robust species for live feed production. The species with the most oceanic-neritic distribution, O. similis, exhibited 72 h LC50 at pH 8.39 ± 0.11 (±95% CL) whereas the most estuarine E. affinis had LC50 at pH 9.51 ± 0.04. The rest had LC50 at intermediary pH's. Egg hatching by a selection of species, Acartia spp., C. typicus and E. affinis, was unaffected by pH up to 9.0–9.5. Nauplii from both Acartia spp. and C. typicus had higher mortality at pH 9.5 than at the other pH regimes while E. affinis nauplii were not affected by pH. Wild Acartia spp. and A. tonsa from a culture showed some differences in response although of minor practical importance for aquaculture; both produced no eggs at pH 9.5, A. tonsa exhibited significantly higher egg production at all other pH's than 9.5, both showed egg hatching invariant of pH, but gradually increasing nauplii mortality with pH. We suggest active/passive selection to obtain the most pH robust species able to cope with accidently, but frequently, elevated pH in aquaculture systems.

General information
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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Roskilde University, University of Copenhagen
Authors: Hansen, B. W. (Ekstern), Hansen, P. J. (Ekstern), Nielsen, T. G. (Intern), Jepsen, P. M. (Ekstern)
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Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
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Web of Science (2015): Indexed yes
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Effects of environmental variables on survey catch rates and distribution by size of shallow- and deep-water Cape hakes, *Merluccius capensis* and *Merluccius paradoxus* off Namibia

In order to study the effects of temperature, oxygen, salinity and time of day on survey trawl catches, we modeled observed catches of juvenile, small, medium and large hakes per station as functions of zenith angle of the sun, geographical position, year, temperature, salinity, oxygen and depth. We used data from summer demersal surveys conducted during the period 2002–2015, together with a computation of the corresponding light level data from which the solar zenith angles were obtained, and fitted the generalized additive models to these data. Based on best model results, important covariates were oxygen, depth, geographical position and temperature. The best models explained 70%, 69%, 57% and 57% of the variability in catches of juvenile, small, medium and large *Merluccius capensis*, respectively, and 71%, 68%, 81% and 70% of juvenile, small, medium and large *Merluccius paradoxus*, respectively. The
significant effects of temperature, oxygen, depth and geographical position on survey catches of hake of different size groups indicate that survey size structure may be affected by the behavior of both species towards environmental conditions. Greater care should therefore be taken when interpreting hake survey biomass estimates, based on swept area method, especially those that were collected during exceptional unfavourable environmental conditions. It would also be highly desirable if the oceanographic conditions are collected on each trawl station in order to improve understanding of the linkage between resources and environmental conditions.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Ministry of Fisheries and Marine Resources
Authors: Kainge, P. I. (Intern), van der Plas, A. K. (Ekstern), Bartholomae, C. H. (Ekstern), Wieland, K. (Intern)
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Scopus rating (2014): CiteScore 2.61
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 2.61
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 2.21
ISI indexed (2012): ISI indexed no
Scopus rating (2011): CiteScore 2.42
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Web of Science (2010): Indexed yes
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**Effects of fertilizers used in agricultural fields on algal blooms**

The increasing occurrence of algal blooms and their negative ecological impacts have led to intensified monitoring activities. This needs the proper identification of the most responsible factor/factors for the bloom formation. However, in natural systems, algal blooms result from a combination of factors and from observation it is difficult to identify the most important one. In the present paper, using a mathematical model we compare the effects of three human induced factors (fertilizer input in agricultural field, eutrophication due to other sources than fertilizers, and overfishing) on the bloom dynamics and DO level. By applying a sophisticated sensitivity analysis technique, we found that the increasing use of fertilizers in agricultural field causes more rapid algal growth and decreases DO level much faster than eutrophication from
other sources and overfishing. We also look at the mechanisms how fertilizer input rate affects the algal bloom dynamics and DO level. The model can be helpful for the policy makers in determining the influential factors responsible for the bloom formation.

**General information**
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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Indian Statistical Institute, Banaras Hindu University
Authors: Chakraborty, S. (Intern), Tiwari, P. K. (Ekstern), Sasmal, S. K. (Ekstern), Misra, A. K. (Ekstern), Chattopadhyay, J. (Ekstern)
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Scopus rating (2016): CiteScore 1.94 SJR 0.601 SNIP 0.96
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.627 SNIP 0.981 CiteScore 1.68
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.654 SNIP 0.808 CiteScore 1.44
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.939 SNIP 0.946 CiteScore 1.84
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.912 SNIP 0.745 CiteScore 1.44
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.748 SNIP 0.715 CiteScore 1.17
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.643 SNIP 0.539
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.422 SNIP 0.414
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.36 SNIP 0.424
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.235 SNIP 0.218
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.268 SNIP 0.375
Scopus rating (2005): SJR 0.24 SNIP 0.242
Scopus rating (2004): SJR 0.15 SNIP 0.15
Scopus rating (2003): SJR 0.137 SNIP 0.147
Effects of global warming and pollutants on marine copepods across space and time

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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Dinh, K. V. (Intern), Nielsen, T. G. (Intern)
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Effects of high-frequency strobed laser light on Atlantic cod (Gadus morhua) physiology and behavior

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Aquaculture, Centre for Ocean Life, SINTEF, Swedish University of Agricultural Sciences
Authors: Behrens, J. (Intern), Jarnit, S. (Intern), Methling, C. (Intern), Mariani, P. (Intern), Thorstensen, J. (Ekstern), Risholm, P. (Ekstern), Thielemann, J. T. (Ekstern), Haugholt, K. H. (Ekstern), Gräns, A. (Ekstern), Visser, A. (Intern)
Publication date: 2017
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Effects of low-oxygen conditions on embryo growth in the painted turtle, Chrysemys picta

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Porto
Authors: Cordero, G. A. (Ekstern), Karnatz, M. L. (Ekstern), Svendsen, J. C. (Intern), Gangloff, E. J. (Ekstern)
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Effects of oil spill responses on key Arctic zooplankton species

The copepod Calanus glacialis is a key species in the Arctic ecosystem. Increased shipping and oil and gas activities in the Arctic increase the risk of an oil spill. It is therefore important to study the potential consequences of an oil spill on this key species in the Arctic marine ecosystems. As a part of a large joint industry initiative (www.arcticresponsetechnology.org) a first of its kind mesocosm experiment was executed in an Arctic fjord of the Island of Svalbard. Effects of natural attenuation of the oil, in-situ burning and chemical dispersion were studied on grazing, egg production and hatching of the Arctic copepod Calanus glacialis. Eight mesocosms with open top and bottom were deployed in the sea ice in Van Mijenfjorden, Svalbard, in February 2015. Two replicates were used for all treatments. After application, surface ice was allowed to re-establish. Water was collected from the top 2 cm water column in March and just before sea ice break up in May, and was used in two 14-day incubation experiments with C. glacialis collected in Isfjorden. Copepods were fed during the experiment and eggs and pellets were quantified daily. Egg hatching was determined in the beginning and end of the experiment. There was no significant effect of the oil spill treatments on average cumulated specific pellet production or egg hatching success. However in May, the average cumulated specific egg production was significantly higher in the dispersed oil treatment compared to the control from day 2 (+ 169 %) until the end of the experiment (+ 41 %)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
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Effects of repeated acute stress in Senegalese sole Solea senegalensis. Can this species habituate to reiterated handling stress?

General information
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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Vigo, University of Porto
Authors: Conde-Sieira, M. (Ekstern), Gesto, M. (Intern), Comesaña, S. (Ekstern), Velasco, C. (Ekstern), Hernandez-Perez, J. (Ekstern), Valente, L. M. P. (Ekstern), Soengas, J. (Ekstern)
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**Efficiency of fisheries is increasing at the ecosystem level**

Managing fisheries presents trade-offs between objectives, for example yields, profits, minimizing ecosystem impact, that have to be weighed against one another. These trade-offs are compounded by interacting species and fisheries at the ecosystem level. Weighing objectives becomes increasingly challenging when managers have to consider opposing objectives from different stakeholders. An alternative to weighing incomparable and conflicting objectives is to focus on win-wins until Pareto efficiency is achieved: a state from which it is impossible to improve with respect to any objective without regressing at least one other. We investigate the ecosystem-level efficiency of fisheries in five large marine ecosystems (LMEs) with respect to yield and an aggregate measure of ecosystem impact using a novel calibration of size-based ecosystem models. We estimate that fishing patterns in three LMEs (North Sea, Barents Sea and Benguela Current) are nearly efficient with respect to long-term yield and ecosystem impact and that efficiency has improved over the last 30 years. In two LMEs (Baltic Sea and North East US Continental Shelf), fishing is inefficient and win-wins remain available. We additionally examine the efficiency of North Sea and Baltic Sea fisheries with respect to economic rent and ecosystem impact, finding both to be inefficient but steadily improving. Our results suggest the following: (i) a broad and encouraging trend towards ecosystem-level efficiency of fisheries; (ii) that ecosystem-scale win-wins, especially with respect to conservation and profits, may still be common; and (iii) single-species assessment approaches may overestimate the availability of win-wins by failing to account for trade-offs across interacting species.

**General information**

State: Published

Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Washington, University of California, Santa Barbara

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Web of Science (2015): Indexed yes

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BFI (2012): BFI-level 2

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BFI (2010): BFI-level 2

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Emergence time and skin melanin spot patterns do not correlate with growth performance, social competitive ability or stress response in farmed rainbow trout

In wild salmonid fish, specific individual behavioral traits have been correlated with the timing of fry emergence from their gravel spawning nests; Early emerging fish display more aggressive behavior and have a higher probability of becoming socially dominant, compared to fish that emerge at a later stage. Apart from aggression and dominance, other behavioral and metabolic traits, such as boldness, metabolic rate, or growth, have also been linked to emergence time. Altogether, the traits of early- and late-emerging fish resemble those of the proactive and reactive stress-coping style, respectively. As proactive fish are considered more resilient to stress, it may be desirable to select these for aquaculture production. However, it is currently unclear to what extent the link between emergence time and stress-coping styles is maintained in the selective breeding of farmed fish. In the present study, eyed eggs from a commercial supplier were hatched, and larvae fractionated according to their emergence time. Later on, juvenile fish from different emergence fractions were subjected to a stress challenge and also tested to evaluate their competitive ability for food. Beyond some slight dissimilarities in the acute stress responses, emergence fraction displayed no correlation with growth rates, or the ability to compete for feed. Within the whole group of fish utilized in the experiments, no relationship between skin melanin spot pattern and growth performance, stress response intensity, or competitive ability was found. Altogether, the differences in physiological traits related to emergence time were not as strong as those found in earlier studies. It is hypothesized, that the origin and degree of domestication of the fish might be partly responsible for this. The predictive value of skin spots or emergence time to infer the fish stress coping style in farmed fish is also discussed.
Environmental effects on the availability of shallow and deep-water hake to the demersal trawl survey in Namibian waters

Studies on several demersal fish species have shown that variability in environmental conditions (including oxygen, temperature, wind and time of day) during trawling may result in differences in the catching efficiency of the trawl gear, which may cause differences in abundance estimations of stocks. This is even complicated in the case of the Cape hakes, Merluccius capensis and Merluccius paradoxus, which are known to perform diurnal vertical migrations possibly for spawning or in search of food. These abundance estimations, together with commercial catch-at-age and catch per unit effort (CPUE) indices, are key input data into the stock assessment model that guides scientific TAC (Total allowable catch) recommendations and other management measure advices, for the Namibian hake stocks. The overall aim of this PhD study was to investigate the effects of environmental conditions (close to the sea bed during trawls) on trawl survey abundance indices through an analysis of existing survey CPUE data, in order to gain a better understanding of the behavioral processes involved. This is crucial for improving the reliability of the hake stock assessment, and it is directly linked to the validation or modification of the current assessment practices. This PhD thesis is made up of a synthesis of four papers with varying objectives. Paper I attempted to study diel patterns in survey trawl catch rates for Namibian hakes using the solar zenith angle of the sun as a proxy for light level near the bottom. The main aim was to examine the effect of diel bias on catchability within and between years, and to explore the implications for survey abundance estimation and the consistency of the survey time-series. Results indicate that time of day has an effect on survey catch rates, mostly for M. capensis, where lower catch rates were obtained during the night, in shallower waters. The second objective (Paper II)
was to study the effects of environmental variables and other covariates (temperature, oxygen, salinity as well as geographical position, time of day and year) on survey trawl catch rates at different size groups (juvenile, small, medium and large) of the two hake species. Most of the years, the environmental data were collected independent of the fishing operations usually on few selected transects with limited spatial overlap between the CTD and the trawl stations. The results, however, indicate that the most important covariates affecting catch rates were bottom oxygen, bottom depth, geographical position and bottom temperature. This is an indication that the size structure of the two species as observed in the survey may have been affected by the behavioral reactions in response to the environmental conditions. These results were confirmed by those of Paper III, which used data collected by a trawl-mounted instrument package, which allows the data collection simultaneously to the trawl operations. There is an indication that the use of a trawl-mounted instrument package can provide reliable information on environmental variables for an improved understanding and interpretation of survey catch rates and subsequent use in stock assessment models for provision of scientific advice on resources. Paper IV was an investigation into diel feeding ecology through food composition based on recent stomach samples in order to gain insight into biological explanation of the observed dynamics of survey catchability. Both hake species fed more on semi-demersal and demersal components of the prey field, which predominantly consisted of horse mackerel, jacopever and Atlantic green eye for M. capensis, and grenadier and cephalopods (squid and cuttlefish) for M. paradoxus. Other prey items were pelagic like krill and myctophids. Hake-on-hake predation was observed, with both hake species occurring as prey in the stomachs of M. capensis while only M. paradoxus occurred in the stomachs of M. paradoxus. This study was unfortunately limited by an insufficient number of samples and inadequate geographical coverage. It can, however, be used as a basis to plan future studies that should then also encompass the use of a gastric evacuation model to estimate the time of the day for ingestion of individual prey items and to quantify hake cannibalism from stomach content data. Results of the different papers are synthesized in relation to diagnosing environmental effects on survey catchability and then suggestions for time series adjustments is provided.

**General information**

State: Published  
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Oceans and Arctic, Ministry of Fisheries and Marine Resources  
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**Environment-dependent plasticity and ontogenetic changes in the brain of hatchery-reared Atlantic salmon**

Lowered rearing density has repeatedly been shown to increase the performance of hatchery-reared salmonids stocked into natural environments. One possible mechanism for this pattern could be that lower densities enhance brain development, which has been shown to be the case in other hatchery enhancement strategies, like environmental enrichment. Here, we investigated the size of the brain in hatchery-reared Atlantic salmon Salmo salar kept at standard (high) and reduced (low) tank densities. In contrast to our predictions, we found that fish reared at high density had larger dry mass of cerebellum and telencephalon, correcting for body size. No differences were detected for total brain mass. Furthermore, we found that the relative size of both telencephalon and cerebellum, in relation to total brain mass, changed with body size. Cerebellum increased in relative size with increased body size, while the opposite pattern was observed for telencephalon. Overall, these results reveal substantial brain plasticity depending on the surrounding environment as well as ontogenetic adaptive changes in the brain of the Atlantic salmon.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, University of Gothenburg, Danish Center for Wild Salmon  
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Envisioning the future of aquatic animal tracking: Technology, science, and application

Electronic tags are significantly improving our understanding of aquatic animal behavior and are emerging as key sources of information for conservation and management practices. Future aquatic integrative biology and ecology studies will increasingly rely on data from electronic tagging. Continued advances in tracking hardware and software are needed to provide the knowledge required by
managers and policymakers
to address the challenges posed by the world’s changing aquatic ecosystems. We foresee multiplatform tracking systems
monitoring the position, activity, and physiology of animals and the environment through which they are moving. Improved
data collection will
be accompanied by greater data accessibility and analytical tools for processing data, enabled by new infrastructure and
cyberinfrastructure. To
operationalize advances and facilitate integration into policy, there must be parallel developments in the accessibility of
education and training,
as well as solutions to key governance and legal issues

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University,
South African Institute for Aquatic Biodiversity, Pacific Northwest National Laboratory, University of Windsor, Macquarie
University, Australian Institute of Marine Science, University of British Columbia, University of Hawaii at Manoa, Dalhousie
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(Ekstern), Hussey, N. E. (Ekstern), Iversen, S. J. (Ekstern), Kessel, S. T. (Ekstern), Kocik, J. F. (Ekstern), Lucas, M. C.
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BFI (2015): BFI-level 2
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Scopus rating (2014): SJR 2.435 SNIP 2.402 CiteScore 3.12
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.747 SNIP 2.618 CiteScore 3.41
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.343 SNIP 2.217 CiteScore 2.89
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.566 SNIP 2.416 CiteScore 3.31
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.208 SNIP 2.44
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.808 SNIP 2.13
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Scopus rating (2008): SJR 1.942 SNIP 2.317
Establishment of a taxonomic and molecular reference collection to support the identification of species regulated by the Western Australian Prevention List for Introduced Marine Pests

Introduced Marine Pests (IMP, = non-indigenous marine species) prevention, early detection and risk-based management strategies have become the priority for biosecurity operations worldwide, in recognition of the fact that, once established, the effective management of marine pests can rapidly become cost prohibitive or impractical. In Western Australia (WA), biosecurity management is guided by the "Western Australian Prevention List for Introduced Marine Pests" which is a policy tool that details species or genera as being of high risk to the region. This list forms the basis of management efforts to prevent introduction of these species, monitoring efforts to detect them at an early stage, and rapid response should they be detected. It is therefore essential that the species listed can be rapid and confidently identified and discriminated from native species by a range of government and industry stakeholders. Recognising that identification of these species requires very specialist expertise which may be in short supply and not readily accessible in a regulatory environment, and the fact that much publicly available data is not verifiable or suitable for regulatory enforcement, the WA government commissioned the current project to collate a reference collection of these marine pest specimens. In this work, we thus established collaboration with researchers worldwide in order to source representative specimens of the species listed. Our main objective was to build a reference collection of taxonomically vouchered specimens and subsequently to generate species-specific DNA barcodes suited to supporting their future identification. To date, we were able to obtain specimens of 75 species (representative of all but four of the pests listed) which have been identified by experts and placed with the WA Government Department of Fisheries and, where possible, in accessible museums and institutions in Denmark.
Australasia. The reference collection supports the fast and reliable taxonomic and molecular identification of marine pests in WA and constitutes a valuable resource for training of stakeholders with interest in IMP recognition in Australia. The reference collection is also useful in supporting the development of a variety of DNA-based detection strategies such as real-time PCR and metabarcoding of complex environmental samples (e.g. biofouling communities). The Prevention List is under regular review to ensure its continued relevance and that it remains evidence and risk-based. Similarly, its associated reference collection also remains to some extent a work in progress. In recognition of this fact, this report seeks to provide details of this continually evolving information repository publicly available to the biosecurity management community worldwide.

General information
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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Department of Fisheries, Government of Western Australia, Chevron Australia, Museum and Art Gallery of the Northern Territory, Western Australian Museum, California Department of Fish and Wildlife, Hellenic Centre for Marine Research, NOAA, Cawthron Institute, Station Biologique de Roscoff, Alfred Wegener Institut-Helmholtz Zentrum für Polar- und Meeresforschung, National Research Council - Institute of Marine Sciences Ancona L.go fiera della pesca SNC -, Macquarie University, University of Louisiana at Lafayette, Italian National Institute for Environmental Protection and Research, Institut Pertanian Bogor, Romberg Tiburon Center, University of Lödz, University of Gdansk, Senckenberg am Meer, Dept. Marine Science, Zoological Institute, Russian Academy of Sciences, Stockholm University, University of Tartu, University of Aberdeen, Institute of Oceanography and Fisheries
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Estimating escapement of fish and invertebrates in a Danish anchor seine
The codend is generally presumed to be the place where the main selectivity of fish occurs in towed fishing gears, but other parts of the net have been found to contribute to the selectivity process of several invertebrate species. This means that conventional selectivity or survival studies may ignore the selectivity of net parts other than the codend for certain species. By attaching 12 small meshed collecting bags to different parts of a Danish anchor seine net and conducting normal commercial fishing activities, this study showed that there is a substantial escapement of fish and (especially) invertebrates from the forward parts of the seine net. For seven species of demersal fish, most fish escaped through the lower panel close to the codend. All invertebrate species were found in higher numbers in the collecting bags than in the codend where many organisms escaped in the lower panel of the wings or the belly. Mean levels of visible damage ranged from 1.00 to 3.25 for collected invertebrates and were similar for all gear parts. Common starfish (Asterias rubens), however, showed highest damage in the extension part of the net.
Estimating uncertainty of data limited stock assessments

Many methods exist to assess the fishing status of data-limited stocks; however, little is known about the accuracy or the uncertainty of such assessments. Here we evaluate a new size-based data-limited stock assessment method by applying it to well-assessed, data-rich fish stocks treated as data-limited. Particular emphasis is put on providing uncertainty estimates of the data-limited assessment. We assess four cod stocks in the North-East Atlantic and compare our estimates of stock status (F/Fmsy) with the official assessments. The estimated stock status of all four cod stocks followed the established stock assessments remarkably well and the official assessments fell well within the uncertainty bounds. The estimation of spawning stock biomass followed the same trends as the official assessment, but not the same levels. We conclude that the data-limited assessment method can be used for stock assessment and that the uncertainty estimates are reliable. Further work is needed to quantify the spawning biomass of the stock.
Estimation of individual growth trajectories when repeated measures are missing

Individuals in a population vary in their growth due to hidden and observed factors such as age, genetics, environment, disease, and carryover effects from past environments. Because size affects fitness, growth trajectories scale up to affect population dynamics. However, it can be difficult to estimate growth in data from wild populations with missing observations and observation error. Previous work has shown that linear mixed models (LMMs) underestimate hidden individual heterogeneity when more than 25% of repeated measures are missing. Here we demonstrate a flexible and robust way to model growth trajectories. We show that state-space models (SSMs), fit using R package growmod, are far less biased than LMMs when fit to simulated data sets with missing repeated measures and observation error. This method is much faster than Markov chain Monte Carlo methods, allowing more models to be tested in a shorter time. For the scenarios we simulated, SSMs gave estimates with little bias when up to 87.5% of repeated measures were missing.

We use this method to quantify growth of Soay sheep, using data from a long-term mark-recapture study, and demonstrate that growth decreased with age, population density, weather conditions, and when individuals are reproductive. The method improves our ability to quantify how growth varies among individuals in response to their attributes and the environments they experience, with particular relevance for wild populations.
Estimation of potential indirect effects of sediment transport from mussel seed fisheries on eelgrass beds

General information
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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Aarhus University
Authors: Saurel, C. (Intern), Mohn, C. (Ekstern), Andersen, K. L. (Intern), Bak, F. (Intern), Barreau, P. D. A. (Intern), Petersen, J. K. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
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Evaluating dispersal potential of an invasive fish by the use of aerobic scope and osmoregulation capacity

Non-indigenous species (NIS) can impact marine biodiversity and ecosystem structure and function. Once introduced into a new region, secondary dispersal is limited by the physiology of the organism in relation to the ambient environment and
by complex interactions between a suite of ecological factors such as presence of predators, competitors, and parasites. Early prediction of dispersal potential and future ‘area of impact’ is challenging, but also a great asset in taking appropriate management actions. Aerobic scope (AS) in fish has been linked to various fitness-related parameters, and may be valuable in determining dispersal potential of aquatic invasive species in novel environments. Round goby, Neogobius melanostomus, one of the most wide-ranging invasive fish species in Europe and North America, currently thrives in brackish and fresh water, but its ability to survive in high salinity waters is unknown to date. We show that AS in round goby is reduced by 30% and blood plasma osmolality increased (indicating reduced capacity for osmoregulation) at salinities approaching oceanic conditions, following slow ramping (5 PSU per week) and subsequent long-term acclimation to salinities ranging between 0 and 30 PSU (8 days at final treatment salinities before blood plasma osmolality measurements, 12-20 additional days before respirometry). Survival was also reduced at the highest salinities yet a significant proportion (61%) of the fish survived at 30 PSU. Reduced physiological performance at the highest salinities may affect growth and competitive ability under oceanic conditions, but to what extent reduced AS and osmoregulatory capacity will slow the current 30 km year-1 rate of advance of the species through the steep salinity gradient from the brackish Baltic Sea and into the oceanic North Sea remains speculative. An unintended natural experiment is in progress to test whether the rate of advance slows down. At the current rate of advance the species will reach the oceanic North Sea by 2018/2019, therefore time for taking preventative action is short.
Evidence of cormorant-induced mortality, disparate migration strategies and repeatable circadian rhythm in the endangered North Sea houting (Coregonus oxyrinchus): A telemetry study mapping the postspawning migration

Life history theory predicts a trade-off between migration and residency where migration is favoured when it infers elevated fitness. Although migration to more favourable environments offers higher growth rates, migrants often experience increased mortality due to predation. Here, we investigated mortality and migration behaviour of the North Sea houting (Coregonus oxyrinchus), an anadromous salmonid endemic to the Wadden Sea. We used acoustic telemetry to map the migration of the only remaining indigenous population by applying stationary hydrophones combined with manual tracking. Data suggested a total mortality of 26%, with 30% of the total mortality attributed to predation by great cormorants (Phalacrocorax carbo sinensis), highlighting that North Sea houting conservation could be jeopardised by increased cormorant predation. Risk of cormorant predation was size-dependent, with smaller fish suffering higher risk of predation. The study found North Sea houting to exhibit disparate migration strategies and identified a lentic area in the estuary as an important habitat. Two newly established artificial lakes within the river system significantly reduced the migration speeds, possibly indicating constrained navigation through the lakes. The migration into the Wadden Sea correlated with temperature perhaps indicating osmoregulatory constraints of sea entry. Unlike most salmonid species, migration occurred both day and night. Moreover, fish exhibited repeatable individual differences in diel activity patterns, suggesting that individuals differ consistently in their migratory activity throughout the 24-hr period. Our study provides novel information on salmonid migration, which is crucial for the development of science-based conservation strategies.
Evidence of local and regional freshening of Northeast Greenland coastal waters

The supply of freshwater to fjord systems in Greenland is increasing as a result of climate change-induced acceleration in ice sheet melt. However, insight into the marine implications of the melt water is impaired by lack of observations demonstrating the fate of freshwater along the Greenland coast and providing evaluation basis for ocean models. Here we present 13 years of summer measurements along a 120 km transect in Young Sound, Northeast Greenland and show that sub-surface coastal waters are decreasing in salinity with an average rate of 0.12 ± 0.05 per year. This is the first observational evidence of a significant freshening on decadal scale of the waters surrounding the ice sheet and comes from a region where ice sheet melt has been less significant. It implies that ice sheet dynamics in Northeast Greenland could be of key importance as freshwater is retained in southward flowing coastal currents thus reducing density of water masses influencing major deep water formation areas in the Subarctic Atlantic Ocean. Ultimately, the observed freshening could have implications for the Atlantic meridional overturning circulation.
Extending electronic length frequency analysis in R

Electronic length frequency analysis (ELEFAN) is a system of stock assessment methods using length-frequency (LFQ) data. One step is the estimation of growth from the progression of LFQ modes through time using the von Bertalanffy growth function (VBGF). The option to fit a seasonally oscillating VBGF (soVBGF) requires a more intensive search due to two additional parameters. This work describes the implementation of two optimisation approaches ("simulated annealing" and "genetic algorithm") for growth function fitting using the open-source software "R." Using a generated LFQ data set with known values, the accuracy of the soVBGF parameter estimation was evaluated. The results indicate that both optimisation approaches are capable of finding high scoring solutions, yet settings regarding the initial restructuring process for LFQ bin scoring (i.e. "moving average,") and the fixing of the asymptotic length parameter (L-infinity) are found to have significant effects on parameter estimation error. An outlook provides context as to the significance of the R-based implementation for further testing and development, as well as the general relevance of the method for data-limited stock assessment.
Extracting DNA from 'jaws': High yield and quality from archived tiger shark (Galeocerdo cuvier) skeletal material

Archived specimens are highly valuable sources of DNA for retrospective genetic/genomic analysis. However, often limited effort has been made to evaluate and optimize extraction methods, which may be crucial for downstream applications. Here, we assessed and optimized the usefulness of abundant archived skeletal material from sharks as a source of DNA for temporal genomic studies. Six different methods for DNA extraction, encompassing two different commercial kits and three different protocols, were applied to material, so-called bio-swarf, from contemporary and archived jaws and vertebrae of tiger sharks (Galeocerdo cuvier). Protocols were compared for DNA yield and quality using a qPCR approach. For jaw swarf, all methods provided relatively high DNA yield and quality, while large differences in yield between protocols were observed for vertebrae. Similar results were obtained from samples of white shark (Carcharodon carcharias). Application of the optimized methods to 38 museum and private angler trophy specimens dating back to 1912 yielded sufficient DNA for downstream genomic analysis for 68% of the samples. No clear relationships between age of samples, DNA quality and quantity were observed, likely reflecting different preparation and storage methods for the trophies. Trial sequencing of DNA capture genomic libraries using 20 000 baits revealed that a significant proportion of captured sequences were derived from tiger sharks. This study demonstrates that archived shark jaws and vertebrae are potential high-yield sources of DNA for genomic-scale analysis. It also highlights that even for similar tissue types, a careful evaluation of extraction protocols can vastly improve DNA yield.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Queensland, Pepperell Research and Consulting Pty Ltd.
Authors: Eg Nielsen, E. (Intern), Morgan, J. A. T. (Ekstern), Maher, S. L. (Ekstern), Edson, J. (Ekstern), Gauthier, M. (Ekstern), Pepperell, J. (Ekstern), Holmes, B. J. (Ekstern), Bennett, M. B. (Ekstern), Ovenden, J. R. (Ekstern)
Pages: 431-442
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Molecular Ecology Resources
Volume: 17
Issue number: 3
ISSN (Print): 1755-098X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.06 SJR 2.864 SNIP 2.176
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.305 SNIP 1.564 CiteScore 4.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.842 SNIP 2.217 CiteScore 5.04
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Extraction of microplastic from biota: recommended acidic digestion destroys common plastic polymers

The chemical digestion of tissue from marine biota for microplastic analysis is currently conducted following a variety of protocols published in scientific literature. Often there is a lack of information on whether and to which degree the applied chemicals are destructive to microplastic particles of various polymer types. In the present study we report that a digestion protocol recently recommended by ICES using nitric and perchloric acid has strong detrimental effects on several common plastic polymers, in particular polyamide and polyurethane and to a lesser degree acrylonitrile butadiene styrene, polymethyl methacrylate and polyvinylchloride. Raman spectroscopic measurements revealed changes in peak occurrence and intensity for several polymers that did not otherwise show visual macroscopic changes. We developed and tested an alkaline digestion protocol in order to preserve small microplastic particles while removing organic tissue material. We recommend this method for the development of guidelines for plastic microplastic monitoring in biota.
Fangstjournalen maj 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Pages: 66
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Volume: 92
Issue number: 4
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2017

Fangstjournalen – masser af fordele for lystfiskeren (Pt.II)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Volume: 92
Issue number: 3
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
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ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2017

Fangstjournalen november 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Oceans and Arctic
Fangstjournalen oktober 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Pages: 43
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Volume: 92
Issue number: 6
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2017

Faster or slower: Has growth of juvenile eastern Baltic cod changed?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Section for Ecosystem based Marine Management
Authors: Hüsky, K. (Intern), Radtke, K. (Ekstern), Eero, M. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

FAST TRACK: Industry developed gear solutions under the landing obligation

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aalborg University
Publication date: 2017
Event: Poster session presented at DanFish International, Aalborg, Denmark.
Main Research Area: Technical/natural sciences
Feed, breed and be eaten: behavior dependent trade-offs in zooplankton

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: van Someren Gréve, H. (Intern), Almeda, R. (Intern), Kierboe, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskmøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Feeding behavior and capture success of turbot Psetta maxima larvae during the transition from upright to tilted swimming position

Aquaculture production of high-quality marine fish larvae might be hampered by poor success in larval initiation of exogenous feeding or the lack of appropriate live feed in their first feeding period. The period of larval metamorphosis may further constrain the successful rearing of flatfish larvae. In order to ascertain changes in feeding during metamorphosis of flatfish, we here compared feeding behavior when larvae of turbot Psetta maxima were either swimming upright or tilted. Using video recordings, we compared the attack rate and prey capture success between flexion (12-13 days-post-hatch, stage 4b-4c) swimming predominantly in upright position and post-flexion (16-17 days-post-hatch, stage 5a-5b) larvae in tilted swimming mode. Both larval groups were fed on copepod nauplii and copepodites. Our results showed a capture success of <50% during the flexion stage, increasing to 73% in the post-flexion stage, and larvae were more successful when feeding on nauplii than when offered copepodite stages. An ontogenetic shift from intermittent to cruise swimming was observed during the metamorphosis concomitant with improved hunting skills. Thus larvae appeared to be able to successfully complete metamorphosis without compromising their feeding ability on copepod prey.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Oceans and Arctic, Nanyang Technological University, Roskilde University
Authors: Bruno, E. (Intern), Mahjoub, M. S. (Ekstern), Hansen, B. W. (Ekstern), Munk, P. (Intern), Støttrup, J. G. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Aquatic Living Resources
Volume: 30
Article number: 35
ISSN (Print): 0990-7440
Ratings:
- BFI (2018): BFI-level 1
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 1
- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 1.41 SJR 0.59 SNIP 0.743
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 0.747 SNIP 0.848 CiteScore 1.39
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 0.641 SNIP 0.905 CiteScore 1.25
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 0.547 SNIP 0.68 CiteScore 1.15
- ISI indexed (2013): ISI indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 0.554 SNIP 0.618 CiteScore 1.19
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
Feeding in a viscous world: How microbes catch prey

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Nielsen, L. T. (Intern), Kiørboe, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2017

Feeding on dispersed vs. aggregated particles: The effect of zooplankton feeding behavior on vertical flux
Zooplankton feeding activity is hypothesized to attenuate the downward flux of elements in the ocean. We investigated whether the zooplankton community composition could influence the flux attenuation, due to the differences of feeding modes (feeding on dispersed vs. aggregated particles) and of metabolic rates. We fed 5 copepod species-three calanoid, one harpacticoid and one poecilamastoid-microplankton food, in either dispersed or aggregated form and measured rates of respiration, fecal pellet production and egg production. Calanoid copepods were able to feed only on dispersed food; when their food was introduced as aggregates, their pellet production and respiration rates decreased to rates observed for starved individuals. In contrast, harpacticoids and the poecilamastoid copepod Oncaea spp. were able to feed only when the food was in the form of aggregates. The sum of copepod respiration, pellet production and egg production rates was equivalent to a daily minimum carbon demand of ca. 10% body weight-(1) for all non-feeding copepods; the carbon demand of calanoids feeding on dispersed food was 2-3 times greater, and the carbon demand of harpacticoids and Oncaea spp. feeding on aggregates was >7 times greater, than the resting rates. The zooplankton species composition combined with the type of available food strongly influences the calculated carbon demand of a copepod community, and thus also the attenuation of vertical carbon flux.
Female nutrition and assisted reproduction in European eel: influences on oogenesis and egg quality

The European eel (Anguilla anguilla) has an enigmatic life-cycle. One of its most unique features is the 5000 to 6000 km separating the growth areas in Europe and North Africa from the spawning grounds in the Sargasso Sea. Even more enigmatic is the fact that naturally matured eels have never been caught and thus, spawning in the wild has never been observed. Because sexual maturation is blocked until the silvering phase and start of spawning migration, eels do not mature spontaneously in captivity and gonad development is induced by the application of exogenous hormones. In female eels, induction of egg production involves a long-term hormonal treatment of salmon or carp pituitary extracts (SPE or CPE) followed by the induction of oocyte maturation and ovulation which includes a SPE primer and a maturation-inducing hormone (MIH), generally 17α, 20β-dihydroxy-4-pregnen-3-one (DHP). Recent progress in techniques for induction of maturation and fertilization of the eggs has enabled the production of many viable eggs and yolk-sac larvae that are able of exogenous feeding. The present studies have contributed to this progress by addressing some of the challenges commonly associated with the induction of female maturation and egg quality. The main objectives of this PhD study were to improve female response to hormonal treatments and resulting egg quality. These challenges were addressed by working with both cultured and wild female eels, testing different broodstock diets and hormonal treatments, and identifying possible factors associated with egg quality. The results showed that dietary fatty acid composition has a significant influence on ovarian development in response to hormonal treatments. During oocyte maturation and ovulation, the expression of hormone receptors at the time SPE and DHP were administrated differed between high and low egg quality groups. It appears that a mismatch between hormone receptor expression and the administration of SPE and DHP may be determinant for acquisition of oocyte developmental competence. Moreover, lipid analysis of eggs obtained from wild-caught female eels showed that the level of most fatty acids were similar between high and low quality eggs. Additionally, levels of essential fatty acids were considerable different from those reported elsewhere for cultured European female eel. Experiments part of this PhD project resulted in a high number of high quality eggs which enabled us to determine the relation between oocyte stage at the time oocyte maturation and ovulation are induced, and egg quality for the first time. As a result, we presented improved guidelines to induce oocyte maturation and ovulation, based on a lipid droplet-based oocyte maturation scale, which may result in an increase in production of viable European eel eggs. Overall, this PhD project contributed to the development of assisted reproduction procedures by providing new and valuable knowledge about the factors influencing the maturational response of European female eels to hormonal treatments and resulting egg quality.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management
Authors: da Silva, F. (Intern), Tomkiewicz, J. (Intern), Støtrup, J. G. (Intern)
Number of pages: 121
Publication date: 2017

Fertilization strategies for Sea Bass Dicentrarchus labrax (Linnaeus, 1758): effects of pre-incubation and duration of egg receptivity in seawater

Studying gamete biology can provide important information about a species fertilization strategy as well as their reproductive ecology. Currently, there is a lack of knowledge about how long sea bass Dicentrarchus labrax eggs can remain viable after being activated in seawater. The objectives of this study were to understand the effects of pre-incubation of fresh and overripe sea bass eggs in seawater and to determine the duration of egg receptivity. Pooled eggs (fresh and overripe) from four females were pre-incubated in seawater for 0 min (control), 0.5 min, 1 min, 3 min, 10 min and 30 min and then fertilized by pooled sperm from four males. The fresh eggs had a higher fertilization success than overripe eggs. Our results revealed a significant effect of pre-incubation time for both the fresh (P < 0.01) and overripe eggs (P < 0.01). Fertilization success of eggs significantly declined for both these treatments after 3 min of pre-incubation, which clearly indicates that sea bass eggs are able to be fertilized by sperm for up to 3 min after release into seawater. This study has particular importance for understanding fertilization strategies, reproductive potential, as well as reproductive ecology of sea bass.
Fine-scale environmental effects on Cape hake survey catch rates in the Northern Benguela, using data from a trawl-mounted instrument package

We investigated fine-scale effects of environmental variables associated with habitat distribution for 4 size groups of Cape hakes, Merluccius capensis and M. paradoxus, using generalized additive models (GAMs) with a negative binominal error distribution. This study took place during the Namibian hake trawl survey of 2016, and was made possible for the first time in Namibia by collecting oceanographic information with a trawl-mounted instrument package concurrently with the catch data. Depth, geographical position, bottom oxygen and bottom temperature had the most pronounced effect on the catch rates of both hake species, whereas solar zenith angle representing diel effects and surface layer chlorophyll appeared to be less important. The explained deviance for the best models ranged from 71.4% for M. capensis to 92.7% for M. paradoxus between 43 and 57 cm in length. Differences in catch rates between species and size groups were most pronounced for bottom depth and bottom oxygen. The results show the potential value of trawl-mounted instrumental packages for the collection of reliable environmental data important in the study of environmental influence on abundance, catch rates and distribution, and in turn in the assessment and management of a resource.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Ministry of Fisheries and Marine Resources

Final Report on Development and usage of REM systems along with electronic data transfer as a measure to monitor compliance with the Landing Obligation – 2016

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Ministry of Food, Agriculture and Fisheries

Authors: Bergsson, H. (Ekstern), Schreiber Plet-Hansen, K. (Intern), Jessen, L. N. (Ekstern), Jensen, P. (Ekstern), Bahlke, S. Ø. (Forskerdatabase)
Number of pages: 61
Publication date: 2017

Publication information
Publisher: Ministry of Food, Agriculture and Fisheries
Original language: English
Main Research Area: Technical/natural sciences
DOIs: 10.13140/RG.2.2.23628.00645
Publication: Research › Report – Annual report year: 2018
First experiences from full-scale denitrifying woodchip bioreactors operated end-of-pipe at commercial RAS

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: von Ahnen, M. (Intern), Pedersen, P. B. (Intern), Dalsgaard, A. J. T. (Intern)
Number of pages: 56
Pages: 34
Publication date: 2017

Host publication information
Title of host publication: 4th NordicRAS Workshop on Recirculating Aquaculture Systems. Aalborg, Denmark, 12-13 October 2017 : Book of Abstracts
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
Fish egg predation by Baltic sprat and herring: do species characteristics and development stage matter?

Predation of eggs by clupeids has been identified as a major factor contributing to early life stage mortality of Baltic cod. We used data from ichthyoplankton sampling and clupeid stomach analyses to investigate whether eggs of other fish species are to a similar extent subject to predation, and how predation pressure differs between egg development stages. Cod, sprat and rockling eggs dominated in the ichthyoplankton fraction in herring and sprat diet, whereas flounder and dab eggs occurred only occasionally. In spring, cod eggs at advanced development stages were positively and sprat eggs generally negatively selected by both predators, while fish eggs were non-selectively consumed in summer. Predation is suggested to account for a large fraction of mortality of cod eggs at older stages, i.e. those eggs, which have survived the often detrimentally low oxygen concentration in and below the permanent halocline. The consumption rates of sprat eggs at all development stages relative to production rates were considerably lower compared to cod, suggesting that egg predation is of lesser importance for sprat recruitment.
Fisheries Impact Evaluation Tool (FIT) with Application to Assess the Bottom Fishing Footprint in Western Baltic Sea (ICES Subdivisions 22-24)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Centre for Ocean Life, Wageningen IMARES
Authors: Bastardie, F. (Intern), Eigaard, O. R. (Intern), Nielsen, J. R. (Intern), Egekvist, J. (Intern), Hintzen, N. T. (Ekstern), van Denderen, P. D. (Intern), Rijnsdorp, A. (Ekstern)
Fisher's preferences and trade-offs between management options

Failure to understand the potential responses of fishers to management measures creates a significant risk of revisiting the familiar scenario of perverse and unintended consequences of those measures. This paper reports on a choice experiment survey to evaluate fisher's preferences for various management measures proposed under the EU Common Fisheries Policy (CFP) reform process, but the conclusions have wider relevance as similar measures are used by comparable fleets in fisheries globally. The survey was conducted with fishers involved in mixed pelagic and demersal fisheries in Ireland, pelagic fisheries in Denmark and demersal fisheries in Greece. Fisheries management policies were characterized by five attributes designed both to cover the principal CFP reform proposals and to integrate ecological, social, economic and institutional factors affecting fisher's decisions. The study uses a random utility modelling framework to reveal the preferences of the fishers across the alternative policy attributes. Results show that while there are generally preferences both for healthy stocks and for maintaining the importance of fishing to the local community, strong interfishery preference differences exist. These differences are most notable in relation to a discard ban and to the use of individual transferable fishing rights, favoured in Denmark, but not in Ireland for instance. The strength of these interfishery differences supports the assertion that there are no panaceas in fisheries management and that solutions should be tailored within the context of specific fisheries. Not doing so could create a significant risk of inappropriately managed fisheries that may lead to unsustainable outcomes.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Marine Institute, National University of Ireland, Hellenic Centre for Marine Research
Authors: Fitzpatrick, M. (Ekstern), Maravelias, C. D. (Ekstern), Eigaard, O. R. (Intern), Hynes, S. (Ekstern), Reid, D. (Ekstern)
Pages: 795-807
Publication date: 2017
Main Research Area: Technical/natural sciences
Fishery and management of Greenland halibut in East Greenland

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Boje, J. (Intern), Gundersen, A. C. (Ekstern)
Publication date: 2017

Host publication information
Title of host publication: Sustainable bio-resources: Management, product development and raw material quality
Publisher: Orkana
ISBN (Print): 978-82-8104-290-2
Main Research Area: Technical/natural sciences
Publication: Research › peer-review › Journal article – Annual report year: 2017

Fish growth in pelagic and benthic food webs across marine ecosystems

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: van Denderen, P. D. (Intern), Andersen, K. H. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2017
Fishing for MSY: using “pretty good yield” ranges without impairing recruitment

Pretty good yield (PGY) is a sustainable fish yield corresponding to obtaining no less than a specified large percentage of the maximum sustainable yield (MSY). We investigated 19 European fish stocks to test the hypothesis that the 95% PGY yield range is inherently precautionary with respect to impairing recruitment. An FMSY range was calculated for each stock as the range of fishing mortalities (F) that lead to an average catch of at least 95% of MSY in long-term simulations. Further, a precautionary reference point for each stock (FP.05) was defined as the F resulting in a 5% probability of the spawning-stock biomass falling below an agreed biomass limit below which recruitment is impaired (Blim) in long-term simulations. For the majority of the stocks analysed, the upper bound of the FMSY range exceeded the estimated FP.05. However, larger fish species had higher precautionary limits to fishing mortality, and species with larger asymptotic length were less likely to have FMSY ranges impairing recruitment. Our study shows that fishing at FMSY generally is precautionary with respect to impairing recruitment for highly exploited teleost species in northern European waters, whereas the upper part of the range providing 95% of MSY is not necessarily precautionary for small- and medium-sized teleosts.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences, Cefas, Marine Research Institute, Thünen Institute of Sea Fisheries, National Marine Fisheries Research Institute, International Council for the Exploration of the Sea, Marine Scotland Science, Queen’s University Belfast
Authors: Rindorf, A. (Intern), Cardinale, M. (Ekstern), Shephard, S. (Ekstern), De Oliveira, J. A. A. (Ekstern), Hjorleifsson, E. (Ekstern), Kempf, A. (Ekstern), Luzenczyk, A. (Ekstern), Millar, C. (Ekstern), Miller, D. C. M. (Ekstern), Needle, C. L. (Ekstern), Simmonds, J. (Ekstern), Vinther, M. (Intern)
Pages: 525-534
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 2
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
Fishing profiles of Danish seiners and bottom trawlers in relation to current EU management regulations

Danish seines and bottom trawls operate differently and have different catching processes. Both gears belong to the same legislative category in European fisheries, but different management strategies in other countries and criticism by fishers on grouping Danish seines and trawls together indicate disagreement on current gear classification. This study compared both gears in terms of their fishing characteristics and catches of commercial species based on 16 years of observer data. Danish seining is a specialised fishing method that targeted few species but with higher total catch rates than bottom trawlers. Bottom trawling is a more all-purpose fishing method that targets a larger number of species, and bottom trawlers use larger engines than Danish seiners. A generalised additive mixed model indicated that catch rates of flatfish are generally higher for Danish seines, and catch rates of roundfish species are higher for trawlers. The results do not directly suggest a separation of the gears in terms of legislation as the quantities of fish below current minimum size were similar, but for example future survival studies may reach different conclusions. Additional factors were found to be important in determining catches of both gears
Fish size composition in space - A spatially explicit size spectrum model of the Celtic Sea fish community for testing novel management approaches
Fish. Wadden Sea Quality Status Report 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Wageningen IMARES
Authors: Tulp, I. (Ekstern), Bolle, L. (Ekstern), Dänhardt, A. (Ekstern), de Vries, P. (Ekstern), Haslob, H. (Ekstern), Jepsen, N. (Intern), Scholle, J. (Ekstern), van der Veer, H. (Ekstern)
Number of pages: 25
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Publication information
Place of publication: Wilhelmshaven
Publisher: Common Wadden Sea Secretariat
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Links:
http://qsr.waddensea-worldheritage.org/reports/fish
Publication: Research › Report – Annual report year: 2017

Fiskeredskaber og selektivitet under landingsforpligtelsen - noget for dig?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Feekings, J. P. (Intern)
Pages: 20
Publication date: 2017

Publication information
Pages (from-to): 20
Newspaper: Fiskeritidende
Volume: 24
No.: 21
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Main Research Area: Technical/natural sciences
Publication: Communication › Newspaper article – Annual report year: 2017

Flabellum alabastrum, en Vestgrønlandsk bægerkoral

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Københavns Universitet
Authors: Jørgensbye, H. (Intern), Tendal, O. S. (Forskerdatabase)
Publication date: 2017
Flere stenrev giver flere torsk

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Fiskeristyrelsen
Authors: Kristensen, L. (Ekstern), Svendsen, J. C. (Intern), Støttrup, J. G. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/nyhed?id=AC981F3F-54D8-4B99-84AF-E7371543B97E

FLEXSELECT: a flexible counter-herding device to reduce bycatch in trawl fisheries

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF Fisheries and Aquaculture
Authors: Melli, V. (Intern), Karlsen, J. D. (Intern), Feekings, J. P. (Intern), Herrmann, B. (Ekstern), Krag, L. A. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Bibliographical note
ICESCM 2017/SSGIEOM:13
Publication: Research › Conference abstract for conference – Annual report year: 2018

FLEXSELECT: counter-herding device to reduce bycatch in crustacean trawl fisheries

FLEXSELECT is a simple counter-herding device which aims at reducing the bycatch of fish by scaring them away from the trawl path without affecting the catches of the target species. FLEXSELECT was tested in the Norway lobster (Nephrops norvegicus) directed trawl fishery, as this includes bycatch of both roundfish and flatfish. Length-based data were collected for Nephrops, four roundfish species (cod, haddock, whiting and hake) and two flatfish species (plaice and lemon sole) and length-based catch comparisons performed. No significant effect on the target species, Nephrops, was detected, whereas a reduction of 39% (CI: 29-46 %) was obtained for the overall number of fish. Catches of all the six fish species examined were significantly reduced by FLEXSELECT, with the efficiency varying considerably among species and over length classes. No significant diel differences were found for either roundfish or flatfish species. FLEXSELECT prevents bycatch species from interacting with the trawl, thus most likely enhancing their survival and fitness. Moreover, its fast attachment system makes FLEXSELECT a flexible tool, adaptable to different fisheries and catch goals.

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF Fisheries and Aquaculture
Authors: Melli, V. (Intern), Karlsen, J. D. (Intern), Feekings, J. P. (Intern), Herrmann, B. (Ekstern), Krag, L. A. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.451 SNIP 1.196
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.589 SNIP 1.379
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.621 SNIP 1.236
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.354 SNIP 1.267
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.558 SNIP 1.553
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.744 SNIP 1.542
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.097 SNIP 1.622
Scopus rating (2002): SJR 1.909 SNIP 1.457
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.769 SNIP 1.46
Web of Science (2001): Indexed yes
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Scopus rating (1999): SJR 1.928 SNIP 1.436
Original language: English
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Følg den daglige smoltvandring i europæiske vandløb

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Aarestrup, K. (Intern), Baktoft, H. (Intern), Sivebæk, F. (Intern)
Publication date: 2017

Følg den naturlige udvandring af ørred- og laksesmolt fra danske vandløb

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, Section for Freshwater Fisheries Ecology
Authors: Koed, A. (Intern), Aarestrup, K. (Intern), Baktoft, H. (Intern), Sivebæk, F. (Intern), Geertz-Hansen, P. (Intern)
Publication date: 2017

Food for thought: pretty good multispecies yield

MSY principles for marine fisheries management reflect a focus on obtaining continued high catches to provide food and livelihoods for humanity, while not compromising ecosystems. However, maintaining healthy stocks to provide the maximum sustainable yield on a single-species basis does not ensure that broader ecosystem, economic, and social objectives are addressed. We investigate how the principles of a "pretty good yield" range of fishing mortalities assumed to provide >95% of the average yield for a single stock can be expanded to a pretty good multispecies yield (PGMY) space and further to pretty good multidimensional yield to accommodate situations where the yield from a stock affects the ecosystem, economic and social benefits, or sustainability. We demonstrate in a European example that PGMY is a practical concept. As PGMY provides a safe operating space for management that adheres to the principles of MSY, it allows the consideration of other aspects to be included in operational management advice in both data-rich and data-limited situations. PGMY furthermore provides a way to integrate advice across stocks, avoiding clearly infeasible management combinations, and thereby hopefully increasing confidence in scientific advice.
Food-web dynamics under climate change
Climate change affects ecological communities through its impact on the physiological performance of individuals. However, the population dynamic of species well inside their thermal niche is also determined by competitors, prey and predators, in addition to being influenced by temperature changes. We use a trait-based food-web model to examine how the interplay between the direct physiological effects from temperature and the indirect effects due to changing interactions between populations shapes the ecological consequences of climate change for populations and for entire
communities. Our simulations illustrate how isolated communities deteriorate as populations go extinct when the environment moves outside the species’ thermal niches. High-trophic-level species are most vulnerable, while the ecosystem function of lower trophic levels is less impacted. Open communities can compensate for the loss of ecosystem function by invasions of new species. Individual populations show complex responses largely uncorrelated with the direct impact of temperature change on physiology. Such complex responses are particularly evident during extinction and invasion events of other species, where climatically well-adapted species may be brought to extinction by the changed food-web topology. Our results highlight that the impact of climate change on specific populations is largely unpredictable, and apparently well-adapted species may be severely impacted.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Zhang, L. (Ekstern), Takahashi, M. (Ekstern), Hartvig, M. (Ekstern), Andersen, K. H. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 2.541 SNIP 1.474
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.948 SNIP 1.535 CiteScore 4.08
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.916 SNIP 1.673 CiteScore 4.18
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.091 SNIP 1.762 CiteScore 5.08
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.947 SNIP 1.881 CiteScore 4.99
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.234 SNIP 1.789 CiteScore 5.02
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.894 SNIP 1.61
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.581 SNIP 1.389
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.364 SNIP 1.372
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.475 SNIP 1.447
Scopus rating (2006): SJR 2.925 SNIP 1.713
Forskere hjælper fynske havørreder

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Olesen, H. J. (Intern), Skov, C. (Intern), Reeh, L. (Intern)
Pages: 34-35
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Havørred Fyn - fiskemagasin
Original language: Danish
Links: https://issuu.com/seatrout.dk/docs/hav___rred_mag_2017_dk_isuu
Publication: Communication › Journal article – Annual report year: 2017

Forskere ved DTU Aqua afslører havørredens adfærd i hav og fjorde

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
Publication date: 2017

**Publication information**
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links: http://www.fiskepleje.dk/nyheder/2017/07/oerredblog?id=269a732f-927b-4c51-8034-55cb1bc737d&utm_source=newsletter&utm_media@mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2017

Forskningskibet Dana er netop vendt hjem fra Østersøen

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Marine Living Resources
Authors: Storr-Paulsen, M. (Intern), Huwer, B. (Intern)
Pages: 14-16
From traits to life-history strategies: Deconstructing fish community composition across European seas

The life history of a species is determined by trade-offs between growth, survival and reproduction to maximize fitness in a given environment. Following a theoretical model, we investigate whether the composition of marine fish communities can be understood in terms of a set of life-history strategies and whether the prevalence of the strategies follows specific spatial patterns that can be related to the environment.
Gender-specific feeding rates in planktonic copepods with different feeding behavior

Planktonic copepods have sexually dimorphic behaviors, which can cause differences in feeding efficiency between genders. Copepod feeding rates have been studied extensively but most studies have focused only on females. In this study, we experimentally quantified feeding rates of males and females in copepods with different feeding behavior: ambush feeding (Oithona nana), feeding-current feeding (Temora longicornis) and cruising feeding (Centropages hamatus). We hypothesize that carbon-specific maximum ingestion rates are similar between genders, but that maximum clearance rates are lower for male copepods, particularly in ambush feeders, where the males must sacrifice feeding for mate searching. We conducted gender-specific functional feeding response experiments using prey of different size and motility. In most cases, gender-specific maximum ingestion and clearance rates were largely explained by the difference in size between sexes, independent of the feeding strategy. However, maximum clearance rates of males were approximately two times higher than for females in the ambush feeding copepod O. nana feeding on an optimal motile prey (Oxyrrhis marina), as hypothesized. We conclude that the conflict between mate searching and feeding can cause significant difference in feeding efficiency between copepod genders in ambush feeders but not in feeding-current and cruising feeders.
Climate changes in the Arctic are predicted to alter distributions of marine species. However, such changes are difficult to quantify because information on present species distribution and the genetic variation within species is lacking or poorly examined. Blue mussels, *Mytilus* spp., are ecosystem engineers in the coastal zone globally. To improve knowledge of distribution and genetic structure of the *Mytilus edulis* complex in the Arctic, we analyzed 81 SNPs in 534 *Mytilus* spp. individuals sampled at 13 sites to provide baseline data for distribution and genetic variation of *Mytilus* mussels in the European Arctic. *Mytilus edulis* was the most abundant species found with a clear genetic split between populations in Greenland and the Eastern Atlantic. Surprisingly, analyses revealed the presence of *Mytilus trossulus* in high Arctic NW Greenland (77°N) and *Mytilus galloprovincialis* or their hybrids in SW Greenland, Svalbard, and the Pechora Sea. Furthermore, a high degree of hybridization and introgression between species was observed. Our study highlights the importance of distinguishing between congener species, which can display local adaptation and suggests that information...
on dispersal routes and barriers is essential for accurate predictions of regional susceptibility to range expansions or invasions of boreal species in the Arctic.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Aarhus University, University of Tromsø, Russian Academy of Sciences, University of Stirling
Authors: Mathiesen, S. S. (Intern), Thyrring, J. (Ekstern), Hansen, J. H. (Intern), Berge, J. (Ekstern), Sukhotin, A. (Ekstern), Leopold, P. (Ekstern), Bekker, M. (Ekstern), Sejr, M. K. (Ekstern), Eg Nielsen, E. (Intern)
Pages: 39–55
Publication date: 2017
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Volume: 10
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.96 SJR 2.299 SNIP 1.478
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.666 SNIP 1.392 CiteScore 4.27
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.356 SNIP 1.402 CiteScore 4.23
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.478 SNIP 1.432 CiteScore 4.48
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.185 SNIP 1.179 CiteScore 3.82
ISI indexed (2012): ISI indexed yes
Scopus rating (2011): SJR 2.427 SNIP 1.216 CiteScore 4.5
Scopus rating (2010): SJR 1.633 SNIP 1.014
Scopus rating (2009): SJR 1.241 SNIP 0.87
Original language: English
Ecology, Evolution, Behavior and Systematics, Genetics, Agricultural and Biological Sciences (all), Mytilus edulis, Arctic fauna, Bivalves, Climate change, Glacial refugium, Hybrid zone, Population structure, SNPs
Electronic versions:
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DOIs:
10.1111/eva.12415
Source: Findit
Source-ID: 2341706842
Publication: Research - peer-review › Journal article – Annual report year: 2016

**Genome architecture enables local adaptation of Atlantic cod despite high connectivity**

Adaptation to local conditions is a fundamental process in evolution; however, mechanisms maintaining local adaptation despite high gene flow are still poorly understood. Marine ecosystems provide a wide array of diverse habitats that frequently promote ecological adaptation even in species characterized by strong levels of gene flow. As one example, populations of the marine fish Atlantic cod (Gadus morhua) are highly connected due to immense dispersal capabilities but nevertheless show local adaptation in several key traits. By combining population genomic analyses based on 12K single-nucleotide polymorphisms with larval dispersal patterns inferred using a biophysical ocean model, we show that Atlantic
cod individuals residing in sheltered estuarine habitats of Scandinavian fjords mainly belong to offshore oceanic populations with considerable connectivity between these diverse ecosystems. Nevertheless, we also find evidence for discrete fjord populations that are genetically differentiated from offshore populations, indicative of local adaptation, the degree of which appears to be influenced by connectivity. Analyses of the genomic architecture reveal a significant overrepresentation of a large ~5 Mb chromosomal rearrangement in fjord cod, previously proposed to comprise genes critical for the survival at low salinities. This suggests that despite considerable connectivity with offshore populations, local adaptation to fjord environments may be enabled by suppression of recombination in the rearranged region. Our study provides new insights into the potential of local adaptation in high gene flow species within fine geographical scales and highlights the importance of genome architecture in analyses of ecological adaptation. This article is protected by copyright. All rights reserved.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Oslo, University of Gothenburg, National Research Council of Italy, Swedish Institute for the Marine Environment
Pages: 4452-4466
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Main Research Area: Technical/natural sciences

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Journal: Molecular Ecology
Volume: 26
Issue number: 17
ISSN (Print): 0962-1083
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.9 SJR 3.508 SNIP 1.651
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.862 SNIP 1.606 CiteScore 5.73
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.446 SNIP 1.602 CiteScore 5.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.13 SNIP 1.564 CiteScore 5.6
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.068 SNIP 1.705 CiteScore 5.36
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.469 SNIP 1.823 CiteScore 5.56
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.513 SNIP 1.915
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.455 SNIP 2.024
Web of Science (2009): Indexed yes
Geographic extent of introgression in Sebastes mentella and its effect on genetic population structure

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Institute of Marine Research, Greenland Institute of Natural Resources, University of Washington
Authors: Saha, A. (Ekstern), Johansen, T. (Ekstern), Hedeholm, R. (Ekstern), Eg Nielsen, E. (Intern), Westgaard, J. (Ekstern), Hauser, L. (Ekstern), Planque, B. (Ekstern), Cadrin, S. X. (Ekstern), Boje, J. (Intern)
Pages: 77–90
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Main Research Area: Technical/natural sciences

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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.96 SJR 2.299 SNIP 1.478
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.666 SNIP 1.392 CiteScore 4.27

Original language: English
Gadus morhua, chromosomal inversion, ecological adaptation, gene flow, population divergence
Electronic versions:
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Source: FindIt
Source-ID: 2371603121
Publication: Research - peer-review › Journal article – Annual report year: 2017
Geostatistical modelling of the spatial life history of post-larval deepwater hake Merluccius paradoxus in the Benguela Current Large Marine Ecosystem

Optimal and sustainable management of fish resources cannot be ensured without a thorough understanding of the migration patterns and population (demographic stock) structure. Recent studies suggest that these aspects of the economically and ecologically important deepwater hake Merluccius paradoxus are not reflected in the current assessment and management practices for the Benguela Current Large Marine Ecosystem. In this study, we compiled data from multiple demersal trawl surveys from the entire distribution area and applied state-of-the-art geostatistical population modelling (GeoPop) to estimate growth rate, mortality, and spatial and temporal distribution patterns of M. paradoxus. The data and the model enabled us to follow temporal and spatial changes in the distribution and infer movements from the recruitment/nursery areas, through the juvenile phase and the adults’ migration to the spawning areas outside/upstream of the nursery areas. The results indicated one primary recruitment/nursery area on the west coast of South Africa and a secondary less-productive recruitment/nursery area on the south coast near Port Elizabeth. Juveniles initially migrated away from the main recruitment area, followed by natal homing by larger individuals. This pattern was highly consistent through the time-series of the study. This perception of a, primarily, panmictic population that performs transboundary migrations between Namibia and South Africa corresponds largely to the hypothesis and data plots given in recent studies. We recommend that fisheries assessment, advice and management take into consideration these aspects of the distribution and population (stock) structure of M. paradoxus

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Department of Applied Mathematics and Computer Science , Section for Marine Living Resources, Department for Agriculture, Forestry and Fisheries, Ministry of Fisheries and Marine Resources
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Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: African Journal of Marine Science
Volume: 39
Issue number: 3
ISSN (Print): 1814-232X
Ratings: 
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.36 SJR 0.661 SNIP 0.8
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.696 SNIP 0.732 CiteScore 1.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.568 SNIP 0.879 CiteScore 1.15
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.71 SNIP 0.749 CiteScore 1.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.529 SNIP 0.488 CiteScore 1.04
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.608 SNIP 0.611 CiteScore 1.15
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.857 SNIP 0.611
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.091 SNIP 0.836
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.921 SNIP 0.62
Scopus rating (2007): SJR 0.578 SNIP 0.611
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.643 SNIP 0.746
Scopus rating (2005): SJR 0.778 SNIP 0.838
Scopus rating (2004): SJR 0.355 SNIP 0.358
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.903 SNIP 1.129
Scopus rating (2002): SJR 0.83 SNIP 1.212
Scopus rating (2001): SJR 1.02 SNIP 1.113
Scopus rating (2000): SJR 0.789 SNIP 0.855
Scopus rating (1999): SJR 0.561 SNIP 0.604
Original language: English
DOIs: 10.2989/1814232X.2017.1379437
Source: FindIt
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Publication: Research - peer-review › Journal article – Annual report year: 2017

GIS- og model-værktøj til forudsigelse af ålegræs retablering sites

General information
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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Styrelsen for Vand & Naturforvaltning (SVANA), DHI Denmark, Syddansk Universitet
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017
glmmTMB balances speed and flexibility among packages for Zero-inflated Generalized Linear Mixed Modeling

Count data can be analyzed using generalized linear mixed models when observations are correlated in ways that require random effects. However, count data are often zero-inflated, containing more zeros than would be expected from the typical error distributions. We present a new package, glmmTMB, and compare it to other R packages that fit zero-inflated mixed models. The glmmTMB package fits many types of GLMMs and extensions, including models with continuously distributed responses, but here we focus on count responses. glmmTMB is faster than glmmADMB, MCMCglmm, and brms, and more flexible than INLA and mgcv for zero-inflated modeling. One unique feature of glmmTMB (among packages that fit zero-inflated mixed models) is its ability to estimate the Conway-Maxwell-Poisson distribution parameterized by the mean. Overall, its most appealing features for new users may be the combination of speed, flexibility, and its interface's similarity to lme4.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, University of Zurich, International Council for the Exploration of the Sea, University of Bergen, Swiss Federal Institute of Technology, McMaster University
Authors: Brooks, M. E. (Intern), Kristensen, K. (Intern), van Benthem, K. J. (Ekstern), Magnusson, A. (Ekstern), Berg, C. W. (Intern), Nielsen, A. (Intern), Skaug, H. J. (Ekstern), Machler, M. (Ekstern), Bolker, B. M. (Ekstern)
Pages: 378-400
Publication date: 2017
Main Research Area: Technical/natural sciences

Global change in the trophic functioning of marine food webs

The development of fisheries in the oceans, and other human drivers such as climate warming, have led to changes in species abundance, assemblages, trophic interactions, and ultimately in the functioning of marine food webs. Here, using a trophodynamic approach and global databases of catches and life history traits of marine species, we tested the hypothesis that anthropogenic ecological impacts may have led to changes in the global parameters defining the transfers of biomass within the food web. First, we developed two indicators to assess such changes: the Time Cumulated Indicator (TCI) measuring the residence time of biomass within the food web, and the Efficiency Cumulated Indicator (ECI) quantifying the fraction of secondary production reaching the top of the trophic chain. Then, we assessed, at the large marine ecosystem scale, the worldwide change of these two indicators over the 1950-2010 time-periods. Global trends were identified and cluster analyses were used to characterize the variability of trends between ecosystems. Results showed that the most common pattern over the study period is a global decrease in TCI, while the ECI indicator tends to increase. Thus, changes in species assemblages would induce faster and apparently more efficient biomass transfers in marine food webs. Results also suggested that the main driver of change over that period had been the large increase in fishing pressure. The largest changes occurred in ecosystems where ‘fishing down the marine food web’ are most intensive.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Université Bretagne Loire, University of British Columbia
Publication date: 2017
Main Research Area: Technical/natural sciences

Global change in the trophic functioning of marine food webs

The development of fisheries in the oceans, and other human drivers such as climate warming, have led to changes in species abundance, assemblages, trophic interactions, and ultimately in the functioning of marine food webs. Here, using a trophodynamic approach and global databases of catches and life history traits of marine species, we tested the hypothesis that anthropogenic ecological impacts may have led to changes in the global parameters defining the transfers of biomass within the food web. First, we developed two indicators to assess such changes: the Time Cumulated Indicator (TCI) measuring the residence time of biomass within the food web, and the Efficiency Cumulated Indicator (ECI) quantifying the fraction of secondary production reaching the top of the trophic chain. Then, we assessed, at the large marine ecosystem scale, the worldwide change of these two indicators over the 1950-2010 time-periods. Global trends were identified and cluster analyses were used to characterize the variability of trends between ecosystems. Results showed that the most common pattern over the study period is a global decrease in TCI, while the ECI indicator tends to increase. Thus, changes in species assemblages would induce faster and apparently more efficient biomass transfers in marine food webs. Results also suggested that the main driver of change over that period had been the large increase in fishing pressure. The largest changes occurred in ecosystems where ‘fishing down the marine food web’ are most intensive.

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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Université Bretagne Loire, University of British Columbia
Publication date: 2017
Main Research Area: Technical/natural sciences
Global distribution of dissolved organic matter along the aquatic continuum: Across rivers, lakes and oceans

Based on an extensive literature survey containing more than 12,000 paired measurements of dissolved organic carbon (DOC) concentrations and absorption of chromophoric dissolved organic matter (CDOM) distributed over four continents and seven oceans, we described the global distribution and transformation of dissolved organic matter (DOM) along the aquatic continuum across rivers and lakes to oceans. A strong log-linear relationship ($R^2 = 0.92$) between DOC concentration and CDOM absorption at 350Å nm was observed at a global scale, but was found to be ecosystem-dependent at local and regional scales. Our results reveal that as DOM is transported towards the oceans, the robustness of the observed relation decreases rapidly ($R^2$ from 0.94 to 0.44) indicating a gradual decoupling between DOC and CDOM. This likely reflects the decreased connectivity between the landscape and DOM along the aquatic continuum. To
support this hypothesis, we used the DOC-specific UV absorbance (SUVA) to characterize the reactivity of the DOM pool which decreased from 4.9 to 1.7 m² Å⁻¹ gC⁻¹ along the aquatic continuum. Across the continuum, a piecewise linear regression showed that the observed decrease of SUVA occurred more rapidly in freshwater ecosystems compared to marine water ecosystems, suggesting that the different degradation processes act preferentially on CDOM rather than carbon content. The observed change in the DOM characteristics along the aquatic continuum also suggests that the terrestrial DOM pool is gradually becoming less reactive, which has profound consequences on cycling of organic carbon in aquatic ecosystems.

**General information**

State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Section for Oceans and Arctic, Aarhus University
Authors: Massicotte, P. (Ekstern), Asmala, E. (Ekstern), Stedmon, C. (Intern), Markager, S. (Ekstern)
Pages: 180-191
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Main Research Area: Technical/natural sciences

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Volume: 609
ISSN (Print): 0048-9697
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- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 5.09 SJR 1.621 SNIP 1.849
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 1.674 SNIP 1.642 CiteScore 4.33
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 1.635 SNIP 1.847 CiteScore 4.2
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 1.527 SNIP 1.759 CiteScore 3.73
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 1.773 SNIP 1.811 CiteScore 3.7
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 1.798 SNIP 1.681 CiteScore 3.61
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
- Scopus rating (2010): SJR 1.644 SNIP 1.513
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 1.571 SNIP 1.602
- BFI (2008): BFI-level 2
- Scopus rating (2008): SJR 1.463 SNIP 1.501
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.407 SNIP 1.491
- Web of Science (2007): Indexed yes
Global occurrence and heterogeneity of the *Roseobacter*-clade species *Ruegeria mobilis*

Tropodithietic acid (TDA)-producing *Ruegeria mobilis* strains of the *Roseobacter* clade have primarily been isolated from marine aquaculture and have probiotic potential due to inhibition of fish pathogens. We hypothesized that TDA producers with additional novel features are present in the oceanic environment. We isolated 42 TDA-producing *R. mobilis* strains during a global marine research cruise. While highly similar on the 16S ribosomal RNA gene level (99–100% identity), the strains separated into four sub-clusters in a multilocus sequence analysis. They were further differentiated to the strain level by average nucleotide identity using pairwise genome comparison. The four sub-clusters could not be associated with a specific environmental niche, however, correlated with the pattern of sub-typing using co-isolated phages, the number of prophages in the genomes and the distribution in ocean provinces. Major genomic differences within the sub-clusters include prophages and toxin-antitoxin systems. In general, the genome of *R. mobilis* revealed adaptation to a particle-associated life style and querying TARA ocean data confirmed that *R. mobilis* is more abundant in the particle-associated fraction than in the free-living fraction occurring in 40% and 6% of the samples, respectively. Our data and the TARA data, although lacking sufficient data from the polar regions, demonstrate that *R. mobilis* is a globally distributed marine bacterial species found primarily in the upper open oceans. It has preserved key phenotypic behaviors such as the production of TDA, but contains diverse sub-clusters, which could provide new capabilities for utilization in aquaculture. The ISME Journal advance online publication, 23 August 2016; doi:10.1038/ismej.2016.111.

General information

State: Published

Organisations: Department of Systems Biology, Bacterial Ecophysiology and Biotechnology, Metabolomics Platform, National Institute of Aquatic Resources, Hellenic Centre for Marine Research, Universidad Miguel Hernandez, Helmholtz Centre for Infection Research (HZI), University of Copenhagen


Number of pages: 15
Pages: 569–583
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: The ISME Journal
Global patterns in marine predatory fish

Large teleost (bony) fish are a dominant group of predators in the oceans and constitute a major source of food and livelihood for humans. These species differ markedly in morphology and feeding habits across oceanic regions; large pelagic species such as tunas and billfish typically occur in the tropics, whereas demersal species of gadoids and flatfish dominate boreal and temperate regions. Despite their importance for fisheries and the structuring of marine ecosystems, the underlying factors determining the global distribution and productivity of these two groups of teleost predators are poorly known. Here, we show how latitudinal differences in predatory fish can essentially be explained by the inflow of energy at the base of the pelagic and benthic food chain. A low productive benthic energy pathway favours large pelagic species, whereas equal productivities support large demersal generalists that outcompete the pelagic specialists. Our
findings demonstrate the vulnerability of large teleost predators to ecosystem-wide changes in energy flows and hence provide key insight to predict the responses of these important marine resources under global change.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Oceans and Arctic, University of Tasmania
Authors: van Denderen, P. D. (Intern), Lindegren, M. (Intern), MacKenzie, B. (Intern), Watson, R. (Ekstern), Andersen, K. H. (Intern)
Pages: 65-70
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Nature Ecology & Evolution
Volume: 2
Issue number: 1
ISSN (Print): 2397-334X
Original language: English
DOI: 10.1038/s41559-017-0388-z. Embargo ends: 27/11/2018
Publication: Research - peer-review › Journal article – Annual report year: 2017

**Global patterns in the productivity of marine fish along parallel pathways of energy**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Oceans and Arctic
Authors: van Denderen, P. D. (Intern), Lindegren, M. (Intern), MacKenzie, B. (Intern), Watson, R. (Ekstern), Andersen, K. H. (Intern)
Publication date: 2017
Event: Abstract from Early career scientist conference: Climate, Oceans and Society, Busan, Korea, Democratic People’s Republic of.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

**Har du prøvet Fangstjournalen endnu?**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2017

**Publication information**
Source/Publisher: Fishing Zealand
Main Research Area: Technical/natural sciences
Links:
http://fishingzealand.dk/nyheder/har-du-provet-fangstjournalen-endnu/
Publication: Communication › Internet publication – Annual report year: 2017

**Hav-/fjordhaver i Danmark – Rekreative, ikke-kommercielle foreningsbaserede akvakulturaktiviteter til produktion af skaldyr og tang**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, NIRAS A/S, Limfjordsrådet
Authors: Andersen, P. (Ekstern), Jørgensen, T. B. (Ekstern), Nielsen, C. F. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017
Heterotrophic nanoflagellate grazing facilitates subarctic Atlantic bloom development

The subarctic Atlantic phytoplankton spring bloom is one of the largest biological features of the ocean; however, processes initiating the bloom are still not well understood. We hypothesize that the microbial grazing food chain plays an important role in creating a pre-bloom condition with top-down control of small-sized phytoplankton, thus paving the way for a diatom-dominated spring bloom. To assess the trophic role of protist grazers during the winter to spring transition, 3 experiments were performed using size-fractionated surface water from the Iceland Basin (March–April 2012). These experiments demonstrated heterotrophic nanoflagellates (HNF) grazing of picophytoplankton to be a key pathway, even though these are rarely considered as important phytoplankton grazers in high-latitude systems. The growth rate of HNF was significantly correlated to the biomass of picophytoplankton and was substantially higher than the growth of the larger microzooplankton (MZP), i.e. ciliates and dinoflagellates. During the first experiment, small phytoplankton dominated and overall protist grazing (HNF + MZP) was low. In the later experiments, MZP grazing on HNF became evident; however, MZP were not able to control the community of larger phytoplankton (>10 μm), which became more abundant. Our experiments thus support the hypothesis that pre-bloom conditions promote a build-up of large phytoplankton, i.e. diatoms. We found that the high growth rates of HNF together with the relaxed MZP grazing pressure allow HNF to respond rapidly to the early primary production by picophytoplankton and maintain a strong top-down control on these. We suggest that this succession may be an important mechanism that allows large diatoms, rather than picophytoplankton, to become the dominant primary producers during the subarctic Atlantic spring bloom.
How do individuals cope with stress? Behavioural, physiological and neuronal differences between proactive and reactive coping styles in fish

Despite the use of fish models to study human mental disorders and dysfunctions, knowledge of regional telencephalic responses in non-mammalian vertebrates expressing alternate stress coping styles is poor. Since perception of salient stimuli associated with stress coping in mammals is mainly under forebrain limbic control, we tested region-specific forebrain neural (i.e. mRNA abundance and monoamine neurochemistry) and endocrine responses at basal and acute stress conditions for previously characterised proactive and reactive Atlantic salmon. Reactive fish show a higher degree of the neurogenesis marker proliferating cell nuclear antigen (pcna) and dopamine activity under basal conditions in DI (proposed hippocampus homologue) and higher post-stress plasma cortisol levels. Proactive fish displayed post-stress higher serotonergic signalling (i.e. higher serotonergic activity and expression of the 5-HT1A receptor abundance) in the
proposed amygdala homologue (Dm), increased expression of the neuroplasticity marker brain derived neurotropic factor (bdnf) in both Dl and Vv (lateral septum homologue), as well as increased expression of the corticotropin releasing factor 1 (cf1) receptor in the Dl, in line with active coping neuro-profiles reported in the mammalian literature. We present novel evidence of proposed functional equivalences in the fish forebrain with mammalian limbic structures.
How old are you—Evaluation of age reading methods for the invasive round goby (Neogobius melanostomus, Pallas 1814)

In the Baltic, the first observation of the round goby (Neogobius melanostomus, Pallas 1814) was made in 1990. Within the past decade the species became invasive and spread rapidly throughout the Baltic Sea. Studies about the fishes potential impacts on resident species promote the need for an increasing knowledge of their basic stock structures such as growth rates, longevity and mortality, which all rely on accurate estimates of age. Former studies on the round goby have used several different age reading techniques. In this study, we compared three standard otolith preparation methods for ageing and present the best procedure for the invasive round goby. The results showed significant differences in age estimates of the same fish between the different preparation methods and between readers. The estimation of the first annulus, the first year, was the most problematic. The overall agreement was lowest when reading the whole otoliths while the best performance was achieved with sectioned and stained preparation method. Depending on method used the growth estimates also differed. The results question comparability between previous studies and highlight the importance of harmonised aging procedures for the round goby for obtaining correct estimates of population parameters such as growth rate, age at maturity, and longevity

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Swedish University of Agricultural Sciences, Thünen Institute of Baltic Sea Fisheries, Institute of Food Safety Animal Health and Environment BIOR, Swedish University of Agricultural Sciences, University of Gdansk, Finnish Environment Institute
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Applied Ichthyology
ISSN (Print): 0175-8659
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
How to increase mussel longline production in Denmark?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Saurel, C. (Intern), Andersen, L. K. (Intern), Barreau, P. D. A. (Intern), Boesen, H. (Intern), Petersen, J. K. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforsormede, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Hvordan har fiskebestandene det i nogle af Danmarks største vandsystemer?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern), Nielsen, J. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Hvordan påvirker bundtrawlfiskeriet Kattegats bundfauna? En analyse af ændringer i densitet og artsrigdom og en diskussion af potentielle indikatorer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data
Authors: Gislason, H. (Intern), Dinesen, G. E. (Intern), Bastardie, F. (Intern), Egekvist, J. (Intern), Eigaard, O. R. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 128598616
Publication: Research › Conference abstract for conference – Annual report year: 2017

Hvordan undervandsdroner og robotter kan hjælpe med at monitere det arktiske marine miljø

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Edelvang, K. (Intern)
Pages: 254-264
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Tidsskriftet Grønland
Issue number: 3
ISSN (Print): 0017-4556
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Original language: Danish
Publication: Research › Journal article – Annual report year: 2017

Hvorfor samarbejde med biologerne?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Danish Fishermen's Producers' Organization
Authors: Storr-Paulsen, M. (Intern), Andersen, M. (Ekstern)
Pages: 17
Publication date: 2017
Publication information
Pages (from-to): 17
**Hvor har fisken været?**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Kristensen, M. L. (Intern)
Publication date: 2017

**Publication information**
Source/Publisher: oerreder.dk
Main Research Area: Technical/natural sciences
Links:
http://oerreder.dk/?p=173
Publication: Communication › Internet publication – Annual report year: 2017

**Hvornår er der faglige grunde til rehabilitering af sæler?**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University
Authors: Alstrup, A. K. O. (Ekstern), Svendsen, J. C. (Intern), Jensen, L. F. (Ekstern)
Pages: 10-12
Publication date: 2017

**Publication information**
Journal: Dyrlægen
Issue number: 3
ISSN (Print): 1903-153X
Original language: Danish
Source: FindIt
Source-ID: 2356062619
Publication: Research › Journal article – Annual report year: 2017

**Hvor vandrer ørrederne hen, når de er i havet?**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
Publication date: 2017

**Publication information**
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/08/her-er-oerrederne-i-havet?id=dd2b0b13-7ed8-44f3-85b2-e9c321239591&utm_source=newsletter&utm_media=email&utm_campaign=2017_08_24_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2017
Hydrodynamic properties and distribution of bait downstream of a zooplankton trap

The flow regime around a chemically baited trap is crucial for the trapping process and distribution of bait downstream of traps. We measured the flow field downstream of a trap prototype in flume experiments and mapped the distribution of bait using laser induced fluorescence. The trap produced a downstream wake, where flow recirculated towards the trap, allowing organisms slower than the free stream flow to interact with the trap. The chemical tracer revealed an average gradient with increasing concentrations towards the trap. Finally, we evaluated trap performance in field experiments. Traps with internal light caught on average 3.4 times more zooplankton than traps without light in short-term deployments (1 h). Trapping efficiency could be manipulated by chemical stimuli; A piece of fish (Salmo salar) inside traps deterred 79% of the zooplankton compared to traps without fish. We conclude that the flow regime around a cylindrical trap may facilitate trapping and that combined stimuli modalities may allow higher selectivity. The effective radius of the trap will depend on the surrounding flow and will likely be small when flow-rate exceeds swimming speed of targeted organisms. Finally, we propose applications for selective traps in aquaculture and pest management.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Gothenburg, University of Oslo
Authors: Selander, E. (Ekstern), Heuschele, J. (Intern), Larsson, A. I. (Ekstern)
Pages: 1020-1027
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Plankton Research
Volume: 39
Issue number: 6
ISSN (Print): 0142-7873
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.186 SNIP 0.98
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.922 SNIP 1.046
Web of Science (2009): Indexed yes
Hydrodynamics of microbial filter feeding

Microbial filter feeders are an important group of grazers, significant to the microbial loop, aquatic food webs, and biogeochemical cycling. Our understanding of microbial filter feeding is poor, and, importantly, it is unknown what force microbial filter feeders must generate to process adequate amounts of water. Also, the trade-off in the filter spacing remains unexplored, despite its simple formulation: A filter too coarse will allow suitably sized prey to pass unintercepted, whereas a filter too fine will cause strong flow resistance. We quantify the feeding flow of the filter-feeding choanoflagellate Diaphanoeca grandis using particle tracking, and demonstrate that the current understanding of microbial filter feeding is inconsistent with computational fluid dynamics (CFD) and analytical estimates. Both approaches underestimate observed filtration rates by more than an order of magnitude; the beating flagellum is simply unable to draw enough water through the fine filter. We find similar discrepancies for other choanoflagellate species, highlighting an apparent paradox. Our observations motivate us to suggest a radically different filtration mechanism that requires a flagellar vane (sheet), something notoriously difficult to visualize but sporadically observed in the related choanocytes (sponges). A CFD model with a flagellar vane correctly predicts the filtration rate of D. grandis, and using a simple model we can account for the filtration rates of other microbial filter feeders. We finally predict how optimum filter mesh size increases with cell size in microbial filter feeders, a prediction that accords very well with observations. We expect our results to be of significance for small-scale biophysics and trait-based ecological modeling.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering, Department of Physics, Biophysics and Fluids
Pages: 9373-9378
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Proceedings of the National Academy of Sciences of the United States of America
Volume: 114
Issue number: 35
ISSN (Print): 0027-8424
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 8.56 SJR 6.321 SNIP 2.629
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 6.767 SNIP 2.682 CiteScore 8.84
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 6.853 SNIP 2.725 CiteScore 8.86
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 6.989 SNIP 2.73 CiteScore 9.5
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 6.792 SNIP 2.682 CiteScore 9.49
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 6.771 SNIP 2.636 CiteScore 9.31
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 6.769 SNIP 2.529
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 6.913 SNIP 2.544
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 6.899 SNIP 2.445
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 6.766 SNIP 2.441
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 6.734 SNIP 2.434
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 6.784 SNIP 2.551
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 7.026 SNIP 2.622
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 7.018 SNIP 2.501
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 7.183 SNIP 2.471
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 7.192 SNIP 2.463
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 7.731 SNIP 2.475
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 8.271 SNIP 2.446

Original language: English
choanoflagellates, computational fluid dynamics, filter feeding, microswimmers, protozoans
Electronic versions:
Identification of ICM elements in Danish cormorant management

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Copenhagen, Københavns Universitet
Authors: Andersen, S. F. (Intern), Dinesen, G. E. (Intern), Worsaae, K. (Forskerdatabase), Støttrup, J. G. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences

Identifying candidate reflexes for lemon sole (Microstomus kitt)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Wageningen IMARES
Authors: Karlsen, J. D. (Intern), Noack, T. (Intern), Uhlmann, S. (Ekstern), Krag, L. A. (Intern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Identifying the optimal depth for mussel suspended culture in shallow and turbid environments

Bivalve aquaculture is commonly carried out in shallow water systems, which are susceptible to resuspension of benthic particulate matter by natural processes such as tidal currents, winds and wave action, as well as human activity. The resuspended material can alter the availability of food particles for cultured bivalves. The effect of resuspended material on bivalve bioenergetics and growth is a function of the quality and concentration of resuspended particles and background diet in the water column. Given the potential for positive or negative impacts on bivalve growth and consequently on farm productivity, farmers must position the cultured biomass at the appropriate depth to benefit from or mitigate the impact of this resuspended material. A combination of field measurements, a 1-D vertical resuspension model and a bioenergetic model for mussels based on Dynamic Energy Budget (DEB) theory has been carried out for a mussel farm in Skive Fjord, a shallow Danish fjord, with the aim of identifying the optimal depth for culture. Observations at the farm location revealed that horizontal advection is more important than vertical resuspension during periods with predominant Eastern winds. In addition, high background seston in the water column reduces the impact of resuspension on the available food for mussels. The simulation of different scenarios in terms of food availability suggested minimal effects of resuspension on mussel growth. Based on this finding and the fact that phytoplankton concentration, the main food source for mussels, is usually higher in the upper part of the water column, suspended culture in the top ~3m of the water column seems to be the optimal practice to produce mussels in Skive Fjord.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Dalhousie University
Authors: Filgueira, R. (Ekstern), Grant, J. (Ekstern), Petersen, J. K. (Intern)
Pages: 15-23
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Sea Research
Volume: 132
ISSN (Print): 1385-1101
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.98 SJR 0.932 SNIP 0.931
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.008 SNIP 1.007 CiteScore 2.09
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.977 SNIP 1.024 CiteScore 2.15
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.928 SNIP 1.098 CiteScore 2
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.115 SNIP 1.06 CiteScore 2.18
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.371 SNIP 1.28 CiteScore 2.5
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.267 SNIP 1.242
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.261 SNIP 1.071
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.289 SNIP 1.156
Scopus rating (2007): SJR 1.402 SNIP 1.179
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.325 SNIP 1.165
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.987 SNIP 0.923
Scopus rating (2004): SJR 0.932 SNIP 0.957
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.366 SNIP 1.146
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.059 SNIP 0.926
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.131 SNIP 0.954
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.127 SNIP 1.021
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.182 SNIP 1.014
If and when: Intrinsic differences and environmental stressors influence migration in brown trout (Salmo trutta)

Partial migration is a common phenomenon, yet the causes of individual differences in migratory propensity are not well understood. We examined factors that potentially influence timing of migration and migratory propensity in a wild population of juvenile brown trout (Salmo trutta) by combining experimental manipulations with passive integrated transponder telemetry. Individuals were subjected to one of six manipulations: three designed to mimic natural stressors (temperature increase, food deprivation, and chase by a simulated predator), an injection of exogenous cortisol designed to mimic an extreme physiological challenge, a sham injection, and a control group. By measuring length and mass of 923 individuals prior to manipulation and by monitoring tagged individuals as they left the stream months later, we assessed whether pre-existing differences influenced migratory tendency and timing of migration, and whether our manipulations affected growth, condition, and timing of migration. We found that pre-existing differences predicted migration, with smaller individuals and individuals in poor condition having a higher propensity to migrate. Exogenous cortisol manipulation had the largest negative effect on growth and condition, and resulted in an earlier migration date. Additionally, low-growth individuals within the temperature and food deprivation treatments migrated earlier. By demonstrating that both pre-existing differences in organism state and additional stressors can affect whether and when individuals migrate, we highlight the importance of understanding individual differences in partial migration. These effects may carry over to influence migration success and affect the evolutionary dynamics of sub-populations experiencing different levels of stress, which is particularly relevant in a changing world.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University
Authors: Peiman, K. S. (Ekstern), Birnie-Gauvin, K. (Intern), Midwood, J. D. (Ekstern), Larsen, M. H. (Intern), Wilson, A. D. M. (Ekstern), Aarestrup, K. (Intern), Cooke, S. J. (Ekstern)
Pages: 375-384
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Oecologia
Volume: 184
Issue number: 2
ISSN (Print): 0029-8549
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): SJR 1.72 SNIP 1.262 CiteScore 3.23
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.974 SNIP 1.287 CiteScore 3.16
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.809 SNIP 1.418 CiteScore 3.24
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.867 SNIP 1.427 CiteScore 3.41
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.964 SNIP 1.42 CiteScore 3.28
ISI indexed (2012): ISI indexed yes
If you can't beat them, eat them: using acoustic telemetry to develop an economically viable fishery for the highly invasive round goby (Neogobius melanostomus)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Freshwater Fisheries Ecology
Authors: Christoffersen, M. (Intern), Svendsen, J. C. (Intern), Behrens, J. (Intern), Jepsen, N. (Intern), van Deurs, M. (Intern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Impacts of climate change on pelagic fisheries

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Living Resources
Authors: Muhling, B. (Ekstern), Lindegreen, M. (Intern), Worsøe Clausen, L. (Intern), Hobday, A. (Ekstern)
Number of pages: 1,048
Pages: 771-815
Publication date: 2017

Host publication information
Title of host publication: Climate Change Impacts on Fisheries and Aquaculture: A Global Analysis
Volume: 2
Publisher: Wiley-Blackwell
Editors: Phillips, B. F., Pérez-Ramírez, M.
Improving escape panel selectivity in Nephrops directed fisheries by actively stimulating fish behaviour

The efficiency of escape panels inserted in trawls relies on fish actively attempting to escape through them. However, several studies indicate that most fish drift towards the aft end of the trawl, passing the escape panel through which they easily could have escaped, without making contact with it. To increase the efficiency of such panels, the contact probability needs to be improved. In this study, we investigate to what extent the efficiency of escape panels can be improved by actively stimulating the escape behaviour of fish. The performance of two identical panel sections was compared in a twin-trawl system, one with and one without a stimulation device. A new coupled analysis method was used to explicitly quantify the improvements in contact probability and release efficiency for the escape panel. The results demonstrate that by actively stimulating escape behaviour, the contact probability and release efficiency for cod (Gadus morhua) can be significantly improved without effecting the catch of Nephrops (Nephrops norvegicus)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF, Danish Fishermen's Producers' Organization
Authors: Krag, L. A. (Intern), Herrmann, B. (Ekstern), Feeings, J. P. (Intern), Lund, H. S. (Ekstern), Karlsen, J. D. (Intern)
Pages: 486-493
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 74
Issue number: 4
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Improving estimates of population status and trend with superensemble models

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Simon Fraser University, Rutgers University, Galway - Mayo Institute of Technology, NOAA, University of California, Santa Barbara, International Council for the Exploration of the Sea, Marine Stewardship Council, European Commission Joint Research Centre Institute, Center for Science and Democracy, Union of Concerned Scientists, Conservation International
Pages: 732-741
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Fish and Fisheries
Volume: 18
Issue number: 4
ISSN (Print): 1467-2960
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Improving fisheries science with high resolution commercial fishery data

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Schreiber Plet-Hansen, K. (Intern), Mortensen, L. O. (Intern), Nielsen, J. R. (Intern), Larsen, E. (Intern), Ulrich, C. (Intern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Bibliographical note
ICES CM 2017/F:407
Publication: Research › Conference abstract for conference – Annual report year: 2017
Inclusion of ecological, economic, social, and institutional considerations when setting targets and limits for multispecies fisheries: Introduction to the Symposium: ‘Targets and Limits for Long Term Fisheries Management’ Quo Vadimus

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, NOAA, Saint Mary's University, Aalborg University, AZTI Technalia, IMARES, Thünen Institute of Baltic Sea Fisheries, Ministry for Primary Industries, Hellenic Centre for Marine Research, Galway - Mayo Institute of Technology, Imperial College London, University of Washington, Marine Institute, University of St Andrews, IFREMER, University of Kiel
Pages: 453-463
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 2
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Increased tolerance to oil exposure by the cosmopolitan marine copepod *Acartia tonsa*

Oil contamination is an environmental hazard to marine ecosystems, but marine organism tolerance to oil after many generations of exposure remains poorly known. We studied the effects of transgenerational oil exposure on fitness-related traits in a cosmopolitan neritic copepod, *Acartia tonsa*. Copepods were exposed to an oil compound, the PAH pyrene, at concentrations of 1, 10, 100 and 100+ (the saturated pyrene concentration in seawater) nM over two generations and measured survival, sex ratio, size at maturity, grazing rate and reproductive success. Exposure to the pyrene concentration of 100+ nM resulted in 100% mortality before adulthood in the first generation. At the pyrene concentration of 100 nM, pyrene reduced grazing rate, increased mortality, reduced the size of females and caused lower egg production and hatching success. Importantly, we found strong evidence for increased tolerance to pyrene exposure in the second generation: the reduction in size at maturity of females was less pronounced in the second generation and survival, egg production and hatching success were recovered to control levels in the second generation. The increased tolerance of copepods to oil contamination may dampen the direct ecological consequences of a coastal oil spill, but it raises the concern whether a larger fraction of oil components accumulated in survived copepods, may be transferred up the food web.
Industry-led fishing gear selectivity improvements: Ideas and lessons learned

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aalborg University
Authors: Feekings, J. P. (Intern), Krag, L. A. (Intern), Malta, T. A. M. D. V. (Intern), Lund, H. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Bibliographical note
ICESCM 2017/SSGIEOM:13
Publication: Research › Conference abstract for conference – Annual report year: 2018
Influence of fixed and moving bed biofilters on micro particle dynamics in a recirculating aquaculture system

Accumulation of fine particulate organic matter in recirculating aquaculture systems (RAS) is a balance between system input (from feed to waste), internal transformation, removal and dilution. The mechanisms leading to fine particle accumulation in RAS are not fully understood, and neither is the potential influence of biofilters in this aspect. This study describes the effect of fixed bed biofilters (FBB) and moving bed biofilters (MBB) on particles size distribution and organic matter. It was conducted in an 8.5 m³ RAS with four equal biofilters – two FBB and two MBB. The RAS was stocked with rainbow trout (Oncorhynchus mykiss), and operated under constant feed loading conditions (1 kg feed/m³ of make-up water) for more than three months.

Production or removal of micro particles according to biofilter mode of operation (FBB vs. MBB) was assessed by operating all biofilters simultaneously as well as separately. In periods where FBB and MBB effects were assessed separately, particle concentration was reduced by approximately 195 particles/mL (from 1117 to 922 particles/mL) per passage through FBB, and increased by 252 particles (from 2409 to 2667 particles/mL) per passage through MBB. In FBB, a 10% reduction in particle concentration also represented a 10% reduction in total particle surface area and particle volume. In MBB, a 10% increase in particle concentration also represented a 10% increase in total particles surface area, but had no effect on total particle volume. A volumetric reduction of particles >100 μm, and an equivalent volumetric increase of particles <40 μm, showed that MBB produced fine particles by disintegration of larger particles. A constant removal of particulate volume through all size classes by FBB demonstrates their function as secondary particle removal units.

Net removal of organic matter (ConcentrationIN− ConcentrationOUT), as biochemical oxygen demand after 5 days (BOD₅), occurred at the same rates in both modes of operation. While FBB removed a higher amount of filtered BOD₅ (material filtered through a 1.6 m filter) than MBB, MBB removed more particulate BOD₅ (Particulate = Raw – Filtered) than FBB, presumably due to disintegration of particles in MBB. In the RAS, ammonia and nitrite were observed at concentrations below 0.20 mg N/L throughout the majority of the experiment. However, during the phase where only MBB were in operation, TAN (Total Ammonia Nitrogen) and nitrite levels increased significantly. Nitrate levels ranged between 40 and 44 mg N/L, reflecting stable operating conditions and constant feed loading. The trends observed when FBB or MBB were operated separately were also observed when all filters were operated simultaneously. Differences in biofilm formation, development and maintenance, coupled to reactor flow characteristics are discussed in relation to the fate of micro particles and organic matter when operating fixed or moving bed biofilters in RAS.
Ingestion, growth and gross growth efficiencies of copepod nauplii with different feeding behavior

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Torres, R. R. (Intern), Almeda, R. (Intern), van Someren Gréve, H. (Intern), Kiørboe, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2017

Insight into understanding water mass circulation and origins in the central Arctic Ocean using dissolved organic matter as a tracer

Insight into understanding water mass circulation and origins in the central Arctic Ocean using dissolved organic matter as a tracer
Interactive effects of prey refuge and additional food for predator in a diffusive predator-prey system

Additional food for predators has been considered as one of the best established techniques in integrated pest management and biological conservation programs. In natural systems, there are several other factors, e.g., prey refuge, affect the success of pest control. In this paper, we analyze a predator-prey system with prey refuge and additional food for predator apart from the focal prey in the presence of diffusion. Our main aim is to study the interactive effects of prey refuge and additional food on the system dynamics and especially on the controllability of prey (pest). Different types of Turing patterns such as stripes, spots, holes, and mixtures of them are obtained. It is found that the supply of additional food to the predator is unable to control the prey (pest) population when prey refuge is high. Moreover, when both prey refuge and additional food are low, spatial distribution of prey becomes complex and once again prey control becomes difficult. However, the joint effect of reduction in prey refuge and the presence of appropriate amount of additional food can control prey (pest) population from the system.
International perceptions of an integrated, multi-sectoral, ecosystem approach to management: Editor's Choice

The Ecosystem Approach to Management (EAM) has emerged over the past decades, largely to promote biodiversity conservation, and more recently sectoral tradeoffs in the management of marine ecosystems. To ascertain the state of practice of EAM operationalization, a workshop was held, which included a pre-workshop online survey. The survey gauged international participants' perspectives regarding capacity, knowledge, and application of EAM. When asked about the subject, most survey respondents had a general understanding of EAM, and provided a clear definition. Major perceived challenges to EAM objectives by those surveyed included limited knowledge, conflicting interests, insufficient communication, and limited organizational legal frameworks or governance structures. Of those directly involved in an ecosystem approach, the majority responded that processes were in place or developed for application of integrated knowledge toward assessing key issues within their respective sectors (i.e. fisheries, conservation, energy), and that capacity was generally high. Our results show that most respondents, irrespective of sector or geography, see value in considering an integrated, broader ecosystem approach as they manage their sector. Although many participants were from the North Atlantic region, our results suggest that much of the international community is converging toward continued understanding of broad-scale, integrated approaches to marine resource management.

General information
State: Published
Pages: 414-420
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 1
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Invasive skaldyr i Limfjorden

General information

State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, University of Bergen, University of Copenhagen
Authors: Petersen, J. K. (Intern), Glenner, H. (Ekstern), Nielsen, P. (Intern), Lützen, J. (Ekstern)
Pages: 36-40
Is a single dimension enough to explain fishers' decision-making?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Queen's University Belfast
Authors: Höffe, H. (Ekstern), Pedreschi, D. (Ekstern), Farnsworth, K. (Ekstern), Bastardie, F. (Intern), Kraak, S. (Ekstern), Reid, D. (Ekstern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Bibliographical note
ICES CM 2017/M:487
Publication: Research › Conference abstract for conference – Annual report year: 2017

Is the osmoregulatory compromise limiting invasive species?
The round goby (Neogobius melanostomus) is a benthic fish native to the brackish waters of the Black and Caspian Seas; however, it has invaded several brackish and freshwater areas in North America and northern Europe. Notably, there are no records of N. melanostomus in high salinity marine habitats and the physiological mechanisms potentially constraining the invasion into this environment are largely unknown. The gills play major roles in gas exchange and ionic regulation and it has been hypothesized that an osmoregulatory compromise impacts performance of each process. The tradeoff of the large gill exchange capacity ideal for gas exchange is greater passive ion fluxes. High ionic waters would result in greater passive ion uptake that would require greater active ion excretion. This osmoregulatory disturbance may interfere with fish invasion by disrupting the regular activity of the gills, thus modifying the usual physiological mechanisms. To examine if the osmoregulatory compromise could constrain the invasion of N. melanostomus into high salinity environments, this study compared Na+/K+ ATPase activity of metabolic phenotypes exposed to 0, 15 and 30 ppt water. Additionally, we examined variation in two important MO2 measures, standard metabolic rate (SMR) and maximum metabolic rate (MMR) when N. melanostomus is exposed to increasing water salinities. Fish with an initially higher MMR (at the control salinity - 0ppt) are likely to be more challenged by environmental stressors than fish with a lower MMR. Our results will enable a better understanding of the physiological mechanisms that may constrain invasive species in the aquatic environment.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, University of Porto, University of West Georgia
Authors: Ferreira, P. G. (Intern), Flavio, H. (Ekstern), Hacking, H. (Ekstern), Genz, J. (Ekstern), Wilson, J. M. (Ekstern), Behrens, J. (Intern), Svendsen, J. C. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Konsekvensvurdering af fiskeri efter blåmuslinger ved og øst for Horsens Fjord samt Endelave 2017

General information
Krebs er en delikatesse - det er nu sæson for fiskeri efter krebs

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Publication: Communication › Internet publication – Annual report year: 2017

Laksekvoter for fiskesæsonen 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Marine Living Resources
Authors: Sivebæk, F. (Intern), Eg Nielsen, E. (Intern), Koed, A. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/Nyhed?id=%7b85796649-9DFD-463D-8B46-A47ED31EFC71%7d
Publication: Communication › Internet publication – Annual report year: 2017

Lakselus - Hjælp med at overvåge udbredelsen af lakselus

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Skov, C. (Intern), Koed, A. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Lakselus kan måske komme til at udgøre en trussel mod danske bestande af vilde laksefisk

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University
Authors: Alstrup, A. K. O. (Ekstern), Svendsen, J. C. (Intern), Jensen, L. F. (Ekstern)
Pages: 20-21
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Dyrlægen
Volume: 4
ISSN (Print): 1903-153X
Original language: Danish
Source: Findit
Source-ID: 2372287548
Publication: Research › Journal article – Annual report year: 2017

LEARN-TEACH: a pilot to boost Ocean Literacy in High Schools
Raising the Ocean Literacy of all levels of society is now a policy priority for the European Commission. The long-term objective is better appreciation of the socio-economic benefits and ecosystem services that the marine environment provides, and encourage better stewardship of the seas. One long-term, and potentially self-sustainable, concept is to put sufficient mutual incentives in place so that researchers, teachers and students in high-schools science and mathematics classes accessorize school curricula with the latest marine research results and knowledge. Summary of preliminary teachers consultations at Copenhagen International School suggest that teachers are prepared and willing to include recent marine research, research data and knowledge in high school science classes and carry over the research data to mathematics/statistics classes and exercises. However the active participation of researchers is sought to provide guidance and translation of latest research findings, and point to real data sources.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Research Secretariat, Connecticut Sea Grant, Copenhagen International School
Number of pages: 1
Publication date: 2017
Conference: EGU General Assembly 2017, Vienna, Austria, 24/04/2017 - 24/04/2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Geophysical Research Abstracts
Volume: 19
Article number: 18398-2
ISSN (Print): 1607-7962
Ratings:
Web of Science (2014): Indexed yes
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2009): BFI-level 1
Original language: English
Lessons from the first generation of marine ecological forecast products

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University of California, Santa Cruz, Dalhousie University, Wageningen IMARES, NOAA, Woods Hole Oceanographic Institution, Max Planck Institute for Meteorology, Gulf of Maine Research Institute, Institute of Marine Research, AZTI Technalia, CSIRO Marine and Atmospheric Research
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Marine Science
Volume: 4
Article number: 289
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.53 SJR 0.173 SNIP 0.109
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.145 SNIP 0.05
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
Original language: English
Electronic versions:
Publishers version
DOIs:
10.3389/fmars.2017.00289
Links:
Publication: Research - peer-review › Journal article – Annual report year: 2017

Lessons learned from practical approaches to reconcile mismatches between biological population structure and stock units of marine fish
Recent advances in the application of stock identification methods have revealed inconsistencies between the spatial structure of biological populations and the definition of stock units used in assessment and management. From a fisheries management perspective, stocks are typically assumed to be discrete units with homogeneous vital rates that can be exploited independently of each other. However, the unit stock assumption is often violated leading to spatial mismatches that can bias stock assessment and impede sustainable fisheries management. The primary ecological concern is the potential for overexploitation of unique spawning components, which can lead to loss of productivity and reduced biodiversity along with destabilization of local and regional stock dynamics. Furthermore, ignoring complex population structure and stock connectivity can lead to misperception of the magnitude of fish productivity, which can translate to suboptimal utilization of the resource. We describe approaches that are currently being applied to improve the assessment and management process for marine fish in situations where complex spatial structure has led to an observed mismatch between the scale of biological populations and spatially-defined stock units. The approaches include: (i) status quo management, (ii) “weakest link” management, (iii) spatial and temporal closures, (iv) stock composition analysis, and (v) alteration of stock boundaries. We highlight case studies in the North Atlantic that illustrate each approach and synthesize the lessons learned from these real-world applications. Alignment of biological and management units requires continual monitoring through the application of stock identification methods in conjunction with responsive management to preserve
biocomplexity and the natural stability and resilience of fish species.

**General information**
State: Published
Authors: Kerr, L. A. (Ekstern), Hintzen, N. T. (Ekstern), Cadrin, S. X. (Ekstern), Worsøe Clausen, L. (Intern), Dickey-Collas, M. (Intern), Goethel, D. R. (Ekstern), Hatfield, E. M. C. (Ekstern), Kritzer, J. P. (Ekstern), Nash, R. D. (Ekstern)
Pages: 1708-1722
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 6
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2001): Indexed yes
Linking climate change to community-level impacts on copepods via a new, trait-based model: Life-history and metabolic mechanisms compared

A new, trait-based copepod model ("Coltrane": Copepod Life-history Traits and Adaptation to Novel Environments) has been developed, drawing on past work on both optimal annual routines and trait-based plankton metacommunity models, in order to evaluate climate impacts on copepods via 1) phenology and life history and 2) temperature and energy budgets in a unified framework. In an idealized global-scale testbed, the model correctly predicts life strategies in large Calanus spp. ranging from multiple generations per year to multiple years per generation. In a Bering Sea testbed, the model replicates the dramatic variability in the abundance of C. glacialis/marshallae observed between warm and cold years of the 2000s, and indicates (consistent with recent field studies) that sea ice-linked prey phenology is a more important driver than temperature per se. In a Disko Bay, West Greenland testbed, the model predicts the viability of a spectrum of large-copepod strategies from income breeders with a adult size ~100 μgC reproducing once per year through capital breeders with an adult size > 1000 μgC with a multiple-year generation length. This spectrum corresponds closely to the observed life histories and physiology of local populations of C. finmarchicus, C. glacialis, and C. hyperboreus. Furthermore, the model replicates the observed range of stored lipid content of these copepod populations (30–60%, C. finmarchicus–C. hyperboreus), suggesting a means for linking changes in temperature and primary production to the energy content as well as size structure of the copepod community.

General information
State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Strathclyde University, Aarhus University, NOAA
Authors: Banas, N. S. (Ekstern), Møller, E. F. (Ekstern), Nielsen, T. G. (Intern), Eisner, L. B. (Ekstern)
Publication date: 2017
Conference: Zooplankton Production Symposium. ICES-PICES, Bergen, Norway, 09/05/2016 - 09/05/2016
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Los pros y los contras del percarbonato de sodio

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Pedersen, L. (Intern), Jokumsen, A. (Intern)
Pages: 1-7
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Global Aquaculture Alliance
Issue number: May
Original language: Spanish
Publication: Research - peer-review › Journal article – Annual report year: 2017

Lost in translation? Multi-metric macrobenthos indicators and bottom trawling
The member states of the European Union use multi-metric macrobenthos indicators to monitor the ecological status of their marine waters in relation to the Water Framework and Marine Strategy Framework Directives. The indicators translate the general descriptors of ecological quality in the directives into a single value of ecological status by combining indices of species diversity, species sensitivity and density. Studies and inter-calibration exercises have shown that the indicators respond to chemical pollution and organic enrichment, but little is known about their response to bottom trawling. We use linear mixed effects models to analyze how bottom trawling intensity affects the indicators used in the Danish (Danish Quality Index, DKI) and Swedish (Benthic Quality Index, BQI) environmental monitoring programs in the Kattegat, the sea area between Sweden and Denmark. Using year and station as random variables and trawling intensity, habitat type, salinity and depth as fixed variables we find a significant negative relationship between the BQI indicator and bottom trawling, while the DKI is related significantly to salinity, but not to trawling intensity. Among the indicator components, the species diversity and sensitivity indices used in the DKI are not significantly linked to trawling, and trawling only affects the BQI when species sensitivities are derived from rarefied samples. Because the number of species recorded per sample (species density) is limited by the number of individuals per sample (density), we expect species density and density to be positively correlated. This correlation was confirmed by a simulation model and by statistical analysis of the bottom samples in which log species density was highly significantly related to log density ($r = 0.75$, $df = 144$, p)

General information
State: Published
Low genetic and phenotypic divergence in a contact zone between freshwater and marine sticklebacks: gene flow constrains adaptation

Background: Distinct hybrid zones and phenotypic and genomic divergence is often observed between marine and freshwater threespine sticklebacks (Gasterosteus aculeatus). Nevertheless, cases also exist where marine-freshwater divergence is diffuse despite seemingly similar environmental settings. In order to assess what characterizes these highly different outcomes, we focused on the latter kind of system in the Odder River, Denmark. Here, a previous study based on RAD (Restriction site Associated DNA) sequencing found non-significant genomewide differentiation between marine and freshwater sticklebacks. In the present study, we analyzed samples on a finer geographical scale. We assessed if the system should be regarded as panmictic, or if fine-scale genetic structure and local selection was present but dominated by strong migration. We also asked if specific population components, that is the two sexes and different lateral plate morphs, contributed disproportionally more to dispersal.

Results: We assessed variation at 96 SNPs and the Eda gene that affects lateral plate number, conducted molecular sex identification, and analyzed morphological traits. Genetic differentiation estimated by FST was non-significant throughout the system. Nevertheless, spatial autocorrelation analysis suggested fine scale genetic structure with a genetic patch size of 770 m. There was no evidence for sex-biased dispersal, but full-plated individuals showed higher dispersal than low- and partial-plated individuals. The system was dominated by full-plated morphs characteristic of marine sticklebacks, but in the upstream part of the river body shape and frequency of low-plated morphs changed in the direction expected for freshwater sticklebacks. Five markers including Eda were under possible diversifying selection. However, only subtle clinal patterns were observed for traits and markers. Conclusions: We suggest that gene flow from marine sticklebacks overwhelms adaptation to freshwater conditions, but the short genetic patch size means that the effect of gene flow on the most upstream region must be indirect and occurs over generations. The occurrence of both weak unimodal and strong bimodal hybrid zones within the same species is striking. We suggest environmental and demographic factors that could determine these outcomes, but also highlight the possibility that long-term population history and the presence or absence of genomic incompatibilities could be a contributing factor.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Aarhus University, Universite Laval
Authors: Pedersen, S. H. (Ekstern), Ferchaud, A. (Ekstern), Bertelsen, M. S. (Ekstern), Bekkevold, D. (Intern), Hansen, M. M. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: B M C Evolutionary Biology
Volume: 17
Article number: 130
ISSN (Print): 1471-2148
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.806 SNIP 1.266 CiteScore 3.12
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.057 SNIP 1.174 CiteScore 3.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.2 SNIP 1.268 CiteScore 3.42
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.94 SNIP 1.197 CiteScore 3.52
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.94 SNIP 1.137 CiteScore 3.43
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Managing living marine resources in a dynamic environment: the role of seasonal to decadal climate forecasts

Recent developments in global dynamical climate prediction systems have allowed for skillful predictions of climate variables relevant to living marine resources (LMRs) at a scale useful to understanding and managing LMRs. Such predictions present opportunities for improved LMR management and industry operations, as well as new research avenues in fisheries science. LMRs respond to climate variability via changes in physiology and behavior. For species and systems where climate-fisheries links are well established, forecasted LMR responses can lead to anticipatory and more effective decisions, benefitting both managers and stakeholders. Here, we provide an overview of climate prediction systems and advances in seasonal to decadal prediction of marine-resource relevant environmental variables. We then describe a range of climate-sensitive LMR decisions that can be taken at lead-times of months to decades, before
highlighting a range of pioneering case studies using climate predictions to inform LMR decisions. The success of these case studies suggests that many additional applications are possible. Progress, however, is limited by observational and modeling challenges. Priority developments include strengthening of the mechanistic linkages between climate and marine resource responses, development of LMR models able to explicitly represent such responses, integration of climate driven LMR dynamics in the multi-driver context within which marine resources exist, and improved prediction of ecosystem-relevant variables at the fine regional scales at which most marine resource decisions are made. While there are fundamental limits to predictability, continued advances in these areas have considerable potential to make LMR managers and industry decision more resilient to climate variability and help sustain valuable resources. Concerted dialog between scientists, LMR managers and industry is essential to realizing this potential.
Mapping sediments in the Greenlandic EEZ

General information
State: Published
Organisations: Arctic Section, National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Jørgensbye, H. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Marine depth use of sea trout Salmo trutta in fjord areas of central Norway: marine depth use of salmo trutta
The vertical behaviour of 44 veteran sea trout Salmo trutta (275-580 mm) in different marine fjord habitats (estuary, pelagic, near shore with and without steep cliffs) was documented during May-February by acoustic telemetry. The swimming depth of S. trutta was influenced by habitat, time of day (day v. night), season, seawater temperature and the body length at the time of tagging. Mean swimming depth during May-September was 1·7 m (individual means ranged from 0·4 to 6·4 m). Hence, S. trutta were generally surface oriented, but performed dives down to 24 m. Mean swimming depth in May-September was deeper in the near-shore habitats with or without steep cliffs (2·0 m and 2·5 m, respectively) than in the pelagic areas (1·2 m). May-September mean swimming depth in all habitats was slightly deeper during day (1·9 m) than at night (1·2 m), confirming that S. trutta conducted small-scale diel vertical movements. During summer, S. trutta residing in near-shore habitat progressively moved deeper over the period May (mean 1·1 m) to August (mean 4·0 m) and then reoccupied shallower areas (mean 2·3 m) during September. In winter (November and February), individuals residing in the innermost part of the fjords were found at similar average depths as they occupied during the summer (mean 1·3 m). The swimming depths of S. trutta coincide with the previously known surface orientation of salmon lice Lepeophtheirus salmonis. Combined with previous studies on horizontal use of S. trutta, this study illustrates how S. trutta utilize marine water bodies commonly influenced by anthropogenic factors such as aquaculture, harbours and marine constructions, marine renewable energy production or other human activity. This suggests that the marine behaviour of S. trutta and its susceptibility to coastal anthropogenic factors should be considered in marine planning processes.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Norwegian University of Science and Technology, Norwegian Institute for Nature Research, Dalhousie University, UiT The Arctic University of Norway
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176
Original language: English
acoustic telemetry, brown trout, marine migration, migratory behaviour, swimming depth
DOIs:
10.1111/jfb.13463
Source: FindIt
Source-ID: 2388576861
Publication: Research - peer-review › Journal article – Annual report year: 2017

Marine Ecosystem Climate Services - Forecasting biology at end-user relevant time-scales

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Payne, M. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Marine fish traits follow fast-slow continuum along coastal-offshore gradient

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Instituto Español de Oceanografía, Marine Research Institute, University of Hamburg, Johann Heinrich von Thünen-Institute, University of Hamburg
Authors: Beukhof, E. (Intern), Frelat, R. (Ekstern), Pécuchet, L. (Intern), Fock, H. (Ekstern), Punzón, A. (Ekstern), Sólmundsson, J. (Ekstern), Moellmann, C. (Ekstern), Lindegren, M. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Conference abstract for conference – Annual report year: 2017

Marine fish traits follow fast-slow continuum along coastal-offshore gradient

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Instituto Español de Oceanografía, Marine Research Institute, University of Hamburg, Johann Heinrich von Thünen-Institute, University of Hamburg
Authors: Beukhof, E. (Intern), Frelat, R. (Ekstern), Pécuchet, L. (Intern), Fock, H. (Ekstern), Punzón, A. (Ekstern), Sólmundsson, J. (Ekstern), Moellmann, C. (Ekstern), Lindegren, M. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Poster – Annual report year: 2017

Marine food webs in a changing ocean: Are we ignoring important plankton components?
Marine snow particles in the oligotrophic Sargasso Sea as analysed by amplicon sequencing: composition and linkage to the plankton

Mating, feeding and not being eaten: sex-specific trade-offs in copepods

Maturity of Greenland Halibut (Reinhardtius hippoglossoides W.) in East Greenland, Faroe Islands and Hatton Bank area.

Metapopulation theory identifies biogeographical patterns among core and satellite marine bacteria scaling from tens to thousands of kilometers: Applied metapopulation theory for marine microbes
feedbacks between local abundance and occupancy within specific biomes. Thus, metapopulation theory applied to
microbial biogeography can provide novel insights into the mechanisms governing shifts in biodiversity resulting from
natural or anthropogenically induced changes in the environment.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Linnaeus University, Lund University, Swedish University of Agricultural Sciences, KTH - Royal Institute of Technology, Umea University
Authors: Lindh, M. V. (Ekstern), Sjöstedt, J. (Intern), Ekstam, B. (Ekstern), Casini, M. (Ekstern), Lundin, D. (Ekstern), Hugerth, L. W. (Ekstern), Hu, Y. O. O. (Ekstern), Andersson, A. F. (Ekstern), Andersson, A. (Ekstern), Legrand, C. (Ekstern), Pinhasi, J. (Ekstern)
Pages: 1222-1236
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Environmental Microbiology
Volume: 19
Issue number: 3
ISSN (Print): 1462-2912
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.02 SJR 2.221 SNIP 1.406
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.999 SNIP 1.584 CiteScore 5.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.85 SNIP 1.616 CiteScore 5.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.246 SNIP 1.843 CiteScore 6.37
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.128 SNIP 1.646 CiteScore 5.94
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.33 SNIP 1.708 CiteScore 6.1
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.738 SNIP 1.544
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.463 SNIP 1.373
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.446 SNIP 1.322
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.312 SNIP 1.502
Scopus rating (2006): SJR 2.414 SNIP 1.511
Micro-and macro-plastics in marine species from Nordic waters

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Norwegian Institute for Water Research
Authors: Bråte, I. L. N. (Ekstern), Huwer, B. (Intern), Thomas, K. V. (Ekstern), Eidsvoll, D. P. (Ekstern), Halsband, C. (Ekstern), Almroth, B. C. (Ekstern), Lusher, A. (Ekstern)
Number of pages: 101
Publication date: 2017

Publication information
Publisher: Nordic Council of Ministers
ISBN (Print): 978-92-893-5118-8
Original language: English

Series: TemaNord
Number: 2017:549
ISSN: 0908-6692
Main Research Area: Technical/natural sciences

Microbiota – host interactions: Linking microbiota associations to fitness in a basal metazoan

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Jaspers, C. (Intern), Weiland-Bräuer, N. (Ekstern), Schmitz-Streit, R. (Ekstern), Reusch, T. (Ekstern)
Publication date: 2017
Event: Poster session presented at Metaorganism Seminar, Kiel, Germany.
Main Research Area: Technical/natural sciences

Microbiota – host interactions: Linking microbiota associations to fitness in a basal metazoan
Micro particles in Danish Model Trout Farms

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: de Jesus Gregersen, J. (Intern), Pedersen, P. B. (Intern), Pedersen, L. (Intern), Møller, B. (Intern), Dalsgaard, A. J. T. (Intern)
Number of pages: 56
Pages: 43
Publication date: 2017

Host publication information
Title of host publication: 4th NordicRAS Workshop on Recirculating Aquaculture Systems. Aalborg, Denmark, 12-13 October 2017 : Book of Abstracts
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
Editor: Dalsgaard, A. J. T.
ISBN (Print): 978-87-7481-241-8
ISBN (Electronic): 978-87-7481-240-1

Series: DTU Aqua Report
Number: 321-17
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Conference: NordicRAS Workshop on Recirculating Aquaculture Systems, Aalborg, Denmark, 12/10/2017 - 12/10/2017

Migration patterns of the Faroe Plateau cod (Gadus morhua, L.) revealed by data storage tags

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Faroe Marine Research Institute, Danish Meteorological Institute, University of the Faroe Islands
Authors: Maj Ottosen, K. (Intern), Pedersen, M. W. (Intern), Eliasen, S. K. (Ekstern), Steingrund, P. (Ekstern), Magnusen, E. (Ekstern), Rasmussen, T. A. S. (Ekstern)
Pages: 37-45
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries Research
Volume: 195
ISSN (Print): 0165-7836
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Unicellular eukaryotes make up the base of the ocean food web and exist as a continuum in trophic strategy from pure heterotrophy (phagotrophic zooplankton) to pure photoautotrophy (‘phytoplankton’), with a dominance of mixotrophic organisms combining both strategies. Here we formulate a trait-based model for mixotrophy with three key resource-harvesting traits: photosynthesis, phagotrophy and inorganic nutrient uptake, which predicts the trophic strategy of species throughout the seasonal cycle. Assuming that simple carbohydrates from photosynthesis fuel respiration, and feeding primarily provides building blocks for growth, the model reproduces the observed light-dependent ingestion rates and species-specific growth rates with and without prey from the laboratory. The combination of traits yielding the highest growth rate suggests high investments in photosynthesis, and inorganic nutrient uptake in the spring and increased phagotrophy during the summer, reflecting general seasonal succession patterns of temperate waters. Our trait-based model presents a simple and general approach for the inclusion of mixotrophy, succession and evolution in ecosystem models.
Modelling Jellyfish in marine ecosystems

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life
Authors: Schnedler-Meyer, N. A. (Intern), Kiørboe, T. (Intern), Mariani, P. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Møde om havørreder i Roskilde Fjord 18. november 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology
Authors: Svendsen, J. C. (Intern), Jørgensen, L. D. (Intern), Støttrup, J. G. (Intern), Christoffersen, M. (Intern), Aarestrup, K. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/nyhed?id=5B1FF7F6-82F2-4665-B829-062CAF42B965
Publication: Communication › Internet publication – Annual report year: 2017

Møde om pighvarre i Roskilde Fjord 15. februar 2017

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Svendsen, J. C. (Intern), Støttrup, J. G. (Intern), Christoffersen, M. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/02/pighvar-moede?id=13172a3f-190c-4f11-8180-6a82200b0877
Publication: Communication › Internet publication – Annual report year: 2017

Monitoring abrupt changes in bacteria within biological stable RAS water

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Norwegian University of Science and Technology
Authors: Rojas-Tirado, P. A. (Intern), Pedersen, P. B. (Intern), Vadstein, O. (Ekstern), Pedersen, L. (Intern)
Number of pages: 56
Pages: 21
Publication date: 2017

Host publication information
Title of host publication: 4th NordicRAS Workshop on Recirculating Aquaculture Systems Aalborg, Denmark, 12-13 October 2017 : Book of Abstracts
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
Editor: Dalsgaard, A. J. T.
ISBN (Print): 978-87-7481-241-8
ISBN (Electronic): 978-87-7481-240-1
Series: DTU Aqua Report
Morphological, physiological and dietary covariation in migratory and resident adult brown trout (Salmo trutta)

The causes and consequences of trait relationships within and among the categories of physiology, morphology, and life-history remain poorly studied. Few studies cross the boundaries of these categories, and recent reviews have pointed out not only the dearth of evidence for among-category correlations but that trait relationships may change depending on the ecological conditions a population faces. We examined changes in mean values and correlations between traits in a partially migrant population of brown trout when migrant sea-run and resident stream forms were breeding sympatrically. Within each sex and life-history strategy group, we used carbon and nitrogen stable isotopes to assess trophic level and habitat use; assessed morphology which reflects swimming and foraging ability; measured circulating cortisol as it is released in response to stressors and is involved in the transition from salt to freshwater; and determined oxidative status by measuring oxidative stress and antioxidants. We found that sea-run trout were larger and had higher values of stable isotopes, cortisol and oxidative stress compared to residents. Most groups showed some correlations between morphology and diet, indicating individual resource specialization was occurring, and we found consistent correlations between morphology and cortisol. Additionally, relationships differed between the sexes (cortisol and oxidative status were related in females but not males) and between life-history strategies (habitat use was related to oxidative status in male sea-run trout but not in either sex of residents). The differing patterns of covariation between the two life-history strategies and between the sexes suggest that the relationships among phenotypic traits are subjected to different selection pressures, illustrating the importance of integrating multiple phenotypic measures across different trait categories and contrasting life-history strategies.
Motile behavior and predation risk in planktonic copepods: Behavior dependent predation risk

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Technical University of Denmark
Authors: van Someren Gréve, H. (Intern), Almeda, R. (Intern), Kioerboe, T. (Intern)
Pages: 1810-1824
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 62
Issue number: 5
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.38 SNIP 1.425
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.329 SNIP 1.682
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.381 SNIP 1.615
Web of Science (2008): Indexed yes
Movement patterns of seaward migrating European eel (Anguilla anguilla) at a complex of riverine barriers: implications for conservation

River infrastructure such as weirs and hydropower stations commonly present migrating fish with multiple potential passage routes. Knowledge of the cues fish use to navigate such environments is required to protect migrants from hazardous areas and guide them towards safe passage; however, this is currently lacking for many species. Employing high-resolution positioning telemetry, this study examined movements of downstream migrating adult European eel, Anguilla anguilla, as they encountered a complex of water control structures in one location on the River Stour, southern England. The distribution of eels across five potential routes of passage differed from that predicted based on proportion of discharge alone. Certain routes were consistently avoided, even when the majority of flow passed through them. Passage distribution was partially explained by avoidance in the vicinity of a floating debris boom. Movement paths were nonrandomly distributed across the forebay and eels moved predominantly within a zone 2–4 m from the channel walls. Understanding of avoidance and structure oriented movement exhibited by eels will help advance effective guidance and downstream passage solutions for adults.

General information
State: Published
Organisations: National Institute of Aquatic Resources, University of Southampton, University of Porto, Environment Agency
Authors: Piper, A. T. (Ekstern), Svendsen, J. C. (Intern), Wright, R. M. (Ekstern), Kemp, P. S. (Ekstern)
Pages: 87–98
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology of Freshwater Fish
Volume: 26
Issue number: 1
ISSN (Print): 0906-6691
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
Moving beyond the MSY concept to reflect multidimensional fisheries management objectives

Maximising the long term average catch of single stock fisheries as prescribed by the globally-legislated MSY objective is unlikely to ensure ecosystem, economic, social and governance sustainability unless an effort is made to explicitly include these considerations. We investigated how objectives to be maximised can be combined with sustainability constraints aiming specifically at one or more of these four sustainability pillars. The study was conducted as a three-year interactive process involving 290 participating science, industry, NGO and management representatives from
six different European regions. Economic considerations and inclusive governance were generally preferred as the key objectives to be maximised in complex fisheries, recognising that ecosystem, social and governance constraints are also key aspects of sustainability in all regions. Relative preferences differed between regions and cases but were similar across a series of workshops, different levels of information provided and the form of elicitation methods used as long as major shifts in context or stakeholder composition did not occur. Maximising inclusiveness in governance, particularly the inclusiveness of affected stakeholders, was highly preferred by participants across the project. This suggests that advice incorporating flexibility in the interpretation of objectives to leave room for meaningful inclusiveness in decision-making processes is likely to be a prerequisite for stakeholder buy-in to management decisions.
Muligheder ved ændret mindstemål og indførelse af vinduesmål for pighvarre (Scophthalmus maximus)


General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University
Authors: Alstrup, A. K. O. (Ekstern), Jensen, L. F. (Ekstern), Christoffersen, M. (Intern), Svendsen, J. C. (Intern)
Pages: 30-38
Publication date: 2017
Main Research Area: Technical/natural sciences

Multi-decadal cod reproductive habitat variability in the Baltic Sea and its impact on reproductive success

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Plikshs, M. (Ekstern), MacKenzie, B. (Intern), Müller-Karulis, B. (Ekstern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Bibliographical note
ICE CM 2017/P:377
Publication: Research › Conference abstract for conference – Annual report year: 2017
Muslinge- og østersfiskeri i Natura 2000 områder – en succeshistorie

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Nielsen, P. (Intern), Canal-Vergés, P. (Intern), Petersen, J. K. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskmøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Mussel fishery in Natura 2000 sites - a success story from Denmark

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Nielsen, P. (Intern), Petersen, J. K. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Conference abstract for conference – Annual report year: 2017

Neuroendocrine and immune responses undertake different fates following tryptophan or methionine dietary treatment: tales from a teleost model

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Universidade do Porto, Universidad Autonoma de Barcelona, Universidade de Vigo, University of Vigo
Publication date: 2017
Event: Abstract from Congress of Iberian Association for Comparative Endocrinology, Vigo, Spain.
Main Research Area: Technical/natural sciences
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Source: PublicationPreSubmission
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Publication: Research › Conference abstract for conference – Annual report year: 2017

Neuroendocrine and immune responses undertake different fates following tryptophan or methionine dietary treatment: tales from a teleost model

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Universidad Autonoma de Barcelona, Universidade de Vigo, University of Porto, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Immunology
Volume: 8
Article number: 1226
ISSN (Print): 1664-3224
Ratings:
New policies may call for new approaches: the case of the Swedish Norway lobster (Nephrops norvegicus) fisheries in the Kattegat and Skagerrak

The European Common Fisheries Policy has in its 2013 reform increased in complexity, such as a call for coherence with the Marine Strategy Framework Directive and a landing obligation, posing new requirements and challenges to managers, scientists and the fishing industry. Therefore, re-evaluations of current practice are important as a basis for management actions. The Swedish fishery for Norway lobster (Nephrops norvegicus) in the Kattegat–Skagerrak area provides an interesting case study of relevance to emerging policies. Sprung from an unbalance in available fish- and Nephrops quotas and an ambition to protect coastal areas, the current fishery has been directed towards three separate fisheries (mixed trawling, directed trawling using a sorting grid and creeling). Studying direct and indirect effects from alternative Swedish quota allocations among gear types is therefore interesting. Accordingly, a screening study was conducted, taking into consideration area-gear interactions in catch rates, to compare the three different fisheries regarding quantified pressures on the target species, the by-catch species, and on the seafloor, as well as to qualitatively discuss social and economic dimensions. In the next step, alternative quota allocations were studied. In Swedish fisheries, we show that creeling offers a substantial reduction of fishing mortality of both undersized Nephrops and fish and a reduced seafloor pressure per landed kilo of Nephrops. Given that the fishing areas in many cases may be interchangeable between gears, allocating a larger quota share to creels in the Swedish fishery would therefore contribute to the integration of fisheries- and environmental management as called for in the new policies.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SP Technical Research Institute of Sweden, Swedish University of Agricultural Sciences
Authors: Hornborg, S. (Ekstern), Jonsson, P. (Ekstern), Sköld, M. (Ekstern), Ulmestrand, M. (Ekstern), Valentinsson, D. (Ekstern), Eigaard, O. R. (Intern), Seekings, J. P. (Intern), Nielsen, J. R. (Intern), Bastardie, F. (Intern), Lövgren, J. (Ekstern)
Pages: 134-145
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 1
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Newton step methods for AD of an objective defined using implicit functions

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Washington
Authors: Bell, B. M. (Ekstern), Kristensen, K. (Intern)
Pages: 1-17
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Optimization Methods and Software
No increase in marine microplastic concentration over the last three decades – A case study from the Baltic Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Oceans and Arctic, University of Copenhagen, Technical University of Denmark, GEOMAR - Helmholtz Centre for Ocean Research Kiel
Authors: Beer, S. (Ekstern), Garm, A. (Ekstern), Huwer, B. (Intern), Dierking, J. (Ekstern), Nielsen, T. G. (Intern)
Number of pages: 1

Original language: English
DOIs: 10.1080/10556788.2017.1406936
Source: FindIt
Source-ID: 2393996574
Publication: Research - peer-review › Journal article – Annual report year: 2017
Non-parallel divergence across Danish freshwater and marine three-spined stickleback Gasterosteus aculeatus populations

This work investigated whether multiple freshwater populations of three-spined stickleback Gasterosteus aculeatus in different freshwater catchments in the Jutland Peninsula, Denmark, derived from the same marine populations show repeated adaptive responses. A total of 327 G. aculeatus collected at 13 sampling locations were screened for genetic variation using a combination of 70 genes putatively under selection and 26 neutral genes along with a marker linked to the ectodysplasin gene (eda), which is strongly correlated with plate armour morphs in the species. A highly significant genetic differentiation was found that was higher among different freshwater samples than between marine–freshwater samples. Tests for selection between marine and freshwater populations showed a very low degree of parallelism and no single nucleotide polymorphism was detected as outlier in all freshwater–marine pairwise comparisons, including the eda. This suggests that G. aculeatus is not necessarily the prime example of parallel local adaptation suggested in much of the literature and that important exceptions exist (i.e. the Jutland Peninsula). While marine populations in the results described here showed a high phenotype–genotype correlation at eda, a low association was found for most of the freshwater populations. The most extreme case was found in the freshwater Lake Hald where all low-plated phenotypes were either homozygotes for the allele supposed to be associated with completely plated morphs or heterozygotes, but none were homozygotes for the putative low-plated allele. Re-examination of data from seven G. aculeatus studies agrees in showing a high but partial association between phenotype–genotype at eda in G. aculeatus freshwater populations and that mismatches occur everywhere in the European regions studied (higher in some areas, i.e. Denmark). This is independent of the eda marker used.
Armour plate, Ectodysplasin, Outlier detection, Parallel adaption, Single nucleotide polymorphisms

DOIs: 10.1111/jfb.13336
Source: FindIt
Source-ID: 2356901342
Publication: Research - peer-review › Journal article – Annual report year: 2017

Nordisk arktisk samarbeid om forskning og høyere utdanning i Høyarktis - SVALGREN

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University Centre in Svalbard, Aarhus University, University of Copenhagen
Authors: Christiansen, H. H. (Ekstern), Forchhammer, M. (Ekstern), Skov, H. (Ekstern), Edelvang, K. (Intern), Priemé, A. (Ekstern)
Pages: 22-24
Publication date: 2017

Publication information
Nutritional physiology of wildlife in a changing world

Over the last century, humans have modified landscapes, generated pollution and provided opportunities for exotic species to invade areas where they did not evolve. In addition, humans now interact with animals in a growing number of ways (e.g. ecotourism). As a result, the quality (i.e. nutrient composition) and quantity (i.e. food abundance) of dietary items consumed by wildlife have, in many cases, changed. We present representative examples of the extent to which vertebrate foraging behaviour, food availability (quantity and quality) and digestive physiology have been modified due to human-induced environmental changes and human activities. We find that these effects can be quite extensive, especially as a result of pollution and human-provisioned food sources (despite good intentions). We also discuss the role of nutrition in conservation practices, from the perspective of both in situ and ex situ conservation. Though we find that the changes in the nutritional ecology and physiology of wildlife due to human alterations are typically negative and largely involve impacts on foraging behaviour and food availability, the extent to which these will affect the fitness of organisms and result in evolutionary changes is not clearly understood, and requires further investigation.

Ny film om succesfuld restaurering af et stort vandløb

Ny film om succesfuld restaurering af et stort vandløb

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication Information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Ny vejledning om vandløbsrestaurering

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern), Sivebæk, F. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/02/gydegrus-vejledning?id=7ae8e37f-9dcc-434e-8ba6-fe2065af8f00&utm_source=newsletter&utm_medium=mail&utm_campaign=2017_02_07_Nyhedsbrev

On the missing link in ecology: improving communication between modellers and experimentalists
Collaboration between modellers and experimentalists is essential in ecological research, however, different obstacles linking both camps often hinder scientific progress. In this commentary, we discuss several issues of the current state of affairs in this research loop. Backed by an online survey amongst fellow ecologists, modellers and experimentalists alike, we identify two major areas that need to be mended. Firstly, differences in language and jargon lead to a lack of exchange of ideas and to unrealistic mutual expectations. And secondly, constraint data sharing, accessibility and quality limit the usage of empirical data and thereby the impact of ecological studies. We discuss ways to advance collaboration; how to improve communication and the design of experiments; and the sharing of data. We hope to start a much-needed conversation between modellers and experimentalists, to further future research collaboration and to increase the impact of single ecological studies alike.

General information
State: Published
Organisations: Centre for Ocean Life, National Institute of Aquatic Resources, Lund University, University of Bergen
Authors: Heuschele, J. (Ekstern), Ekvall, M. T. (Ekstern), Mariani, P. (Intern), Lindemann, C. (Ekstern)
Pages: 1071-1077
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Oikos
Volume: 126
Issue number: 8
ISSN (Print): 0030-1299
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.313 SNIP 1.348
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.389 SNIP 1.346 CiteScore 3.59
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.494 SNIP 1.486 CiteScore 3.69
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.24 SNIP 1.375 CiteScore 3.55
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.364 SNIP 1.419 CiteScore 3.53
ISI indexed (2012): ISI indexed yes
Ontogenetic body-mass scaling of nitrogen excretion relates to body surface area in diverse pelagic invertebrates

Many physiological and ecological processes depend on body size and the supply of limiting nutrients. Hence, it is important to derive quantitative predictions based on a mechanistic understanding of the influence of body size on metabolic rate and on the ratios of consumed to excreted elements. Among diverse pelagic invertebrates that change shape during ontogeny, recent analysis has demonstrated a significant positive correlation between the body-mass allometry of respiration rates (measured as the ontogenetic body mass-scaling exponent bR) and the allometry of body surface area (bA, as predicted from body-shape changes using a Euclidean model). As many pelagic invertebrates use a large portion of their external body surface for both resource uptake and waste excretion, we predicted that body-mass scaling exponents for rates of excretion of soluble N (bN) should also then relate to the degree of body-shape change during growth. We tested this hypothesis using literature data on bN for 39 species of pelagic invertebrates across five different phyla, and find strong support: bN is significantly positively correlated with predicted bA, whilst also co-varying with bR. Intraspecific differences between bN and bR values reveal ontogenetic shifts in the ratio of O2-consumed to N-excreted. We suggest that a variety of factors, including adaptive developmental shifts in the relative anabolism and catabolism of proteins and lipids, may cause these shifts in consumption-excretion ratios. Diverse pelagic invertebrates that dominate vast open water ecosystems falsify the predictions of general metabolic scaling theories built upon resource-transport networks, but support predictions of surface-area dependent theory.
Optælling af lystfiskeri langs kysten

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.aqua.dtu.dk/nyheder/2017/04/flyoptaelling-af-lystfiskere?id=edfa0dcf-143e-42a8-80d5-9f0918ba1567&utm_source=newsletter&utm_media@mail&utm_campaign=2017_04_19_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2017

Optimization of mitigation mussel culture for nutrient extraction and animal feedstock replacement: An introduction.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Taylor, D. (Intern), Saurel, C. (Intern), Nielsen, P. (Intern), Petersen, J. K. (Intern)
Number of pages: 2
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
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Bibliographical note
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Publication: Research › Conference abstract for conference – Annual report year: 2017

Optimizing RAS operations by new measures

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Dalsgaard, J. (Intern), Pedersen, L. (Intern), Pedersen, P. B. (Intern)
Pages: 1
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquacultural Engineering
Volume: 78 A
ISSN (Print): 0144-8609
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Optimum ozonation of freshwater pilot recirculating aquaculture system - Water quality

General information

State: Published
Number of pages: 56
Pages: 48
Publication date: 2017
Organic Fe speciation in the Eurasian Basins of the Arctic Ocean and its relation to terrestrial DOM

The bio-essential trace metal iron (Fe) has poor inorganic solubility in seawater, and therefore dissolution is dependent on organic complexation. The Arctic Ocean is subject to strong terrestrial influences which contribute to organic solubility of Fe, particularly in the surface. These influences are subject to rapid changes in the catchments of the main contributing rivers. Here we report concentrations and binding strengths of Fe-binding organic ligands in relation to spectral properties of Dissolved Organic Matter (DOM) and concentrations of humic substances. Full-depth profiles of Fe and Fe-binding organic ligands were measured for 11 stations, good agreement to previous studies was found with ligand concentrations between 0.9 and 2.2. equivalent. nM of Fe (Eq.nM. Fe) at depths > 200. m. We found nutrient-like profiles of Fe in the Atlantic-influenced Nansen basin, surface enrichment in the surface over the Amundsen and Makarov basins and scavenging effects in the deep Makarov basin. A highly detailed surface transect consisting of two sections crossing the surface flow from the Siberian continental shelf to the Fram Strait, the TransPolar Drift (TPD), clearly indicates the flow path of the riverine contribution to Fe and Fe-binding organic ligands with concentrations of 0.7 to 4.4. nM and 1.6 to 4.1. Eq.nM. Fe, respectively. This is on average 4.5 times higher in DFe and 1.7 times higher in Fe-binding organic ligands than outside the TPD flow path. Conditional binding strengths of ligands in the entire dataset were remarkably similar at 11.45. ≤. LogK'. ≤. 12.63. Increased organic Fe-binding organic ligand concentrations were evident in the Arctic Ocean surface. To better identify the organic substances responsible for Fe complexation in the Arctic Ocean, diverse analytical approaches and a standard other than Suwannee River Fulvic Acid are recommended.
Overview of coralline red algal crusts and rhodolith beds (Corallinales, Rhodophyta) and their possible ecological importance in Greenland

Coralline red algae are a globally distributed and abundant group of shallow marine benthic calcifiers. They can form important ecosystems that provide a three-dimensional habitat to a large variety of marine organisms. While the study of coralline red algae has traditionally been focused on warm-water habitats, numerous recent reports have now described widespread coralline red algal ecosystems from high-latitude regions, particularly in the Northern Hemisphere. In fact, it is becoming increasingly evident that coralline red algae are likely the dominant marine calcifying organisms on the seafloor of the Arctic and subarctic photic zone. This article gives a first overview of the distribution of coralline red algal crusts and rhodolith (free-living coralline red algal nodules) grounds in Greenland and the first report of rhodoliths in East Greenland. Museum data and recent sampling information have been compiled to develop a distribution map of coralline genera and rhodolith communities. The depth range of coralline red algae in Greenland has been extended by 27 m, from 50 to 77 m depth. In addition, rhodoliths of the normally crust-forming species Clathromorphum compactum are described for the first time from a sheltered Greenland fjord. Based on the data compiled here, it becomes clear that rhodolith communities are a widespread feature of the Greenland shallow shelf areas. Gaining a better understanding of the distribution of these hitherto poorly understood high-latitude ecosystems is essential due to their function as spawning areas and nursery grounds for commercially important fish and invertebrates.
Oxidative stress and partial migration in brown trout (Salmo trutta)

During migration, animals are typically limited by their endogenous energetic resources which must be allocated to the physiological costs associated with locomotion, as well as avoiding and/or compensating for oxidative stress. To date, there have been few attempts to understand the role of oxidative status in migration biology, particularly in fish. Semi-anadromous brown trout (Salmo trutta, Linnaeus 1758) exhibit partial migration, where some individuals smoltify and migrate to sea, and others become stream residents, providing us with an excellent model to investigate the link between oxidative stress and migration. Using the brown trout, we obtained blood samples from juveniles from a coastal stream in Denmark in the fall prior to peak seaward migration which occurs in the spring, and assayed for antioxidant capacity (oxygen radical absorbance capacity) and oxidative stress levels (ratio of oxidized to reduced glutathione). We found that individuals that migrated had higher antioxidant capacity than residents and that future migration date was negatively correlated with both antioxidant capacity and body length in the fall. This study provides the first evidence that oxidative status is associated with migration strategy and timing, months in advance of the actual migration, and provides insight into the role of oxidative status in animal migration.
Participatory boat tracking reveals spatial fishing patterns in an Indonesian artisanal fishery

The Spermonde Archipelago holds one of the largest artisanal fisheries in Indonesia, providing livelihoods for local communities and many other people involved in international trade networks of seafood. High demand and a lack of enforcement of existing fisheries regulations turn into high pressure for the coral reef ecosystem, contributing to its overall degradation. Estimations on the ecological impacts of different levels of fishing pressure, as well as fisheries stock assessments and marine resource management require precise information of the spatial distribution of fishing effort, which involves great uncertainty when only anecdotal information is considered. We explored the feasibility of applying participatory boat tracking to complement fisheries data during the NW monsoon season 2014-2015. We conducted interviews, measured catch landings and distributed GPS data loggers among hook and line fishermen to identify fishing grounds by gear-dependent patterns of boat movement. Most of the fishing activities involved two gears (octopus bait and trolling line for live groupers) and three fishing grounds. The mass of catch landings was dominated by Octopoda (CPUE=10.1 kg boatday-1) while the most diverse group was the fish family Serranidae, with Plectropomus leopardus being the main target species. In conclusion, boat tracking combined with interviews and catch surveys has proven a useful tool to reduce uncertainty in information on spatial resource use, while allowing a high level of participation by fishermen.
Particle surface area and bacterial activity in recirculating aquaculture systems
Suspended particles in recirculating aquaculture systems (RAS) provide surface area that can be colonized by bacteria. More particles accumulate as the intensity of recirculation increases thus potentially increasing the bacterial carrying capacity of the systems. Applying a recent, rapid, culture-independent fluorometric detection method (Bactiquant®) for measuring bacterial activity, the current study explored the relationship between total particle surface area (TSA, derived from the size distribution of particles >5 μm) and bacterial activity in freshwater RAS operated at increasing intensity of recirculation (feed loading from 0.043 to 3.13 kg feed m−3 make-up water). Four independent sets of water samples from different systems were analyzed and compared including samples from: (i) two individual constructed wetlands treating the effluent system water from two commercial, freshwater rainbow trout (Oncorhynchus mykiss) farms of different recirculation intensity; (ii) an 8.5 m3 pilot scale RAS; and (iii) twelve identical, 1.7 m3 pilot scale RAS assigned one of four micro-screen treatments (no micro-screen, 100, 60, or 20 μm mesh size micro-screens) in triplicate. There was a strong, positive, linear correlation (p < 0.05) between TSA and bacterial activity in all systems with low to moderate recirculation intensity (i.e. feed loading ≤1 kg feed m−3 make-up water). However, the relationship apparently ceased to exist in the systems with highest recirculation intensity (feed loading 3.13 kg feed m−3 make-up water; corresponding to 0.32 m3 make-up water kg−1 feed). This was likely due to the accumulation of dissolved nutrients sustaining free-living bacterial populations, and/or accumulation of suspended colloids and fine particles less than 5 μm in diameter, which were not characterized in the study but may provide significant surface area. Hence, the study substantiates that particles in RAS provide surface area supporting bacterial activity, and that particles play a key role in controlling the bacterial carrying capacity at least in less intensive RAS. Applying fast, culture-independent techniques for determining bacterial activity might provide a means for future monitoring and assessment of microbial water quality in aquaculture farming systems.

General information
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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Christian-Albrechts-Universität zu Kiel
Pages: 18-23
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.09 SJR 0.798 SNIP 1.525
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.723 SNIP 1.148 CiteScore 1.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.72 SNIP 1.437 CiteScore 1.61
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.666 SNIP 1.511 CiteScore 1.8
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.946 SNIP 1.377 CiteScore 1.72
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Passive vs Active Knowledge Transfer: boosting grant proposal impact

Research funders are increasingly concerned with measurable socio-economic impact of investment in research, and on increasingly shorter timescales. Innovation, and “open innovation” are the policy priorities of the moment and optimising the flow of ideas along the lab-2-market spectrum is essential for re-use of results, fuelling open innovation, and boosting socio-economic impact or public funded research.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Research Secretariat, Section for Oceans and Arctic, Section for Marine Ecology and Oceanography, AquaTT
Authors: Grigorov, I. (Intern), Bayliss-Brown, G. (Ekstern), Murphy, D. (Ekstern), Thøgersen, T. L. (Intern), Mariani, P. (Intern)
Number of pages: 1
Publication date: 2017
Conference: EGU General Assembly 2017, Vienna, Austria, 24/04/2017 - 24/04/2017
Main Research Area: Technical/natural sciences

Publication information

Journal: Geophysical Research Abstracts
Volume: 19
Article number: 18355-2
ISSN (Print): 1607-7962
Ratings:

Web of Science (2014): Indexed yes
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Paternal identity impacts embryonic development for two species of freshwater fish

Paternal, compared to maternal, contributions were believed to have only a limited influence on embryonic development and larval fitness traits in fishes. Therefore, the perspective of male influence on early life history traits has come under scrutiny. This study was conducted to determine parental effects on the rate of eyed embryos of Ide, Leuciscus idus and Northern pike, Esox lucius. Five sires and five dams from each species were crossed using a quantitative genetic breeding design and the resulting 25 sib groups of each species were reared to the embryonic eyed stage. We then partition variation in embryonic phenotypic performance to maternal, paternal, and parental interactions using the Restricted Maximum Likelihood (REML) model. Results showed that paternal, maternal, and the paternal × maternal interaction terms were highly significant for both species; clearly demonstrating that certain family combinations were more compatible than others. Paternal effects explained 20.24% of the total variance, which was 2-fold higher than the maternal effects (10.73%) in Ide, while paternal effects explained 18.9% of the total variance, which was 15-fold higher than the maternal effects (1.3%) in Northern pike. Together, these results indicate that male effects are of major importance during embryonic development for these species. Furthermore, this study demonstrates that genetic compatibility between sires and dams plays an important role and needs to be taken into consideration for reproduction of these and likely other economically important fish species.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of South Bohemia, University of Warmia and Mazury in Olsztyn, University of Windsor
Authors: Siddique, M. A. M. (Ekstern), Linhart, O. (Ekstern), Krejzef, S. (Ekstern), Zarski, D. (Ekstern), Pitcher, T. E. (Ekstern), Politis, S. N. (Intern), Butts, I. (Intern)
Pages: 30-35
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: General and Comparative Endocrinology
Volume: 245
ISSN (Print): 0016-6480
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.55 SJR 1.056 SNIP 0.924
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.269 SNIP 0.943 CiteScore 2.62
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.109 SNIP 0.951 CiteScore 2.51
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.192 SNIP 1.242 CiteScore 2.96
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.062 SNIP 1.183 CiteScore 3.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Pelagic habitat: exploring the concept of good environmental status

Marine environmental legislation is increasingly expressing a need to consider the quality of pelagic habitats. This paper uses the European Union marine strategy framework to explore the concept of good environmental status (GES) of pelagic habitat with the aim to build a wider understanding of the issue. Pelagic ecosystems have static, persistent and ephemeral features, with manageable human activities primarily impacting the persistent features. The paper explores defining the meaning of "good", setting boundaries to assess pelagic habitat and the challenges of considering habitat biodiversity in a moving medium. It concludes that for pelagic habitats to be in GES and able to provide goods and services to humans, three conditions should be met: (i) all species present under current environmental conditions should be able to find the pelagic habitats essential to close their life cycles; (ii) biogeochemical regulation is maintained at normal levels; (iii) critical physical dynamics and movements of biota and water masses at multiple scales are not obstructed. Reference points for acceptable levels of each condition and how these may change over time in line with prevailing oceanographic conditions, should be discussed by knowledge brokers, managers and stakeholders. Managers should think about a habitat hydrography rather than a habitat geography. Setting the bounds of the habitats requires a consideration of dimension, scale and gradients. It is likely that to deal with the challenges caused by a dynamic environment and the relevance of differing spatial and temporal scales, we will need to integrate multidisciplinary empirical data sets with spatial and temporal models to assess and monitor progress towards, or displacement from GES of the pelagic habitat.

General information

State: Published
Authors: Dickey-Collas, M. (Intern), McQuatters-Gollop, A. (Ekstern), Bresnan, E. (Ekstern), Kraberg, A. C. (Ekstern), Manderson, J. P. (Ekstern), Nash, R. D. M. (Ekstern), Otto, S. A. (Ekstern), Sell, A. F. (Ekstern), Tweddle, J. F. (Ekstern), Trenkel, V. M. (Ekstern)
Pages: 2333–2341
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
P-E performances of four Danish S. latissima populations – Is low light traits persistent and traceable in the F1-generation?
Performance of a marine activated sludge system for N removal using external and internal carbon sources

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Schmedes, P. S. (Intern), Nielsen, M. M. (Intern), Reitan, K. (Ekstern), Petersen, J. K. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Telemetry has become a standard tool in fish research, but tagging methods still need refinement to achieve better results and to improve animal welfare. One of the problems reported from evaluations of surgical implants is unsatisfactory wound closure. Thus, researchers struggle to find better ways to close incisions, typically for implants of tags under field conditions. Problems are regularly encountered when closing incisions with traditional absorbable or non-absorbable suture, including decreased growth, slow wound healing, erythema and necrosis at sutures. In this study, survival, growth, tag expulsion rate and incision healing was compared among three groups of dummy transmitter-tagged wild brown trout Salmo trutta where incisions were closed with two types of suture material (absorbable vs. fast absorbable) and Histo-glue. The tagged fish were kept in semi-natural ponds for 20 days. Survival did not differ between groups, but growth of the tagged fish was lower than that of the control group. Histo-glue gave the best healing, but resulted in high tag loss rate (33%). The fast absorbable suture did not disappear faster than normal absorbable suture, healing and tag loss was similar. The use of fast absorbable suture may hold potential for improving the procedure and should be further tested.

Telemetry has become a standard tool in fish research, but tagging methods still need refinement to achieve better results and to improve animal welfare. One of the problems reported from evaluations of surgical implants is unsatisfactory wound closure. Thus, researchers struggle to find better ways to close incisions, typically for implants of tags under field conditions. Problems are regularly encountered when closing incisions with traditional absorbable or non-absorbable suture, including decreased growth, slow wound healing, erythema and necrosis at sutures. In this study, survival, growth, tag expulsion rate and incision healing was compared among three groups of dummy transmitter-tagged wild brown trout Salmo trutta where incisions were closed with two types of suture material (absorbable vs. fast absorbable) and Histo-glue. The tagged fish were kept in semi-natural ponds for 20 days. Survival did not differ between groups, but growth of the tagged fish was lower than that of the control group. Histo-glue gave the best healing, but resulted in high tag loss rate (33%). The fast absorbable suture did not disappear faster than normal absorbable suture, healing and tag loss was similar. The use of fast absorbable suture may hold potential for improving the procedure and should be further tested.

Performance of fast-absorbable suture and histo-glue in closing incisions in Brown trout

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern), Larsen, M. H. (Intern), Aarestrup, K. (Intern)
Pages: 1233-1237
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Transactions of the American Fisheries Society
Volume: 146
ISSN (Print): 0002-8487
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Fish in a recirculating aquaculture system (RAS) live with abundant microorganisms. These can become a health threat when the fish immune system cannot counterbalance the pathogenic microbial colonization. Therefore, microbial control in a RAS can potentially reduce the risk of infections and hence improve fish health. In the present study, a periodic microbial control was performed in a RAS with 16 tanks stocked with mirror carp (Cyprinus carpio) for 3 months. Half of the fish culture tanks were treated with 1 mg L⁻¹ peracetic acid (PAA) twice per week, while the other half remained untreated. The water circulation was interrupted immediately before each PAA-treatment, and resumed after 3 h. The total aerobic bacterial density was similar in all culture tanks, except during the PAA-treatments and the concurrent circulation interruptions. During these periods, the bacterial density decreased up to 90% in PAA-treated water, while a 6-fold bacterial increase was observed in untreated water. In the first 2 months of treatment, PAA-exposed fish showed lower plasma cortisol concentration than the unexposed fish. Subsequently, the trunk kidney leukocytes of PAA-exposed fish showed stronger respiratory burst than the unexposed fish. By the end of the experiment, the PAA-exposed fish had better gill morphology, compared to the unexposed fish. The present study indicates that periodic disinfection of culture water in
a RAS with PAA could transiently reduce the suspended bacteria density, modulate the fish stress response, and have an overall beneficial effect on fish health in the long term.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Humboldt-University of Berlin, Agricultural Research Service, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Authors: Liu, D. (Ekstern), Straus, D. L. (Ekstern), Pedersen, L. (Intern), Meinelt, T. (Ekstern)
Pages: 154-159
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Aquaculture
Volume: 485
ISSN (Print): 0044-8486
Ratings:
- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 1.151 SNIP 1.394
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.941 SNIP 1.263
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 2
- Scopus rating (2008): SJR 0.909 SNIP 1.173
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.019 SNIP 1.318
- Web of Science (2007): Indexed yes
- Scopus rating (2006): SJR 1.008 SNIP 1.689
- Web of Science (2006): Indexed yes
- Scopus rating (2005): SJR 0.915 SNIP 1.236
Physiological roles of tryptophan in teleosts: current knowledge and perspectives for future studies

Tryptophan is an essential amino acid with a huge functional versatility, in addition to its participation in protein synthesis. Because of the complexity of its metabolism, and the functional relevance of several of its metabolites, it directly or indirectly participates in a wide array of physiological pathways. This amino acid is a precursor for the synthesis of the neurotransmitter/neuromodulator serotonin (5HT), the hormone melatonin and kynurenine and related compounds such as kynurenic acid, quinolinic acid or niacin. Because of this, it has a key role in the regulation of processes ranging from the neuroendocrine to the
immune system in vertebrates. In aquaculture, extensive research has been performed to optimize the levels of tryptophan in the commercial diets for many fish species. Providing adequate levels of this amino acid is critically important for fish growth but also for fish welfare, as tryptophan has been shown to modulate fish behaviour, stress responses, and antioxidant and immune systems. Currently, available data suggest a wide variation in tryptophan requirements of different species ranging 0.3–1.3% of dietary protein level, but recent evidence also shows that fish tryptophan requirements can greatly vary depending on the rearing conditions of the fish. We also review here the participation of tryptophan and related metabolites in different physiological functions that are crucial for fish welfare. The review covers the involvement of tryptophan in 5HT- and melatonin-mediated functions, along with its participation in the regulation of the immune system and its role as an antioxidant and antitoxic agent in fish.

**General information**

State: Accepted/In press
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Iranian Fisheries Science Research Institute (IFSRI), Universidad De Granada, Universidade do Porto
Authors: Hoseini, S. M. (Ekstern), Pérez-Jiménez, A. (Ekstern), Costas, B. (Ekstern), Azeredo, R. (Ekstern), Gesto, M. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Reviews in Aquaculture (Print)
ISSN (Print): 1753-5123
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 4.75 SJR 1.818 SNIP 2.764
Scopus rating (2015): SJR 1.552 SNIP 2.016 CiteScore 3.82
Scopus rating (2014): SJR 1.51 SNIP 1.757 CiteScore 3.38
Scopus rating (2013): SJR 0.979 SNIP 1.142 CiteScore 2.05
Scopus rating (2012): SJR 1.001 SNIP 1.83 CiteScore 2.46
Scopus rating (2011): SJR 0.658 SNIP 1.658 CiteScore 1.13
Scopus rating (2010): SJR 0.233 SNIP 0.324
Original language: English
DOIs: 10.1111/raq.12223. Embargo ends: 09/03/2019
Publication: Research - peer-review – Journal article – Annual report year: 2017

**Pighvarrers vandring i Roskilde Fjord**

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology
Authors: Svendsen, J. C. (Intern), Støtrup, J. G. (Intern), Flavio, H. (Ekstern), Christoffersen, M. (Intern), Aarestrup, K. (Intern)
Publication date: 2017

**Publication information**

Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Publication: Communication › Internet publication – Annual report year: 2017

**Pighvars vandring i Roskilde Fjord**

**General information**
Pike (Esox lucius L.) on the edge: consistent individual movement patterns in transitional waters of the western Baltic

Pike in the western Baltic Sea live on the edge of their salinity tolerance. Under physiologically challenging conditions, organism may respond by moving to environmentally more benign areas during critical periods, such as during spawning. We hypothesised that pike in a brackish lagoon (8–10 ppt salinity) would perform spawning- and feeding-related movements between areas with different salinity regimes. Twenty-two pike were caught prior to spawning, tagged with acoustic transmitters, and their movements were tracked for 18 months. Pike showed two main patterns of movements that were consistent within individuals across two years. Whereas some individuals stayed in the lagoon year-round, most pike left the lagoon for longer periods after spawning and returned to the lagoon prior to following year’s spawning season. We found no evidence that probability of moving out of the lagoon co-varied with either length or condition factor. Despite the fact that the lagoon’s salinity is close to the reported upper limit for pike egg development, results indicated that all pike spawned in the lagoon. Correspondingly, genetic data showed that all fish belonged to the same reproductive population unit. Movement patterns thus appear to reflect individual variation in home-range and/or resource optimisation following ideal free principles.
PIT-tagging method for small fishes: A case study using sandeel (Ammodytes tobianus)

Passive integrated transponder (PIT) tags are commonly used to assess fish movement for use in fisheries management. Here, we investigated physiological and behavioral effects of tagging on sandeels (Ammodytes tobianus) using PIT tags constituting 2.1 ± 0.9% of their body weight. Swimming stamina (RSS), calculated as time spent swimming against the current relative to total swimming time, and tail beat frequency were compared between tagged and untagged fish as was blood hematocrit levels at 7, 14, and 42 d post-tagging. Survival and tag retention were also documented at 14, 42, and 84 d (via x-rays and dissections). RSS was not different between tagged and untagged fish with means (± SD) of 60 ± 9% and 61 ± 12%. Tail beat frequency was not different between tagged and untagged fish at 2.8 ± 0.3 and 3.0 ± 0.4 beats s⁻¹ for tagged and untagged fish, respectively. Likewise, hematocrit was not affected by tagging and levels were between 21–26% for both groups. Survival rates were high and did not differ between groups (96% for tagged and 99% untagged fish). Tag retention was 100%. X-rays and dissections did not reveal any signs of tag movement at 14–84 d, and there was no difference between relative positions of the tags. None of the tags were encapsulated in the body cavity after 14 d, whereas 40 and 56% of the tags were encapsulated in a thin tissue membrane between the intestine and kidney after 42 and 84 d, respectively. After 14 d all incisions had healed with only minor or no signs of the tag insertion site. Collectively, these data provide substantial evidence for the possibility of conducting large-scale tagging studies on this species in the field.
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.154 SNIP 1.135 CiteScore 1.7
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.022 SNIP 1.075
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.025 SNIP 1.274
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.906 SNIP 1.134
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.944 SNIP 1.023
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.076 SNIP 1.314
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.299 SNIP 1.22
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.934 SNIP 0.891
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.611 SNIP 0.836
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.546 SNIP 0.865
Original language: English
DOIs:
Plan for fiskepleje i Lindenborg Å: Distrikt 18 - vandsystem 03

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Geertz-Hansen, P. (Intern)
Number of pages: 23
Publication date: 2017

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: Danish

Series: Plan
Number: 56-2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Commissioned › Report – Annual report year: 2017

Plan for fiskepleje i Skjern Å: Distrikt 27 - vandsystem 01

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Christensen, H. A. (Intern), Mikkelsen, J. S. (Intern)
Number of pages: 115
Publication date: 2017

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: Danish

Series: Plan
Number: 58-2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Commissioned › Report – Annual report year: 2017

Plan for fiskepleje i tilløb til Lovns Bredning og Hjarbæk Fjord: Distrikt 19 - vandsystem 17 / Distrikt 22 - vandsystem 1-10

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Carøe, M. (Intern)
Number of pages: 21
Publication date: 2017

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: Danish

Series: Plan
Number: 57-2017
Main Research Area: Technical/natural sciences
Publication: Commissioned › Report – Annual report year: 2017
Plan for fiskepleje i Vandsystemer mellem Mariager Fjord (inkl.) og Limfjorden: Distrikt 16 - vandsystem 01-22a

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Mikkelsen, J. S. (Intern), Carøe, M. (Intern)
Number of pages: 37
Publication date: 2017

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: Danish
Series: Plan
Number: 55-2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Commissioned › Report – Annual report year: 2017

Plan for fiskepleje i Varde Å: Distrikt 28 - vandsystem 01

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Holm, M. K. (Intern)
Number of pages: 73
Publication date: 2017

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: Danish
Series: Plan
Number: 59-2017
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Commissioned › Report – Annual report year: 2017

Plankton and fisheries

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Brander, K. (Intern)
Number of pages: 704
Publication date: 2017

Host publication information
Title of host publication: Marine Plankton : A practical guide to ecology, methodology, and taxonomy
Publisher: Oxford University Press
Editors: Castellani , C., Edwards, M.
ISBN (Print): 9780199233267
Chapter: 8
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2017

Plankton biogeography: An exploration of patterns, drivers, functions, and predictability

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Population dynamics of juvenile brown trout (Salmo trutta L.), recruitment, mortality, biological production and smolt yield in two Danish baeks

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Brun, P. G. (Intern), Payne, M. (Intern), Kiørboe, T. (Intern)
Number of pages: 196
Publication date: 2017

Host publication information
Title of host publication: Brown Trout: Biology, Ecology and Management
Publisher: Wiley
Editors: Lobón-Cervia, J., Sanz, N.
ISBN (Print): 978-1-119-26831-4
Chapter: 14
Main Research Area: Technical/natural sciences
Publication: Research › Ph.D. thesis – Annual report year: 2017

Population structure and connectivity of tiger sharks (Galeocerdo cuvier) across the Indo-Pacific Ocean basin

Population genetic structure using nine polymorphic nuclear microsatellite loci was assessed for the tiger shark (Galeocerdo cuvier) at seven locations across the Indo-Pacific, and one location in the southern Atlantic. Genetic analyses revealed considerable genetic structuring (FST > 0.14, p<0.001) between all Indo-Pacific locations and Brazil. By contrast, no significant genetic differences were observed between locations from within the Pacific or Indian Oceans, identifying an apparent large, single Indo-Pacific population. A lack of differentiation between tiger sharks sampled in Hawaii and other Indo-Pacific locations identified herein is in contrast to an earlier global tiger shark nDNA study. The results of our power analysis provide evidence to suggest that the larger sample sizes used here negated any weak population subdivision observed previously. These results further highlight the need for crossjurisdictional efforts to manage the sustainable exploitation of large migratory sharks like G. cuvier.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Queensland, Queensland Department of Primary Industries
Authors: Holmes, B. J. (Ekstern), Williams, S. M. (Ekstern), Otway, N. M. (Ekstern), Eg Nielsen, E. (Intern), Maher, S. L. (Ekstern), Bennett, M. B. (Ekstern), Ovenden, J. R. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Royal Society Open Science
Volume: 4
Issue number: 7
Article number: 170309
ISSN (Print): 2054-5703
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 2.27 SJR 0.957 SNIP 1.017
Web of Science (2016): Indexed yes
Scopus rating (2015): SNIP 0.957 SJR 0.636 CiteScore 1.92
Original language: English
MULTIDISCIPLINARY, MOVEMENT PATTERNS, HABITAT USE, AUSTRALIA, MARINE, DIFFERENTIATION, CONSERVATION, SOFTWARE, TRENDS, HAWAII, GENETICS, tiger shark, Galeocerdo cuvier, population structure,
Positioning of aquatic animals based on time-of-arrival and random walk models using YAPS (Yet Another Positioning Solver)

Aquatic positional telemetry offers vast opportunities to study in vivo behaviour of wild animals, but there is room for improvement in the data quality provided by current procedures for estimating positions. Here we present a novel positioning method called YAPS (Yet Another Positioning Solver), involving Maximum Likelihood analysis of a state-space model applied directly to time of arrival (TOA) data in combination with a movement model. YAPS avoids the sequential positioning-filtering-approach applied in alternative tools by using all available data in a single model, and offers better accuracy and error control. Feasibility and performance of YAPS was rigorously tested in a simulation study and by applying YAPS to data from an acoustic transmitter towed in a receiver array. Performance was compared to an alternative positioning model and proprietary software. The simulation study and field test revealed that YAPS performance was better and more consistent than alternatives. We conclude that YAPS outperformed the compared alternative methods, and that YAPS constitute a vast improvement to currently available positioning software in acoustic telemetry. Additionally, in contrast to vendor-supplied solutions, YAPS is transparent, flexible and can easily be adapted and extended for further improvements or to meet study specific requirements such as three-dimensional positioning.
Potentiale for nyt og tættere nordisk samarbejde i Højarktis – SVALGREEN

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University Centre in Svalbard, Aarhus University, University of Copenhagen
Authors: Edelvang, K. (Intern), Christiansen, H. H. (Ekstern), Forchhammer, M. (Ekstern), Skov, H. (Ekstern), Priemé, A. (Ekstern)
Pages: 340-344
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Tidsskriftet Grønland
ISSN (Print): 0017-4556
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Original language: Danish
Electronic versions:
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Potential for cumulative effects of human stressors on fish, sea birds and marine mammals in Arctic waters

General information
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Practical steps toward integrating economic, social and institutional elements in fisheries policy and management

While international agreements and legislation call for incorporation of four pillars of sustainability, the social (including cultural), economic and institutional aspects (the ‘human dimension’) have been relatively neglected to date. Three key impediments have been identified: a relative lack of explicit social, economic and institutional objectives; a general lack of process (frameworks, governance) for routine integration of all four pillars of sustainability; and a bias towards biological considerations. Practical integration requires a ‘systems’ approach with explicit consideration of strategic and operational aspects of management; multidisciplinary or transdisciplinary evaluations; practical objectives for the four pillars of sustainability; appropriate participation; and a governance system that is able to integrate these diverse considerations in management. We challenge all involved in fisheries to immediately take five practical steps toward integrating ecological, economic, social and institutional aspects: (1) Adopt the perspective of the fishery as a ‘system’ with interacting natural, human and management elements; (2) Be aware of both strategic and operational aspects of fisheries assessment and management; (3) Articulate overarching objectives that incorporate all four pillars of sustainability; (4) Encourage appropriate (and diverse) disciplinary participation in all aspects of research, evaluation and management; and (5) Encourage development of (or emulate) participatory governance.

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of New Brunswick, Australian National University, Saint Mary's University, Cathy Dichmont Consulting, Wageningen IMARES, CSIRO, Fisheries and Oceans Canada, Aalborg University
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Predator persistence through variability of resource productivity in Tritrophic systems

The trophic structure of species communities depends on the energy transfer between trophic levels. Primary productivity varies strongly through time, challenging the persistence of species at higher trophic levels. Yet resource variability has mostly been studied in systems with only one or two trophic levels. We test the effect of variability in resource productivity in a tritrophic model system including a resource, a size-structured consumer, and a size-specific predator. The model complies with fundamental principles of mass conservation and the body-size dependence of individual-level energetics and predator-prey interactions. Surprisingly, we find that resource variability may promote predator persistence. The positive effect of variability on the predator arises through periods with starvation mortality of juvenile prey, which reduces the intraspecific competition in the prey population. With increasing variability in productivity and starvation mortality in the juvenile prey, the prey availability increases in the size range preferred by the predator. The positive effect of prey mortality on the trophic transfer efficiency depends on the biologically realistic consideration of body size-dependent and food-dependent functions for growth and reproduction in our model. Our findings show that variability may promote the trophic transfer efficiency, indicating that environmental variability may sustain species at higher trophic levels in natural ecosystems.

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Predicting ecosystems for managing a dynamic ocean

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Publication date: 2017

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Predicting the consequences of species loss using size-structured biodiversity approaches: Consequences of biodiversity loss

Understanding the consequences of species loss in complex ecological communities is one of the great challenges in current biodiversity research. For a long time, this topic has been addressed by traditional biodiversity experiments. Most of these approaches treat species as trait-free, taxonomic units characterizing communities only by species number without accounting for species traits. However, extinctions do not occur at random as there is a clear correlation between extinction risk and species traits. In this review, we assume that large species will be most threatened by extinction and use novel allometric and size-spectrum concepts that include body mass as a primary species trait at the levels of populations and individuals, respectively, to re-assess three classic debates on the relationships between biodiversity and (i) food-web structural complexity, (ii) community dynamic stability, and (iii) ecosystem functioning. Contrasting current expectations, size-structured approaches suggest that the loss of large species, that typically exploit most resource species, may lead to future food webs that are less interwoven and more structured by chains of interactions and compartments. The disruption of natural body-mass distributions maintaining food-web stability may trigger avalanches of secondary extinctions and strong trophic cascades with expected knock-on effects on the functionality of the ecosystems. Therefore, we argue that it is crucial to take into account body size as a species trait when analysing the consequences of biodiversity loss for natural ecosystems. Applying size-structured approaches provides an integrative ecological concept that enables a better understanding of each species' unique role across communities and the causes and consequences of biodiversity loss.
Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures

Unintentional mortality of higher trophic-level species in commercial fisheries (bycatch) represents a major conservation concern as it may influence the long-term persistence of populations. An increasingly common strategy to mitigate bycatch of harbor porpoises (Phocoena phocoena), a small and protected marine top predator, involves the use of pingers (acoustic alarms that emit underwater noise) and time-area fishing closures. Although these mitigation measures can reduce harbor porpoise bycatch in gillnet fisheries considerably, inference about the long-term population-level consequences is currently lacking. We developed a spatially explicit individual-based simulation model (IBM) with the aim to evaluate the effectiveness of these two bycatch mitigation measures. We quantified both the direct positive effects (i.e., reduced bycatch) and any indirect negative effects (i.e., reduced foraging efficiency) on the population size using the inner Danish waters as a biological system. The model incorporated empirical data on gillnet fishing effort and noise avoidance behavior by free-ranging harbor porpoises exposed to randomized high-frequency (20- to 160-kHz) pinger signals. The IBM simulations revealed a synergistic relationship between the implementation of time-area fishing closures and pinger deployment. Time-area fishing closures reduced bycatch rates substantially but not completely. In contrast, widespread pinger deployment resulted in total mitigation of bycatch but frequent and recurrent noise avoidance behavior in high-quality foraging habitat negatively affected individual survival and the total population size. When both bycatch mitigation measures were implemented simultaneously, the negative impact of pinger noise-induced sub-lethal behavioral effects on the population was largely eliminated with a positive effect on the population size that was larger than when the mitigation measures were used independently. Our study highlights that conservationists and policy makers need to consider and balance both the direct and indirect effects of harbor porpoise bycatch mitigation measures before enforcing their widespread implementation. Individual-based simulation models, such as the one presented here, offer an efficient and dynamic framework to evaluate the impact of human activities on the long-term survival of marine populations and can serve as a basis to design adaptive management strategies that satisfy both ecological and socioeconomic demands on marine ecosystems.

General information
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Main Research Area: Technical/natural sciences
Prediction of required ozone dosage for pilot recirculating aquaculture systems based on laboratory studies

In recirculating aquaculture systems (RAS), the water quality changes continuously. Organic and inorganic compounds accumulate creating toxic conditions for the farmed organisms. Ozone improves water quality diminishing significantly both bacteria load and dissolved organic matter. However, in a non-meticulously designed system, residual ozone might reach the culture tanks causing significant harm to cultured species or excess costs. The aim of the study was to predict the suitable ozone dosage in pilot RAS, for water treatment purposes, based on laboratory studies. The ozone effect on water quality of freshwater RAS and system’s ozone demand was investigated. Bench-scale ozonation experiments revealed the ozone demand of the system to be 180 mg O3/h. Three different ozone dosages were applied to four replicated systems with fixed feed loading (1.56 kg feed/m3 make up water). Results suggested that the optimal ozone dosage was 15g O3/ kg feed. Selected water quality parameters were measured, assessing biofilters performance as well as nitrogen and carbon-based compound concentration change during ozonation. Overall, this study contributed to a better understanding of the challenges of an ozonated RAS leading to the optimal design of such systems.
environmental conditions and pollution. Arctic Oceans hold a substantial amount of the world’s remaining oil and gas reserves, but exploration is extremely technically challenging. To enable proper risk assessment, it is crucial to understand how oil spills can impact Arctic marine ecosystems. During polar night, biological processes in Arctic marine ecosystems are conventionally believed to slow down or cease. Indeed, several marine species have overwintering strategies, such as the Calanus copepods that overwinters for 8-10 months at depths of 200-2000 m and migrate to the productive surface layers to feed on the short Arctic bloom. We conducted a winter experiment with two species of Arctic copepod to study the impact of long term exposure to oil during polar night. We used the ecological important Calanus hyperboreus (winter breeder) and C. glacialis (spring breeder) as tests species, and quantified effects on the fitness-related traits mortality, egg production, grazing and egg hatching. Females were incubated in bottles with seawater and the oil compound pyrene (in concentrations of 0.1, 1, 10, 100 and 100+ nM) from December to March. They were transferred to clean seawater and fed in excess for 2-3 weeks until termination of the experiment. Mortality was checked daily, and egg and fecal pellets were collected within 24 h of production. Egg hatching success was determined at the beginning, middle and end of the experiment. Preliminary results indicate that C. hyperboreus exhibit a delayed response to pyrene through reduced feeding after transfer to clean seawater. Effects diminish over time, and feeding rate is recovered after 14 days without exposure to oil. Both egg production and feeding rate of C. glacialis is impacted by exposure in a concentration dependent manner after transfer to clean seawater. These findings suggest, that long term oil exposure during overwintering does indeed impact both Calanus species, and that C. hyperboreus seem to be more robust than the smaller C. glacialis. While effects on C. glacialis may have implications for stock recruitment within the season, potential effects on C. hyperboreus are likely delayed until next season. Negative effects on copepods may potentially affect the entire food chain and have severe ecosystem effects.

Prevalence and risk factors associated with Theileria parva infection in cattle in three regions of Tanzania

Ticks and tickborne diseases (TBDs) are serious constraints to cattle production in Tanzania and other tropical and subtropical countries. Among the TBDs, East Coast fever (ECF) is the most important as it causes significant economic losses to the cattle industry in Tanzania. However, control of ECF in Tanzania has continued to be a challenge due to inadequate epidemiological information. The main objective of this study was to determine the epidemiological situation of Theileria parva infections in cattle kept under pastoral and agro-pastoral farming systems in Mara, Singida, and Mbeya regions of Tanzania. Blood samples were collected from 648 cattle in the three regions. Genomic DNA was extracted and amplified in a polymerase chain reaction (PCR) using T. parva-specific primers targeting the 104-kD antigen (P104) gene. In addition, information was collected on the possible risk factors of T. parva infection (animal age, region, animal sex, tick burden, tick control method, and frequency of acaricide application). The prevalence of T. parva across the three regions was 14.2%. There was variation in prevalence among the three regions with Mara (21.8%) having a significantly higher (p = 0.001) prevalence than the other regions. Moreover, Mbeya exhibited relatively lower prevalence (7.4%) compared to the other regions. Factors found to be significantly associated with an animal being PCR positive for T. parva were region (p = 0.001) and tick burden (p = 0.003). Other factors were not found to be significant predictors of being PCR positive for T. parva. The present study showed high variation in tick burden and T. parva prevalence across the regions. Therefore, different strategic planning and cost-effective control measures for ticks and T. parva infection should be implemented region by region in order to reduce losses caused by ticks and ECF in the study area.
Forage fish occupy a central position in marine food-webs worldwide by mediating the transfer of energy and organic matter from lower to higher trophic levels. The lesser sandeel (Ammodytes marinus) is one of the ecologically and economically most important forage fish species in the North-east Atlantic, acting as a key prey for predatory fish and sea birds, as well as supporting a large commercial fishery. In this case study, we investigate the underlying factors affecting recruitment and how these in turn affect productivity of the North Sea sandeel using long-term data and modelling. Our results demonstrate how sandeel productivity in the central North Sea (Dogger Bank) depends on a combination of
external and internal regulatory factors, including fishing and climate effects, as well as density dependence and food availability of the preferred zooplankton prey (Calanus finmarchicus and Temora longicornis). Furthermore, our model scenarios suggest that while fishing largely contributed to the abrupt stock decline during the late 1990s and the following period of low biomass, a complete recovery of the stock to the highly productive levels of the early 1980s would only be possible through changes in the surrounding ecosystem, involving lower temperatures and improved feeding conditions. To that end, we stress the need for ecosystem-based management accounting for multiple internal and external factors occurring within the broader context of the ecosystem in which forage fish species, such as sandeel, play an important and integral part.
Prøv noget nyt: Spis kutling

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Pukkellaksen trækker ind i danske vandløb

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
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Pukkellaks fanget i endnu et dansk vandløb

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Authors: Sivebæk, F. (Intern)
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Pukkellaks – status på forekomst af pukkellaks i danske vandløb og kystnære områder

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
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Pulse versus continuous peracetic acid applications: Effects on rainbow trout performance, biofilm formation and water quality
Peracetic acid (PAA) products are being introduced to aquaculture as sustainable disinfectants. Two strategies are used to apply PAA: high dose pulse applications, or low dose continuous application. In the present study, their impacts on fish health and water quality were investigated in triplicate flow-through tanks stocked with rainbow trout. The gentler and shorter water cortisol increase measured along twice-per-week pulse applications of 1 mg L⁻¹ PAA indicated a progressive adaptation of fish. In contrast, the continuous application of 0.2 mg L⁻¹ PAA caused no stress to fish. Meanwhile, no mortality and no impact on growth or innate cellular immunity were observed. The pulse applications restricted biofilm formation, and partially inhibited nitrification. Additionally, the highest oxygen concentration and stable pH were observed. In contrast, the continuous application promoted biofilm formation, and caused a pH increase and intermediate oxygen concentration. The contrast was probably due to different susceptibility of microbes to PAA-induced oxidative stress. To summarize, pulse PAA applications cause minor stress in fish, but have advantages over continuous application by ensuring better water quality.
Quantifying predation on Baltic cod early life stages

Predation on cod (Gadus morhua) eggs by sprat (Sprattus sprattus) and herring (Clupea harengus) is known to be one of the processes influencing reproductive success of the eastern Baltic cod and has been reported to have contributed to lack of recovery of the stock in the 1990s. This study quantifies the predation on cod eggs in the Bornholm Basin, the major spawning area of cod in the central Baltic Sea, in the 1990s in comparison with the second half of the 2000s. The analyses involve estimating daily consumption rates of predator populations, which are then compared with corresponding daily egg production rates. As a methodological advancement compared with earlier studies, spatially resolved information on predator distribution and abundance is utilized in quantifying predator stock size. This resulted in more realistic consumption estimates in relation to overall egg production compared with earlier studies that consistently overestimated predation pressure by clupeids. Our results suggest a generally lower predation pressure on cod eggs in the mid- to late 2000s, due to a combination of reduced predator abundance and lower daily rations by individual predators.
Reconciling agriculture and stream restoration in Europe: A review relating to the EU Water Framework Directive

Agriculture is widespread across the EU and has caused considerable impacts on freshwater ecosystems. To revert the degradation caused to streams and rivers, research and restoration efforts have been developed to recover ecosystem functions and services, with the European Water Framework Directive (WFD) playing a significant role in strengthening the progress.

Analysing recent peer-reviewed European literature (2009–2016), this review explores 1) the conflicts and difficulties faced when restoring agriculturally impacted streams, 2) the aspects relevant to effectively reconcile agricultural land uses and healthy riverine ecosystems and 3) the effects and potential shortcomings of the first WFD management cycle.

Our analysis reveals significant progress in restoration efforts, but it also demonstrates an urgent need for a higher number and detail of restoration projects reported in the peer-reviewed literature. The first WFD cycle ended in 2015 without reaching the goal of good ecological status in many European water-bodies. Addressing limitations reported in recent papers, including difficulties in stakeholder integration and importance of small headwater streams, is crucial. Analysing recent developments on stakeholder engagement through structured participatory processes will likely reduce perception discrepancies and increase stakeholder interest during the next WFD planning cycle.

Despite an overall dominance of nutrient-related research, studies are spreading across many important topics (e.g. stakeholder management, land use conflicts, climate change effects), which may play an important role in guiding future policy. Our recommendations are important for the second WFD cycle because they 1) help secure the development and dissemination of science-based restoration strategies and 2) provide guidance for future research needs.

**General information**

**State:** Published

**Organisations:** National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Porto

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Reducing discards without reducing profit: Free gear choice in a Danish result-based management trial

The 2013 Common Fisheries Policy introduced a landing obligation on a range of species. This is changing the fundamental principles on which EU fisheries management is based, with more focus on the full accountability of all catches (a move towards catch quota management) and less accountability on the means used to obtain these catches (a move towards results-based management). To investigate the potentials and challenges that these paradigm shifts give rise to, a 6-months ‘unrestricted gear’ trial was performed in Denmark in 2015. Twelve trawlers of different size, rigging,
fishing area and target species were challenged to test their own solutions to reduce unwanted bycatch and/or choke species, while maintaining their profitability. Fully documented fishery (FDF) was required, including electronic monitoring, self-estimation of discards and haul-by-haul catch documentation. Fishers’ participation in the trial was partly incentivized through the allocation of additional quota. Fishers used twinned standard and test gears whenever possible, or switched gear sequentially otherwise. The participating fishers tested different options depending on their fishery and the type of issues they faced individually, and adjusted their test fishery over time through incremental small steps. A total of 1497 hauls were analysed for landings, discards and discard-ratio (discard to catch ratio), along with species composition and temporal trends. Nine vessels reduced discard ratio in the test fishery, one showed no difference between test and control fishery, while two vessels displayed an increase in discard ratio. The catch compositions were also significantly different, with fewer predicted “choke species” occurring in the test fisheries and a more valuable size composition. Ultimately, despite smaller landings in multiple vessels, no vessel showed reduction in value-per-unit-effort (VPUE) and one Baltic vessel significantly increased the VPUE. No temporal trends in discard ratio were noted. This trial showed that relaxing technical regulations has a potential to provide some flexibility to cope with the landing obligation, where unwanted catches could be reduced to some extent without negative effects on economic viability. Some practical implementation challenges were nevertheless encountered, which are discussed in the perspective of implementing results-based management at full scale.

General information
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Reflex impairment, physiological stress, and discard mortality of European plaice Pleuronectes platessa in an otter trawl fishery

The reformed European Common Fisheries Policy introduced a discard ban, with a possibility of exempting species where a high discard survival can be demonstrated. This necessitates a validation of the methods used for estimating the discard mortality of candidate species. In this study, we assess whether reflex impairment can predict short-term mortality in commercially trawled European plaice upon landing and after air exposure of up to 90 min. Sub-lethal stress was assessed by a suite of physiological variables. Over a 10-day period, mortality was monitored for a total of 199 plaice following trawl and air exposure of varying duration, and for 50 control fish scored for reflex impairment on board the vessel. Mortality was only observed in fish exposed to air for >60 min, and averaged 11.1% (95% CI = 7.1–16.3%). Reflex impairment was found to be a significant (P < 0.001) predictor of mortality in a generalized linear model, excluding other initially included variables by using a stepwise method. Plasma cortisol, haematocrit, and plasma osmolality all indicated a profound and increasing level of stress with air exposure, accompanied by a near depletion of muscle phosphocreatine and nucleotides. Fishing site had an unexpected, but significant (p < 0.05) effect on stress levels, which was also reflected in reflex impairment and mortality. Based on these findings, a possible exemption from the discard ban should include considerations on the duration of air exposure.

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Remote electronic monitoring and the landing obligation – some insights into fishers’ and fishery inspectors’ opinions

The European fisheries management is currently undergoing a fundamental change in the handling of catches of commercial fisheries with the implementation of the 2013 Common Fisheries Policy. One of the main objectives of the policy is to end the practice of discarding in the EU by 2019. However, for such changes to be successful, it is vital to ensure stakeholders acceptance, and it is prudent to consider possible means to verify compliance with the new regulation. Remote Electronic Monitoring (REM) with Closed-Circuit Television (CCTV) has been tested in a variety of fisheries worldwide for different purposes and is currently considered as one possible tool to ensure compliance with a European ban on discards. This study focuses on Danish fishery inspectors and on fishers with REM experience, whose opinions are less well known. Their views on the landing obligation and on the use of REM were investigated using interviews and questionnaires, and contrasted to some fishers without REM experience. 80% of fishery inspectors and 58% of REM-experienced fishers expressed positive views on REM. 9 out of 10 interviewed fishers without REM experience were against REM. Participation in a REM trial has not led to antipathy towards REM. Fishery inspectors saw on-board observers, at-sea control and REM as the three best solutions to control the landing obligation but shared the general belief that the landing obligation cannot be enforced properly and will be difficult for fishers to comply with. The strengths and weaknesses of REM in this context are discussed.
Repeated intra-specific divergence in lifespan and ageing of African annual fishes along an aridity gradient

Lifespan and ageing are substantially modified by natural selection. Across species, higher extrinsic (environmentally-related) mortality (and hence shorter life expectancy) selects for the evolution of more rapid ageing. However, among populations within species, high extrinsic mortality can lead to extended lifespan and slower ageing as a consequence of condition-dependent survival. Using within-species contrasts of eight natural populations of Nothobranchius fishes in common garden experiments, we demonstrate that populations originating from dry regions (with short life expectancy) had shorter intrinsic lifespans and a greater increase in mortality with age, more pronounced cellular and physiological deterioration (oxidative damage, tumor load), and a faster decline in fertility than populations from wetter regions. This parallel intra-specific divergence in lifespan and ageing was not associated with divergence in early life history (rapid growth, maturation) or pace-of-life syndrome (high metabolic rates, active behavior). Variability across four study species suggests that a combination of different ageing and life history traits conformed with or contradicted the predictions for each species. These findings demonstrate that variation in lifespan and functional decline among natural populations are linked, genetically underpinned, and can evolve relatively rapidly. This article is protected by copyright. All rights reserved.

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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Academy of Sciences of the Czech Republic, University of Chemistry and Technology in Prague, University of Chemistry and Technology, Prague
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Respirometry increases cortisol levels in rainbow trout Oncorhynchus mykiss: implications for measurements of metabolic rate

This study aimed to assess the extent to which chasing, handling and confining Oncorhynchus mykiss to a small respirometer chamber during respirometric experiments is stressful and affects metabolic measurements. The study observed increased cortisol levels in animals tested using a chase protocol and subsequent intermittent-flow respirometry, suggesting that this procedural treatment may stress animals.
Responsible genetic approach to stock restoration, sea ranching and stock enhancement of marine fishes and invertebrates

The origins of agriculture date to about 9000 years, but commercial culture and supplementation of marine populations reach back only a few centuries. Hence, wild populations still play a major role in seafood production. Closed culture, stock restorations, sea ranching and stock enhancements of marine fishes and invertebrates have been implemented with various outcomes. A review of the literature indicates that considerable effort has been directed toward culture technologies to maximize production, but scant attention has been given to genetic risks to wild populations. Genetic risks from stock enhancements can be substantial, because of inattention to brood-stock sizes, and because hybridization between hatchery-reared and wild individuals can lower the fitness or lead to the extinction of a natural population. In many cases, small brood-stock sizes have led to the loss of genetic diversity. In some cases, hatchery-reared individuals appear to have replaced, rather than supplemented, wild populations. Here, we outline a responsible approach to managing genetic resources that includes six steps: (1) assess the costs and benefits of a stock restoration or enhancement, (2) set goals and genetic benchmarks, (3) use appropriate brood stock and limit domestication, (4) design release strategies that maximize the effectiveness of supplementation efforts, (5) track individuals after release and (6) minimize genetic impacts on wild populations. Stock supplementation is often viewed as an immediate solution to a stock decline, but should be undertaken as a last resort because of the high cost of implementation and the substantial ecological and genetic risks to wild populations.
Restoration of a boulder reef in temperate waters: Strategy, methodology and lessons learnt

Anthropogenic impacts on marine habitats are a global problem, particularly in coastal areas. While boulder reefs in temperate waters hold high biomass and biodiversity, and may be unable to recover from anthropogenic stressors without restoration efforts, little is known about how to restore and conserve this important marine habitat. Limited knowledge is a serious impediment to projects aimed at restoring boulder reefs that have been degraded or removed by substrate extraction. In 2008, a boulder reef was restored in Kattegat, the transitional waters between the North Sea and the Baltic Sea, using differently sized boulders. The restored reef covered approximately 27,600 m² seafloor and included 100,712 tons of boulders added at depths ranging between 4 and 11 m. This paper describes methodology and lessons learned during the restoration project. Before the restoration, geological and geotechnical surveys confirmed that the sea bed could support added boulders, and high resolution bathymetric surveys provided input for the design of the reef, particularly for numerical modelling of the hydrographic and sediment transport conditions. Numerical modelling was used to derive hydrographic design conditions for boulder placements and further, to ensure that the restored reef would not affect the sea bed morphology and hydrographic conditions at a local harbour and at a protected habitat, both situated in the vicinity of the restoration area. Data on the physical structure of the restored boulder reef, collected in 2009, demonstrated that cavernous structures and shallow reef areas were restored. Moreover, data collected in 2012 confirmed the stability of the restored reef. Finally, results highlighted the importance of stakeholder mapping at the outset, appropriate timing of stakeholder involvement and ongoing consideration of stakeholder perceptions. Charting strategy and introducing a checklist for marine restoration projects, this paper outlines important considerations and methodology needed to ensure that restoration of temperate reef structures meet the objectives, without having undesirable effects on existing hydrographic and morphological conditions, including nearby coastal areas and protected marine habitats.

General information
State: Published
Authors: Støttrup, J. G. (Intern), Dahl, K. (Ekstern), Niemann, S. (Ekstern), Stenberg, C. (Intern), Reker, J. (Ekstern), Stamphøj, E. M. (Ekstern), Göke, C. (Ekstern), Svendsen, J. C. (Intern)
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BFI (2013): BFI-level 1
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ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
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Scopus rating (2012): SJR 1.791 SNIP 2.111 CiteScore 3.48
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Sustainable management of coastal systems requires an iterative process using a multidisciplinary approach that integrates the three pillars of sustainable development: environmental protection, social progress and economic growth. The Systems Approach Framework (SAF) provides a structure for an Integrated Coastal Management (ICM) process with an effective science-policy interface that embraces the challenge of simulating complex systems and encapsulates citizen involvement from the onset. We analysed the findings of 16 re-analyses studies undertaken in eight Baltic Sea countries to test how well SAF elements had been applied in practice within ICM processes. The results revealed the main ICM driver was ecology or economy. Several ICM elements as defined by the SAF are already standard within the Baltic Sea region. However, in many cases, the omission of stakeholder and institutional mapping as instructed by the SAF led to an unbalanced participation of stakeholders, or in some cases, lack of involvement of stakeholders at the start of the process. Most of the ICM processes failed to include an integrated, cross-sectorial, ecological-socio-economic assessment. This extends from the lack of system thinking when defining the Policy Issue for the problem and when developing the conceptual model, which often leads to one-sectorial solutions, which may not be sustainable. Furthermore, the duration of some of the ICM processes was prolonged due to disagreement and opposition early in the process and/or lack of manager experiences in conducting a stakeholder participatory process. Finally, due to its stringent structure the SAF was found to be a suitable quality assurance for sustainable ICM processes.
Digestive physiology is considered to be under circadian control, but there is little evidence in teleost fish. The present study explored the rhythmicity and plasticity to feeding schedules of enzymatic digestion in a candidate aquaculture fish, *Trachinotus falcatus*.
the permit (Trachinotus falcatus). The first experiment identified the rhythms of digestive factors throughout the light-dark (LD) cycle. Gastric luminal pH and pepsin activity showed significant daily variation albeit not rhythmic. These dynamic changes were likewise observed in several digestive enzymes, in which the activities of intestinal protease, chymotrypsin and lipase exhibited significant daily rhythms. In the second experiment, the existence of feed anticipatory activity in the digestive factors was investigated by subjecting the fish to either periodic or random feeding. Anticipatory gastric acidification prior to feeding was identified in periodically fed fish. However, pepsin activity did not exhibit such anticipation but a substantial postprandial increase was observed. Intestinal protease, leucine aminopeptidase and lipase anticipated periodic mealtime with elevated enzymatic activities. Plasma melatonin and cortisol demonstrated robust daily rhythms but feeding time manipulations revealed no significant impact. Plasma ghrelin level remained constant during the LD cycle and appeared to be unaffected by differing feeding regimes as well. Taken together, the digestive factors of permit were highly dynamic during the LD cycle. Periodic feeding entrained digestive physiology and mediated anticipatory gastric acidification and intestinal enzymatic activities. This knowledge will be essential in developing feeding protocols and husbandry-related welfare strategies that will further advance this candidate finfish as an aquaculture species.

General information
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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, NOFIMA, Research Institute for Aquaculture No. 1
Authors: Lazado, C. C. (Intern), Pedersen, P. B. (Intern), Nguyen, H. Q. (Ekstern), Lund, I. (Intern)
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Journal: Comparative Biochemistry and Physiology. Part A: Molecular & Integrative Physiology
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.16 SJR 0.794 SNIP 0.879
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.917 SNIP 0.915 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.983 SNIP 0.94 CiteScore 2.18
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.956 SNIP 1.058 CiteScore 2.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.773 SNIP 1.032 CiteScore 2.18
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.858 SNIP 1.048 CiteScore 2.2
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.836 SNIP 1.041
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.794 SNIP 0.944
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BFI (2008): BFI-level 1
Sæler og fisk som naturlige måleplattformer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Boje, J. (Intern)
Pages: 270-276
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BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed no
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ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
BFI (2009): BFI-level 1
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Original language: Danish
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Scavenging strategies of hagfish in the Kattegat

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Publication: Research › Poster – Annual report year: 2017

Seasonal body size reductions with warming covary with major body size gradients in arthropod species
Major biological and biogeographical rules link body size variation with latitude or environmental temperature, and these rules are often studied in isolation. Within multivoltine species, seasonal temperature variation can cause substantial changes in adult body size, as subsequent generations experience different developmental conditions. Yet, unlike other size patterns, these common seasonal temperature–size gradients have never been collectively analysed. We undertake the largest analysis to date of seasonal temperature-size gradients in multivoltine arthropods, including 102 aquatic and terrestrial species from 71 global locations. Adult size declines in warmer seasons in 86% of the species examined. Aquatic species show approximately 2.5-fold greater reduction in size per °C of warming than terrestrial species, supporting the hypothesis that greater oxygen limitation in water than in air forces aquatic species to exhibit greater plasticity in body size with temperature. Total percentage change in size over the annual cycle appears relatively constant with annual temperature range but varies between environments, such that the overall size reduction in aquatic-developing species (approx. 31%) is almost threefold greater than in terrestrial species (approx. 11%). For the first time, we show that strong correlations exist between seasonal temperature–size gradients, laboratory responses and latitudinal–size clines, suggesting that these patterns share common drivers.
General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Queen Mary University of London, University of Liverpool
Authors: Horne, C. R. (Ekstern), Hirst, A. G. (Intern), Atkinson, D. (Ekstern)
Publication date: 2017
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Journal: Proceedings of the Royal Society B: Biological Sciences
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  BFI (2018): BFI-level 2
  Web of Science (2018): Indexed yes
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  Web of Science (2017): Indexed yes
  BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 2.541 SNIP 1.474
  Web of Science (2016): Indexed yes
  BFI (2015): BFI-level 2
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  Web of Science (2015): Indexed yes
  BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.916 SNIP 1.673 CiteScore 4.18
  Web of Science (2014): Indexed yes
  BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.091 SNIP 1.762 CiteScore 5.08
  ISI indexed (2013): ISI indexed yes
  BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.947 SNIP 1.881 CiteScore 4.99
  ISI indexed (2012): ISI indexed yes
  Web of Science (2012): Indexed yes
  BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.234 SNIP 1.789 CiteScore 5.02
  ISI indexed (2011): ISI indexed yes
  Web of Science (2011): Indexed yes
  BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.894 SNIP 1.61
  Web of Science (2010): Indexed yes
  BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.581 SNIP 1.389
  Web of Science (2009): Indexed yes
  BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.364 SNIP 1.372
  Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.475 SNIP 1.447
  Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.925 SNIP 1.713
  Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.633 SNIP 1.52
  Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.872 SNIP 1.699
  Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.891 SNIP 1.561
Seasonal succession in zooplankton feeding traits reveals trophic trait coupling

The seasonal forcing of pelagic communities invokes a succession of the dominant phytoplankton and zooplankton species. Here, we characterize the seasonal succession of the plankton traits and their interactions using observations and model simulations of the plankton community in the western English Channel. We focus on activity traits that characterize the defensive and feeding abilities of zooplankton and distinguish between low risk, low return ambush feeders and high risk, high return feeding-current feeders. While the phytoplankton succession depends on traits related to nutrient acquisition and photosynthesis, it also depends on grazing which couples feeding and motility traits across trophic guilds. Despite interannual variations in the species dominating the protist plankton community, the seasonal trait distribution reveals robust and repeatable seasonal patterns, changing between non-motile cells flourishing in spring and motile community dominating during summer. The zooplankton community is dominated by active feeding-current feeders with peak biomass in the late spring declining during summer. The model reveals how zooplankton grazing reinforces protist plankton seasonal succession and shows how the physical environment controls the vertical structure of plankton communities, where ambush feeders exhibit a preference for greater depths during summer. We characterize the seasonal succession as trophic trait coupling and conjecture that this coupling leads to a trophic trait cascade where successive trophic levels alternate in their expression of activity traits further up in the food chain.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Authors: Kenitz, K. (Intern), Visser, A. (Intern), Mariani, P. (Intern), Andersen, K. H. (Intern)
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
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Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
Seasonal succession in zooplankton feeding traits reveals trophic trait coupling

General information
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Authors: Kenitz, K. (Intern), Visser, A. (Intern), Mariani, P. (Intern), Andersen, K. H. (Intern)
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Publication: Research › Conference abstract for conference – Annual report year: 2017
Sea trout (Salmo trutta L.) in Denmark

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Rasmussen, G. H. (Intern), Pedersen, S. (Intern)
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Publisher: Wiley
Editors: Lobón-Cervía, J., Sanz, N.
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Chapter: 19
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Selectivity in a divided codend used in the multispecies trawl fishery targeting crustaceans

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF Fisheries and Aquaculture, Aalborg University
Authors: Karlsen, J. D. (Intern), Krag, L. A. (Intern), Herrmann, B. (Ekstern), Lund, H. S. (Ekstern)
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Semi-continuously addition of peracetic acid to a flow-through fish farm: Technical note

- Demonstration of a safe and reliable practical method to reduce ectoparasites related mortality of farmed fish.
- Central peracetic acid application caused even distribution to all ponds and considered suitable for organic fish farming.
- Low dose and easy degradable peracetic acid is an alternative aquaculture management approach to formalin flush treatment.

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State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Danish Aquaculture Organisation
Authors: Pedersen, L. (Intern), Henriksen, N. H. (Ekstern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.83 SJR 1.615 SNIP 2.382
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.609 SNIP 2.383 CiteScore 5.57
Sensitivity of a tropical micro-crustacean (Daphnia lumholtzi) to trace metals tested in natural water of the Mekong River

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Ho Chi Minh City University of Technology, Vietnam National University, Nha Trang University, University of Rennes
Authors: Dao, T. (Ekstern), Le, V. (Ekstern), Bui, B. (Ekstern), Dinh, K. V. (Intern), Wiegand, C. (Ekstern), Dao, C. (Ekstern), To, T. (Ekstern), Nguyen, L. (Ekstern), Vo, T. (Ekstern)
Pages: 1360-1370
Publication date: 2017
Main Research Area: Technical/natural sciences
Shifts in coastal sediment oxygenation cause pronounced changes in microbial community composition and associated metabolism

A key characteristic of eutrophication in coastal seas is the expansion of hypoxic bottom waters, often referred to as ‘dead zones’. One proposed remediation strategy for coastal dead zones in the Baltic Sea is to mix the water column using pump stations, circulating oxygenated water to the sea bottom. Although microbial metabolism in the sediment surface is recognized as key in regulating bulk chemical fluxes, it remains unknown how the microbial community and its metabolic processes are influenced by shifts in oxygen availability. Here, coastal Baltic Sea sediments sampled from oxic and anoxic sites, plus an intermediate area subjected to episodic oxygenation, were experimentally exposed to oxygen shifts. Chemical, 16S rRNA gene, metagenomic, and metatranscriptomic analyses were conducted to investigate changes in chemistry fluxes, microbial community structure, and metabolic functions in the sediment surface. Compared to anoxic controls, oxygenation of anoxic sediment resulted in a proliferation of bacterial populations in the facultative anaerobic genus Sulfurovum that are capable of oxidizing toxic sulfide. Furthermore, the oxygenated sediment had higher amounts of RNA transcripts annotated as sqr, fccB, and dsrA involved in sulfide oxidation. In addition, the importance of cryptic sulfur cycling was highlighted by the oxidative genes listed above as well as dsvA, trrB, dmsA, and ddhAB that encode reductive processes being identified in anoxic and intermediate sediments turned oxic. In particular, the intermediate site sediments responded differently upon oxygenation compared to the anoxic and oxic site sediments. This included a microbial community composition with more habitat generalists, lower amounts of RNA transcripts attributed to methane oxidation, and a reduced rate of organic matter degradation. These novel data emphasize that genetic expression analyses has the power to identify key molecular mechanisms that regulate microbial community responses upon oxygenation of dead zones. Moreover, these results highlight that microbial responses, and therefore ultimately remediation efforts, depend largely on the oxygenation history of sites. Furthermore, it was shown that re-oxygenation efforts to remediate dead zones could ultimately be facilitated by in situ microbial molecular mechanisms involved in removal of toxic H2S and the potent greenhouse gas methane.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Linnaeus University, Lund University
Authors: Broman, E. (Ekstern), Sjöstedt, J. (Intern), Pinhassi, J. (Ekstern), Dopson, M. (Ekstern)
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Scopus rating (2016): CiteScore 10.6 SJR 6.225 SNIP 2.321
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 5.709 SNIP 1.839 CiteScore 8.85
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Scopus rating (2014): SJR 4.708 SNIP 1.467 CiteScore 7.32
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ISI indexed (2013): ISI indexed no
Original language: English
16S rRNA, Anoxic, Metagenomics, Metatranscriptomics, Oxic, Sediment

Electronic versions:
Shifts in North Sea forage fish productivity and potential fisheries yield

1. Forage fish populations support large scale fisheries and are key components of marine ecosystems across the world, linking secondary production to higher trophic levels. While climate-induced changes in the North Sea zooplankton community are described and documented in literature, the associated bottom-up effects and consequences for fisheries remain largely unidentified.

2. We investigated the temporal development in forage fish productivity and the associated influence on fisheries yield of herring, sprat, Norway pout and sandeel in the North Sea. Using principal component analysis, we analysed 40 years of recruitment success and growth proxies to reveal changes in productivity and patterns of synchrony across stocks (i.e. functional complementarity). The relationship between forage fish production and Calanus finmarchicus (an indicator of climate change) was also analysed. We used a population model to demonstrate how observed shifts in productivity affected total forage fish biomass and fisheries yield.

3. The productivity of North Sea forage fish changed around 1993 from a higher average productivity to lower average productivity. During the higher productivity period, stocks displayed a covariance structure indicative of functional complementarity. Calanus finmarchicus was positively correlated to forage fish recruitment, however, for growth, the direction of the response differed between species and time periods. Maximum sustainable yield (MSY) and the associated fishing mortality (Fmsy) decreased by 33%–68% and 26%–64%, respectively, between the higher and lower productivity periods.

4. Synthesis and applications. The results demonstrate that fisheries reference points for short-lived planktivorous species are highly dynamic and respond rapidly to changes in system productivity. Furthermore, from an ecosystem-based fisheries management perspective, a link between functional complementarity and productivity, indicates that ecosystem resilience may decline with productivity. Based on this, we advise that system productivity, perhaps monitored as forage fish growth, becomes an integral part of management reference points; in both single species and ecosystem contexts. However, to retain social license of biological advice when fish catch opportunities are reduced, it is crucial that shifts in productivity are thoroughly documented and made apparent to managers and stakeholders.

General information
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Authors: Worsøe Clausen, L. (Intern), Rindorf, A. (Intern), van Deurs, M. (Intern), Dickey-Collas, M. (Intern), Hintzen, N. T. (Ekstern)
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Web of Science (2017): Indexed Yes
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Scopus rating (2016): CiteScore 5.5 SJR 2.869 SNIP 2.008
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.242 SNIP 1.96 CiteScore 5.38
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.998 SNIP 2.171 CiteScore 5.25
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.031 SNIP 2.225 CiteScore 5.45
Shining the light on the loss of rheophilic fish habitat in lowland rivers as a forgotten consequence of barriers and its implications for management

Abstract
1. The majority of rivers around Europe have been modified in one way or another, and no longer have an original, continuous flow from source to outlet. The presence of weirs and dams has altered habitats, thus affecting the wildlife that lives within them. This is especially true for migrating rheophilic fish species, which, in addition to safe passage, depend on gradient and fast-flowing waters for reproductive success and early development.
2. Thus far, research has focused on investigating the impacts of weirs and dams on fish passage, with less attention paid to the loss of habitat entrained by such infrastructure. The loss of rheophilic habitat is particularly important in lowland streams, where gradient is limited, and dams and weirs can be constructed with less effort.
3. Denmark is considered a typical lowland country, where the landscape around streams and rivers has been modified by agriculture and other human activities for centuries, leaving management practitioners wondering how much change is acceptable to maintain sustainable fish populations and fisheries practices.
4. With examples from Denmark, this paper attempts to conceptualize the loss in habitat as a result of barriers in lowland streams and rivers, and the repercussions that such alterations may have on rheophilic fish populations. Furthermore, the need for management to address habitat loss and its related consequences concurrently with the improvement of fish passage is emphasized.
Short-term and long-term effects of transient exogenous cortisol manipulation on oxidative stress in juvenile brown trout

In the wild, animals are exposed to a growing number of stressors with increasing frequency and intensity, as a result of human activities and human-induced environmental change. To fully understand how wild organisms are affected by stressors, it is crucial to understand the physiology that underlies an organism's response to a stressor. Prolonged levels of elevated glucocorticoids are associated with a state of chronic stress and decreased fitness. Exogenous glucocorticoid manipulation reduces an individual's ability to forage, avoid predators and grow, thereby limiting the resources available for physiological functions like defence against oxidative stress. Using brown trout (Salmo trutta), we evaluated the short-term (2 weeks) and long-term (4 months over winter) effects of exogenous cortisol manipulations (versus relevant shams and controls) on the oxidative status of wild juveniles. Cortisol caused an increase in glutathione over a 2 week period and appeared to reduce glutathione over winter. Cortisol treatment did not affect oxidative stress levels or low molecular weight antioxidants. Cortisol caused a significant decrease in growth rates but did not affect predation risk. Over-winter survival in the stream was associated with low levels of oxidative stress and glutathione. Thus, oxidative stress may be a mechanism by which elevated cortisol causes negative physiological effects.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University
Authors: Birnie-Gauvin, K. (Intern), Peiman, K. S. (Ekstern), Larsen, M. H. (Intern), Aarestrup, K. (Intern), Willmore, W. G. (Ekstern), Cooke, S. J. (Ekstern)
Pages: 1693-1700
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Sind Quallen womöglich die Urväter höheren Lebens?

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Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Jaspers, C. (Intern)
Publication date: 2017

**Publication information**
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Links: https://www.welt.de/wissenschaft/article165396951/Sind-Quallen-womoeglich-die-Urvaeter-hoeheren-Lebens.html
Publication: Communication › Internet publication – Annual report year: 2017

Skærmeline giver renere jomfruhummerfangst

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Melli, V. (Intern), Frandsen, R. (Intern), Krag, L. A. (Intern), Feeings, J. P. (Intern)
Pages: 9-10
Publication date: 2017

**Publication information**
Pages (from-to): 9-10
Newspaper: Fiskeri Tidende
Volume: 24
No.: 47
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Main Research Area: Technical/natural sciences
Publication: Communication › Newspaper article – Annual report year: 2017

Snæblen - Vadehavets tiger: Der Nordseeschnäpel - Tiger des Wattenmeers

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Pages: 43-48
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Nationalpark magasin
Issue number: 4
Søpunge – en ny proteinløs som biomasse i bioraffineri?

**General information**
- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Danish Shellfish Centre, University of Gothenburg
- **Authors:** Møller, L. F. (Intern), Petersen, J. K. (Intern), Havenhand, J. (Ekstern)
- **Publication date:** 2017
- **Event:** Abstract from Dansk Havforskermøde, Helsingør, Denmark.
- **Main Research Area:** Technical/natural sciences
- **Publication:** Research › Conference abstract for conference – Annual report year: 2017

Sortmundet kutling: Invasionen fra Sortehavet fortsætter

**General information**
- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management
- **Authors:** Ramkær, K. (Ekstern), van Deurs, M. (Intern), Christoffersen, M. (Intern)
- **Publication date:** 2017
- **Main Research Area:** Technical/natural sciences
- **Publication:** Research › Conference abstract for conference – Annual report year: 2017

Sortmundet kutling (Neogobius melanostomus) spreder sig på bekostning af hjemmehørende danske arter

**General information**
- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Aarhus University Hospital
- **Authors:** Alstrup, A. K. O. (Ekstern), Jensen, L. F. (Ekstern), Svendsen, J. C. (Intern)
- **Pages:** 6-11
- **Publication date:** 2017
- **Main Research Area:** Technical/natural sciences
- **Publication:** Research › Conference abstract for conference – Annual report year: 2017

Sortmundet kutling - Vi spiser os til løsningen

**General information**
- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Section for Marine Living Resources
- **Authors:** Krebs, M. L. (Ekstern), Behrens, J. (Intern)
Spatial distribution, origin and source and sink areas of marine litter in the water column of the North Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Institute of Marine Research, Swedish University of Agricultural Sciences, Marine Scotland, Johann Heinrich von Thünen-Institute, IFREMER, Wageningen IMARES
Authors: Huwer, B. (Intern), Kloppmann, M. (Ekstern), Loots, C. (Ekstern), van Damme, C. J. G. (Ekstern), Nash, R. (Ekstern), Bland, B. (Ekstern), Ritchie, L. (Ekstern)
Number of pages: 1
Publication date: 2017

Host publication information
Title of host publication: Book of Abstracts Sustain 2017
Article number: A-3
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Electronic versions:
SustainAbstracts2017c.compressed_7.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Spatial planning for aquaculture: the Georeferenced Interactions Database (GRID)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, National Research Council of Italy, Hellenic Centre for Marine Research
Publication date: 2017
Event: Poster session presented at EAS Aquaculture Europe 2017, Dubrovnik, Croatia.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2017

Spatial Planning for Fisheries in the Adriatic Sea, – the ECOAST project

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, National Research Council of Italy
Authors: Grati, F. (Ekstern), Bolognini, L. (Ekstern), Bastardie, F. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Spatial planning for fisheries in the Northern Adriatic: working toward viable and sustainable fishing

Given the great overfishing of the demersal resources in the Northern Adriatic Sea (geographical sub-area [GSA] 17), along with the fishing pressure in marine habitats, evidence strongly supports the need to evaluate appropriate management approaches. Several fishing activities operate simultaneously in the area, and the need to minimize conflicts among them is also a social concern. We applied a spatially and temporally explicit fish and fisheries model to assess the impact of a suite of spatial plans suggested by practitioners that could reduce the pressure on the four demersal stocks of high commercial interest in the GSA 17 and that could promote space sharing between mutually exclusive activities. We found that excluding trawlers from some areas has lowered the effective fishing effort, resulting in some economic losses but providing benefit to the set netters. Not every simulated fishing vessel is impacted in the same way because some fishing communities experienced different economic opportunities, particularly when a 6-nautical mile buffer zone from the coast was implemented in the vicinity of important fishing grounds. Along this buffer zone, the four stocks were only slightly benefiting from the protection of the area and from fewer discards. In contrast, assuming a change in the ability of the population to disperse led to a large effect: Some fish became accessible in the coastal waters, therefore increasing the landings for rangelimited fishers, but the discard rate of fish also increased, greatly impairing the long-term biomass levels. Our evaluation, however, confirmed that no effort is displaced onto vulnerable benthic habitats and to grounds not suitable for the continued operation of fishing. We conclude that the tested spatial management is helpful, but not sufficient to ensure sustainable fishing in the area, and therefore, additional management measures should be taken. Our test platform investigates the interaction between fish and fisheries at a fine geographical scale and simulates data for varying fishing methods and from different harbor communities in a unified framework. We contribute to the development of effective science-based inputs to facilitate policy improvement and better governance while evaluating trade-offs in fisheries management and marine spatial planning.

Spatio-temporal dynamics of cod nursery areas in the Baltic Sea

In this study the drift of eastern Baltic cod larvae and juveniles spawned within the historical eastern Baltic cod spawning grounds was investigated by detailed drift model simulations for the years 1971–2010, to examine the spatio-temporal dynamics of environmental suitability in the nursery areas of juvenile cod settlement. The results of the long-term model scenario runs, where juvenile cod were treated as simulated passively drifting particles, enabled us to find strong indications for long-term variations of settlement and potentially the reproduction success of the historically important eastern Baltic cod nursery grounds. Only low proportions of juveniles hatched in the Arkona Basin and in the Gotland Basin were able to settle in their respective spawning ground. Ocean currents were either unfavorable for the juveniles to
reach suitable habitats or transported the juveniles to nursery grounds of neighboring subdivisions. Juveniles which hatched in the Bornholm Basin were most widely dispersed and showed the highest settlement probability, while the second highest settlement probability and horizontal dispersal was observed for juveniles originating from the Gdansk Deep. In a long-term perspective, wind-driven transport of larvae/juveniles positively affected the settlement success predominately in the Bornholm Basin and in the Bay of Gdansk. The Bornholm Basin has the potential to contribute on average 54\% and the Bay of Gdansk 11\% to the production of juveniles in the Baltic Sea. Furthermore, transport of juveniles surviving to the age of settlement with origin in the Bornholm Basin contributed on average 13 and 11\% to the total settlement in the Arkona Basin and in the Gdansk Deep, respectively. The time-series of the simulated occupied juvenile cod habitat in the Bornholm Basin and in the Gdansk Deep showed a similar declining trend as the Fulton's K condition factor of demersal 1-group cod, which may confirm the importance of oxygen-dependent habitat availability and its effect on density dependence as a process relevant for recruitment success.
Spatiotemporal modelling of marine movement data using Template Model Builder (TMB)

Tracking of marine animals has increased exponentially in the past decade, and the resulting data could lead to an in-depth understanding of the causes and consequences of movement in the ocean. However, most common marine tracking systems are associated with large measurement errors. Accounting for these errors requires the use of hierarchical models, which are often difficult to fit to data. Using 3 case studies, we demonstrate that Template Model Builder (TMB), a new R package, is an accurate, efficient and flexible framework for modelling movement data. First, to demonstrate that TMB is as accurate but 30 times faster than bsam, a popular R package used to apply state-space models to Argos data, we modelled polar bear Ursus maritimus Argos data and compared the locations estimated by the models to GPS locations of these same bears. Second, to demonstrate how TMB’s gain in efficiency and frequentist framework facilitate model comparison, we developed models with different error structures and compared them to find the most effective model for light-based geolocations of rhinoceros auklets Cerorhinca monocerota. Finally, to maximize efficiency through TMB’s use of the Laplace approximation of the marginal likelihood, we modelled behavioural changes with continuous rather than discrete states. This new model directly accounts for the irregular sampling intervals characteristic of Fastloc-GPS data of grey seals Halichoerus grypus. Using real and simulated data, we show that TMB is a fast and powerful tool for modelling marine movement data. We discuss how TMB’s potential reaches beyond marine movement studies.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Dalhousie University, Macquarie University, University of Alberta, Bedford Institute of Oceanography
Authors: Auger-Méthé, M. (Ekstern), Albertsen, C. M. (Intern), Jonsen, I. D. (Ekstern), Derocher, A. E. (Ekstern), Lidgard, D. C. (Ekstern), Studholme, K. R. (Ekstern), Bowen, W. D. (Ekstern), Crossin, G. T. (Ekstern), Flemming, J. M. (Ekstern)
Pages: 237-249
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology Progress Series
Volume: 565
ISSN (Print): 1616-1599
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Web of Science (2018): Indexed yes
Web of Science (2017): Indexed yes
Species integrity enhanced by a predation cost to hybrids in the wild

Species integrity can be challenged, and even eroded, if closely related species can hybridize and produce fertile offspring of comparable fitness to that of parental species. The maintenance of newly diverged or closely related species therefore hinges on the establishment and effectiveness of pre- and/or post-zygotic reproductive barriers. Ecological selection, including predation, is often presumed to contribute to reduced hybrid fitness, but field evidence for a predation cost to hybridization remains elusive. Here we provide proof-of-concept for predation on hybrids being a postzygotic barrier to gene flow in the wild. Cyprinid fishes commonly produce fertile, viable hybrid offspring and therefore make excellent study organisms to investigate ecological costs to hybrids. We electronically tagged two freshwater cyprinid fish species (roach Rutilus rutilus and bream Abramis brama) and their hybrids in 2005. Tagged fish were returned to their lake of origin, exposing them to natural predation risk from apex avian predators (great cormorant, Phalacrocorax carbo). Scanning for
regurgitated tags under cormorant roosts 3-4 years later identified cormorant-killed individual fish and allowed us to
directly test for a predation cost to hybrids in the wild. Hybrid individuals were found significantly more susceptible to
cormorant predation than individuals from either parental species. Such ecological selection against hybrids contributes to
species integrity, and can enhance species diversification.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Lund University,
University of Nottingham, Swiss Federal Institute of Aquatic Science and Technology (Eawag)
Authors: Nilsson, P. A. (Ekstern), Hulthén, K. (Ekstern), Chapman, B. B. (Ekstern), Hansson, L. (Ekstern), Brodersen, J.
(Ekstern), Bakttoft, H. (Intern), Vinterstare, J. (Ekstern), Brönmark, C. (Ekstern), Skov, C. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Biology Letters
Volume: 13
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Article number: 20170208
ISSN (Print): 1744-9561
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  Web of Science (2018): Indexed yes
  BFI (2017): BFI-level 2
  Web of Science (2017): Indexed Yes
  BFI (2016): BFI-level 2
  Scopus rating (2016): CiteScore 2.69 SJR 1.653 SNIP 1.03
  BFI (2015): BFI-level 2
  Scopus rating (2015): SJR 1.906 SNIP 1.128 CiteScore 2.85
  Web of Science (2015): Indexed yes
  BFI (2014): BFI-level 2
  Scopus rating (2014): SJR 1.949 SNIP 1.229 CiteScore 3.07
  BFI (2013): BFI-level 2
  Scopus rating (2013): SJR 2.211 SNIP 1.407 CiteScore 3.69
  ISI indexed (2013): ISI indexed yes
  Web of Science (2013): Indexed yes
  BFI (2012): BFI-level 2
  Scopus rating (2012): SJR 1.994 SNIP 1.465 CiteScore 3.39
  ISI indexed (2012): ISI indexed yes
  Web of Science (2012): Indexed yes
  BFI (2011): BFI-level 2
  Scopus rating (2011): SJR 2.406 SNIP 1.466 CiteScore 3.58
  ISI indexed (2011): ISI indexed yes
  BFI (2010): BFI-level 2
  Scopus rating (2010): SJR 2.209 SNIP 1.254
  Web of Science (2010): Indexed yes
  BFI (2009): BFI-level 2
  Scopus rating (2009): SJR 2.263 SNIP 1.37
  Web of Science (2009): Indexed yes
  BFI (2008): BFI-level 1
  Scopus rating (2008): SJR 2.028 SNIP 1.304
  Web of Science (2008): Indexed yes
  Scopus rating (2007): SJR 1.954 SNIP 1.36
  Scopus rating (2006): SJR 1.278 SNIP 0.903
  Web of Science (2006): Indexed yes
  Web of Science (2005): Indexed yes
Original language: English

cormorant, diversity, evolution, fish, predator–prey
Species-specific vulnerability of Arctic copepods to oil contamination and global warming

Arctic ecosystems are predicted to have more severe effects from global warming as during the last decades the temperatures have increased in this region at a rate of 2-4 times higher than the global average. In addition, oil exploitation and shipping activities in the Arctic are predicted to increase under global warming as the result of the retreat of sea ice, posing the risk of oil contamination. It is poorly known how cold adapted copepods in the Arctic deal with the combined effects of global warming and oil exposure. To address this, we exposed females of two copepods species Calanus glacialis and C. finmarchicus to pyrene at three temperatures: 2, 6 and 10°C. Both species co-exist in the Disko Bay, Greenland, but only C. glacialis is a true Arctic species while C. finmarchicus is of north Atlantic origin. Pyrene is one of the most toxic components of crude oil to marine copepods. The temperatures of 2, 6 and 10°C represent the mean sea water temperature during the reproductive season, the 4°C increase in mean temperature by 2100 as predicted by IPCC scenario RCP8.5 (2013) and the extreme sea water temperature, respectively, in Disko Bay. Four degree temperature increase did not have an effect on grazing rate and survival of both species. However, the extreme temperature (10°C) increased the grazing rate and mortality of C. glacialis, but not in C. finmarchicus. Exposure to high pyrene strongly reduced survival and grazing rate in both species and this pattern was independent of temperatures. Notably, exposure to high pyrene resulted in ca. 70% of mortality in C. finmarchicus, the species with North Atlantic Origin, that was two times higher than the mortality observed for C. glacialis, the true Arctic species. These results suggest that extreme temperature under global warming and oil contamination may drastically change the relative abundance of the Arctic pelagic copepod community by changing the species-specific vulnerability to extreme temperature and oil exposure.

Spectral signature of suspended fine particulate material on light absorption properties of CDOM

Fine submicron organic particles can represent an important fraction of the dissolved organic matter (DOM) pool in aquatic ecosystems and their optical properties differ from those normally considered dissolved (< 0.2 μm), which means that the choice of filter type/pore size can influence the light absorption characteristics. In this study, a total of 867 paired CDOM absorption spectra (n =1734) from different ecosystems (lakes, streams, sewages and estuaries) were measured on 0.2 μm and GF/F (nominal pore size 0.7 μm) filters. The aims were to evaluate how fine organic particles influence the spectral signature of the DOM pool and to quantify the effects of choice of filter type. In aquatic ecosystems influenced by terrestrial DOM (rivers and lakes), the dissolved fraction (here defined as< 0.2 μm) overwhelmed the fine particulate signal (0.2–0.7 μm) which did not contribute significantly to the absorption signal. In contrast, freshly-produced fine particles released by phytoplankton significantly increased measured CDOM absorption in productive environments with low terrestrial background. Our results demonstrate that the choice of filter pore size can have a significant impact on the outcome of spectral metrics often used to characterise CDOM such as the spectral slope (S) or the slope ratio (SR). Hence, this may complicate the combining of CDOM absorption measurements from different studies where different pore sizes were used as fine particulate material may significantly influence the spectral signature, particularly in situations where phytoplankton is the dominating source of DOM.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Dinh, K. V. (Intern), Nielsen, T. G. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 132116785
Publication: Research › Conference abstract for conference – Annual report year: 2017
Stable isotopes reveal the effect of trawl fisheries on the diet of commercially exploited species
Bottom trawling can change food availability for benthivorous demersal species by (i) changing benthic prey composition through physical seabed impacts and (ii) by removing overall benthic consumer biomass increasing the net availability of benthic prey for remaining individuals. Thus trawling may both negatively and positively influence the quantity and quality of food available. Using δ 13C and δ 15N we investigated potential diet changes of three commercially exploited species across trawling gradients in the Kattegat (plaice, dab and Norway lobster (Nephrops)) and the Irish Sea (Nephrops). In the Kattegat, trawling affected primarily the biomass of benthic consumers, lowering competition. Nephrops showed significant positive relationships for δ 13C and a domed relationship for δ 15N with trawling. In the Irish Sea, intense trawling had a negative effect on benthic prey. δ 13C and δ 15N thus showed the inverse relationships to those observed in the Kattegat. Plaice from the Kattegat, showed a significant relationship with trawling intensity for δ 13C, but not for δ 15N. No relationship was found for dab. Changes of δ 13C and δ 15N correlated with changes in condition of species. The results show that the removal of demersal competitors and benthos by trawling can change the diets of commercial species, ultimately affecting their body condition.
Stallingen bør fredes endnu tre år

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links: http://www.fiskepleje.dk/nyheder/2017/03/stalling-fredning-2017?id=a1cf8882-0e39-4959-b479-6e1908d8f91c&utm_source=newsletter&utm_media=mail&utm_campaign=2017_03_30_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2017

Stallingens biologi: Den nyeste videns om stallingens biologi er nu samlet på fiskepleje.dk.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Ravn, H. D. (Intern), Nielsen, J. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links: http://www.fiskepleje.dk/fiskebiologi/stalling?utm_source=newsletter&utm_media=mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2017

Starvation tolerance of neritic copepods with different overwintering and feeding strategies

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Roskilde University
Authors: Holm, M. W. (Intern), Kiørboe, T. (Intern), Almeda, R. (Intern), Hansen, B. W. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Stress and recovery from trawl capture of Norway lobster (Nephrops norvegicus) and potential for live storage

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Section for Ecosystem based Marine Management, Section for Marine Living Resources, STMI
Authors: Skov, P. V. (Intern), Methling, C. (Intern), Larsen, B. K. (Intern), Unmack, C. P. (Ekstern), Karlsen, J. D. (Intern), Behrens, J. (Intern)
Strong delayed interactive effects of metal exposure and warming: latitude-dependent synergisms persist across metamorphosis

As contaminants are often more toxic at higher temperatures, predicting their impact under global warming remains a key challenge for ecological risk assessment. Ignoring delayed effects, synergistic interactions between contaminants and warming, and differences in sensitivity across species’ ranges could lead to an important underestimation of the risks. We addressed all three mechanisms by studying effects of larval exposure to zinc and warming before, during, and after metamorphosis in Ischnura elegans damselflies from high- and low-latitude populations. By integrating these mechanisms into a single study, we could identify two novel patterns. First, during exposure zinc did not affect survival, whereas it induced mild to moderate postexposure mortality in the larval stage and at metamorphosis, and very strongly reduced adult lifespan. This severe delayed effect across metamorphosis was especially remarkable in high-latitude animals, as they appeared almost insensitive to zinc during the larval stage. Second, the well-known synergism between metals and warming was manifested not only during the larval stage but also after metamorphosis, yet notably only in low-latitude damselflies. These results highlight that a more complete life-cycle approach that incorporates the possibility of delayed interactions between contaminants and warming in a geographical context is crucial for a more realistic risk assessment in a warming world.
Strong delayed interactive effects of metal exposure and warming: latitude-dependent synergisms persist across metamorphosis

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University of Leuven
Authors: Debecker, S. (Ekstern), Dinh, K. V. (Intern), Stoks, R. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 132116813
Publication: Research › Conference abstract for conference – Annual report year: 2017

Subtidal habitats

General information
State: Published
Succession of picophytoplankton during the spring bloom 2012 in Disko Bay (West Greenland)—an unexpectedly low abundance of green algae

General information
State: Published
Organisations: Section for Ocean Ecology and Climate, National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, Greenland Climate Research Centre
Authors: Sørensen, N. (Ekstern), Daugbjerg, N. (Ekstern), Richardson, K. (Ekstern), Nørregaard, R. D. (Intern), Espersen, L. S. K. (Intern), Mohl, M. (Intern), Nielsen, T. G. (Intern)
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Main Research Area: Technical/natural sciences

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Journal: Polar Biology
Volume: 40
Issue number: 2
ISSN (Print): 0722-4060
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.72 SJR 0.866 SNIP 0.761
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.985 SNIP 0.751 CiteScore 1.62
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.931 SNIP 0.81 CiteScore 1.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.109 SNIP 1.054 CiteScore 2.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.029 SNIP 0.891 CiteScore 1.89
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.857 SNIP 0.925 CiteScore 1.77
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.868 SNIP 0.885
Survival and growth compared between wild and farmed eel stocked in freshwater ponds

To evaluate the efficiency of eel stocking, we compared the survival and growth of wild eels (2–5 g) with that of "farmed" eels (3–6 g). Wild eels were caught in a river and farmed eels came from a farm, where wild imported glass eels are cultured. Two experiments of 5–12 month duration were conducted in a series of shallow, open ponds of approximately 200 m². Wild and farmed eels were batch tagged, mixed and released in the ponds at an initial density of 0.5 individual/m². Survival was rather high (34–88%) with variations between ponds. No significant difference in survival was found between wild and farmed during the first 5 month in both experiments. Growth rates were significantly higher for farmed eels compared to wild eels in both experiments. The results show that farmed eels performed better than wild eels. In regions with low recruitment the eel population may be increased by importing glass eels, stocked directly or stocked as on-grown farmed eel. The optimal size for stocking (between glass- and 3 g eels) may be determined through future studies.
Survival and growth compared between wild and farmed eel stocked in freshwater ponds

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Survival of migrating sea trout (Salmo trutta) smolts during their passage of an artificial lake in a Danish lowland stream

Artificial lake development is often used as a management tool to reduce nutrient runoff to coastal waters. Denmark has restored more than 10,000 ha of wetlands and lakes in the last 14 years as a consequence of 'Action Plans for the Aquatic Environment', which aim to meet the demands of the European Union's Water Framework Directive. Juvenile, seaward migrating salmonids are highly affected by impounded waterbodies, as they are subjected to extraordinary high mortalities due to predation and altered habitat.

From 2005 to 2015, survival and migration patterns of wild brown trout (Salmo trutta) smolts were investigated by using radio, acoustic and Passive Integrated Transponder telemetry both before and after the development of an artificial lake in a small Danish lowland stream. In 2005 and 2006, before the lake developed, survival was estimated to be 100% in the river stretch where the lake later developed. In 2007 and in the period between 2009 and 2015, mean yearly survival decreased to 26%. Mean time for passing the area increased significantly after the development of the lake from 0.42 to 5.95 days. Generalized additive models were used to model the probability of a successful passage. Water temperature and discharge were key environmental factors affecting survival of the smolts during the passage of the lake. Furthermore, smolt survival was negatively correlated with condition factor. This elevated level of smolt mortality may seriously compromise self-sustaining anadromous salmonid populations when artificial lakes are developed in connection with rivers.
Swimming and feeding of mixotrophic biflagellates

Many unicellular flagellates are mixotrophic and access resources through both photosynthesis and prey capture. Their fitness depends on those processes as well as on swimming and predator avoidance. How does the flagellar arrangement and beat pattern of the flagellate affect swimming speed, predation risk due to flow-sensing predators, and prey capture? Here, we describe measured flows around two species of mixotrophic, biflagellated haptophytes with qualitatively different
flagellar arrangements and beat patterns. We model the near cell flows using two symmetrically arranged point forces with variable position next to a no-slip sphere. Utilizing the observations and the model we find that puller force arrangements favour feeding, whereas equatorial force arrangements favour fast and quiet swimming. We determine the capture rates of both passive and motile prey, and we show that the flow facilitates transport of captured prey along the haptonema structure. We argue that prey capture alone cannot fulfil the energy needs of the observed species, and that the mixotrophic life strategy is essential for survival.

General information
State: Published
Organisations: Department of Physics, Biophysics and Fluids, National Institute of Aquatic Resources, Centre for Ocean Life, Technical University of Denmark
Authors: Dölger, J. (Intern), Nielsen, L. T. (Intern), Kiørboe, T. (Intern), Andersen, A. P. (Intern)
Number of pages: 10
Publication date: 2017
Main Research Area: Technical/natural sciences

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Journal: Scientific Reports
Volume: 7
Article number: 39892
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.057 SNIP 1.684 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.103 SNIP 1.544 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
ISI indexed (2011): ISI indexed no
Original language: English
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Bibliographical note
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Source: FindIt
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Publication: Research - peer-review › Journal article – Annual report year: 2017

Tagging method for small fishes: A case study using lesser sandeel (Ammodytes tobianus)

General information
State: Published
Temperature effects on gene expression and morphological development of European eel, Anguilla anguilla larvae

Temperature is important for optimization of rearing conditions in aquaculture, especially during the critical early life history stages of fish. Here, we experimentally investigated the impact of temperature (16, 18, 20, 22 and 24°C) on thermally induced phenotypic variability, from larval hatch to first-feeding, and the linked expression of targeted genes [heat shock proteins (hsp), growth hormone (gh) and insulin-like growth factors (igf)] associated to larval performance of European eel, Anguilla anguilla. Temperature effects on larval morphology and gene expression were investigated throughout early larval development (in real time from 0 to 18 days post hatch) and at specific developmental stages (hatch, jaw/teeth formation, and first-feeding). Results showed that hatch success, yolk utilization efficiency, survival, deformities, yolk utilization, and growth rates were all significantly affected by temperature. In real time, increasing temperature from 16 to 22°C accelerated larval development, while larval gene expression patterns (hsp70, hsp90, gh and igf-1) were delayed at cold temperatures (16°C) or accelerated at warm temperatures (20-22°C). All targeted genes (hsp70, hsp90, gh, igf-1, igf-2a, igf-2b) were differentially expressed during larval development. Moreover, expression of gh was highest at 16°C during the jaw/teeth formation, and the first-feeding developmental stages, while expression of hsp90 was highest at 22°C, suggesting thermal stress. Furthermore, 24°C was shown to be deleterious (resulting in 100% mortality), while 16°C and 22°C (~50 and 90% deformities respectively) represent the lower and upper thermal tolerance limits. In conclusion, the high survival, lowest incidence of deformities at hatch, high yolk utilization efficiency, high gh and low hsp expression, suggest 18°C as the optimal temperature for offspring of European eel. Furthermore, our results suggest that the still enigmatic early life history stages of European eel may inhabit the deeper layer of the Sargasso Sea and indicate vulnerability of this critically endangered species to increasing ocean temperature.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, University of Tartu
Authors: Behrens, J. (Intern), van Deurs, M. (Intern), Ojaveer, H. (Ekstern), Christensen, E. A. F. (Intern)
Publication date: 2017
Event: Poster session presented at CeMEB 18th Assembly, Tjärnö, Sweden.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2017
Temporal and spatial differences between taxonomic and trait biodiversity in a large marine ecosystem: Causes and consequences

Biodiversity is a multifaceted concept, yet most biodiversity studies have taken a taxonomic approach, implying that all species are equally important. However, species do not contribute equally to ecosystem processes and differ markedly in their responses to changing environments. This recognition has led to the exploration of other components of biodiversity, notably the diversity of ecologically important traits. Recent studies taking into account both taxonomic and trait diversity have revealed that the two biodiversity components may exhibit pronounced temporal and spatial differences. These apparent incongruences indicate that the two components may respond differently to environmental drivers and that changes in one component might not affect the other. Such incongruences may provide insight into the structuring of communities through community assembly processes, and the resilience of ecosystems to change. Here we examine temporal and spatial patterns and drivers of multiple marine biodiversity indicators using the North Sea fish community as a case study. Based on long-term spatially resolved survey data on fish species occurrences and biomasses from 1983 to 2014 and an extensive trait dataset we: (i) investigate temporal and spatial incongruences between taxonomy and trait-based indicators of both richness and evenness; (ii) examine the underlying environmental drivers and, (iii) interpret the results in the context of assembly rules acting on community composition. Our study shows that taxonomy and trait-based biodiversity indicators differ in time and space and that these differences are correlated to natural and anthropogenic drivers, notably temperature, depth and substrate richness. Our findings show that trait-based biodiversity indicators add information regarding community composition and ecosystem structure compared to and in conjunction with taxonomy-based indicators. These results emphasize the importance of examining and monitoring multiple indicators of biodiversity in ecological studies as well as for conservation and ecosystem-based management purposes.
Testing the potential for improving quality of sediments impacted by mussel farms using bioturbating polychaete worms

Biodeposits from farmed mussels severely influence the biogeochemistry of sediments by increasing the levels of organic matter (OM). Mitigation of such negative impacts is important for the development of sustainable aquaculture operations. As a step towards developing methods for remediation of coastal sediments affected by mussel farming, the effects of the polychaete, Hediste diversicolor was evaluated experimentally. In a series of field- and laboratory experiments we tested hypotheses about the effects of polychaetes on sediment oxygen consumption, nutrient fluxes and sulphide pools under different polychaete densities and sedimentation regimes. The experimental results support the idea that polychaetes can mitigate negative effects on the benthic environment beneath mussel farms. H. diversicolor oxidized the sediment and generally enhanced the oxygen consumption, and thus the decomposition of OM. The accumulation of pore water sulphides were reduced and fluxes of nutrients across the sediment-water interface increased. Additional calculations suggest that the effects of polychaetes were mainly indirect and driven by increased microbial activity due to the borrowing activity of the polychaetes. Trends of increasing decomposition with increasing polychaete density suggest that the decomposition could be further enhanced by higher densities. Overall, we concluded that H. diversicolor is a potentially strong candidate for remediation of mussel farm sediments. The results show that sediments inhabited by H. diversicolor have high assimilative capacity of OM and oxygen conditions are significantly improved following the addition of polychaetes at naturally occurring densities. However, technological developments are needed in order to allow the approach to be used in practice.
The composition of readily available carbon sources produced by fermentation of fish faeces is affected by dietary protein:energy ratios

Fish solid waste (faeces) produced in recirculated aquaculture systems (RAS) might be used for on-farm, single-sludge denitrification if transformed into soluble organic carbon substances. The current study investigated the effect of feeding diets with increasing protein to energy ratios (P:E_15, 17, 19, 21 and 23 g/MJ) to rainbow trout (Oncorhynchus mykiss) on the production of volatile fatty acids (VFAs) and ethanol during 7 days fermentation of the produced fish faeces. The total yields of VFAs and ethanol obtained (expressed as chemical oxygen demand (COD)) ranged between 0.21±0.24 gCOD/gTCOD, showing no differences between treatments. However, the type and quantities of individual VFAs and ethanol changed according to the dietary treatment. Lower P:E ratio diets resulted in higher production of butyric acid and ethanol, whereas higher P:E ratio diets resulted in an increased production of acetic and valeric acid. Changing the diet composition thus affects the composition of readily available carbon that can be derived from the faeces. This can be applied to enhance on-farm single sludge denitrification and reduce the need for adding external carbon sources such as e.g. methanol.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Letelier-Gordo, C. O. (Intern), Larsen, B. K. (Intern), Dalsgaard, J. (Ekstern), Pedersen, P. B. (Intern)
Pages: 27-32
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquacultural Engineering
Volume: 77
ISSN (Print): 0144-8609
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
The constraints of high density production of the calanoid copepod Acartia tonsa Dana

Copepods are excellent live feed for marine fish larvae in aquaculture. Culturing copepods at high density is important to increase the total egg yield, but this is still a main challenge. To address this, we conducted experiments to test factors affecting the egg harvest potential of the well studied and aquaculture relevant calanoid Acartia tonsa. A simple model was developed to evaluate the influence of individual egg production, egg predation, crowding effects and tank design on the
egg harvest. At high densities from 500 to 3500 ind L−1, there was no difference in food ingestion and egg cannibalism. However, the copepods showed lower food consumption and egg cannibalism compared to the ecologically relevant densities of 20–100 ind L−1. Model calculations demonstrate that maximum egg harvest is the result of a subtle balance between water mixing and tank depth: a shallow, non-mixed tank will allow the eggs to settle and escape cannibalism but at the same time prevent the algal food staying suspended, and full utilization of the egg production potential depends on the fine tuning of these parameters.
The development of tools for tracing and evaluating the genetic impact of fish from aquaculture

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Padua
Authors: Bargelloni, L. (Ekstern), Nielsen, E. E. (Intern)
Pages: 87
Publication date: 2017
Conference: 12th International Symposium on Genetics in Aquaculture, Santiago de Compostella, Spain, 21/06/2015 - 21/06/2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 472
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
The effect of increased loads of dissolved organic matter on estuarine microbial communities and functions

**General information**

State: Published

Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Umea University, University of Copenhagen, Københavns Universitet

Authors: Traving, S. J. (Ekstern), Rowe, O. (Ekstern), Jakobsen, N. M. (Ekstern), Sørensen, H. (Ekstern), Dinasquet, J. V. (Forskerdatabase), Stedmon, C. (Intern), Andersson, A. (Ekstern), Riemann, L. (Ekstern)

Publication date: 2017

Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.

Main Research Area: Technical/natural sciences

**The effect of increased loads of dissolved organic matter on estuarine microbial community composition and function**

Increased river loads are projected as one of the major consequences of climate change in the northern hemisphere, leading to elevated inputs of riverine dissolved organic matter (DOM) and inorganic nutrients to coastal ecosystems. The objective of this study was to investigate the effects of elevated DOM on a coastal pelagic food web from the coastal northern Baltic Sea, in a 32-day mesocosm experiment. In particular, the study addresses the response of bacterioplankton to differences in character and composition of supplied DOM. The supplied DOM differed in stoichiometry and quality and had pronounced effects on the recipient bacterioplankton, driving compositional changes in response to
DOM type. The shifts in bacterioplankton community composition were especially driven by the proliferation of Bacteroidetes, Gemmatimonadetes, Planctomycetes, and Alpha- and Betaproteobacteria populations. The DOM additions stimulated protease activity and a release of inorganic nutrients, suggesting that DOM was actively processed. However, no difference between DOM types was detected in these functions despite different community compositions. Extensive release of re-mineralized carbon, nitrogen and phosphorus was associated with the bacterial processing, corresponding to 25-85% of the supplied DOM. The DOM additions had a negative effect on phytoplankton with decreased Chl a and biomass, particularly during the first half of the experiment. However, the accumulating nutrients likely stimulated phytoplankton biomass which was observed to increase towards the end of the experiment. This suggests that the nutrient access partially outweighed the negative effect of increased light attenuation by accumulating DOM. Taken together, our experimental data suggest that parts of the future elevated riverine DOM supply to the Baltic Sea will be efficiently mineralized by microbes. This will have consequences for bacterioplankton and phytoplankton community composition and function, and significantly affect nutrient biogeochemistry.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Copenhagen, Umea University
Authors: Traving, S. J. (Ekstern), Rowe, O. (Ekstern), Jakobsen, N. M. (Intern), Sørensen, H. (Ekstern), Dinasquet, J. V. (Ekstern), Stedmon, C. (Intern), Andersson, A. (Ekstern), Riemann, L. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Microbiology
Volume: 8
Article number: 351
ISSN (Print): 1664-302X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.16 SJR 1.731 SNIP 1.172
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.878 SNIP 1.208 CiteScore 4.15
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.861 SNIP 1.16 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.751 SNIP 0.951 CiteScore 3.56
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.415 SNIP 0.725 CiteScore 2.78
ISI indexed (2012): ISI indexed no
Scopus rating (2011): SJR 0.626 SNIP 0.187
Web of Science (2011): Indexed yes
Original language: English
16S rRNA, Baltic Sea, bacterioplankton community composition, climate change, community functions, dissolved organic matter, extracellular enzymes, generalized linear models
Electronic versions:
Publishers version
DOIs:
10.3389/fmicb.2017.00351
Source: FindIt
Source-ID: 2352383773
Publication: Research - peer-review › Journal article – Annual report year: 2017
The footprint of bottom trawling in European waters: distribution, intensity, and seabed integrity

Mapping trawling pressure on the benthic habitats is needed as background to support an ecosystem approach to fisheries management. The extent and intensity of bottom trawling on the European continental shelf (0-1000 m) was analysed from logbook statistics and vessel monitoring system data for 2010-2012 at a grid cell resolution of 1 x 1 min longitude and latitude. Trawling intensity profiles with seabeamed impact at the surface and subsurface level are presented for 14 management areas in the North-east Atlantic, Baltic Sea and Mediterranean Sea. The footprint of the management areas ranged between 53-99% and 6-94% for the depth zone from 0 to 200 m (Shallow) and from 201 to 1000 m (Deep), respectively. The footprint was estimated as the total area of all grid cells that were trawled fully or partially. Excluding the untrawled proportions reduced the footprint estimates to 28-85% and 2-77%. Largest footprints per unit landings were observed off Portugal and in the Mediterranean Sea. Mean trawling intensity ranged between 0.5 and 8.5 times per year, but was less in the Deep zone with a maximum intensity of 6.4. Highest intensities were recorded in the Skagerrak-Kattegat, Iberian Portuguese area, Tyrrhenian Sea and Adriatic Sea. Bottom trawling was highly aggregated. For the Shallow zone the seabed area where 90% of the effort occurred comprised between 17% and 63% (median 36%) of the management area. Footprints were high over a broad range of soft sediment habitats. Using the longevity distribution of the untrawled infaunal community, the seabed integrity was estimated as the proportion of the biomass of benthic taxa where the trawling interval at the subsurface level exceeds their life span. Seabed integrity was low (< 0.1) in large parts of the European continental shelves, although smaller pockets of seabed with higher integrity values occur. The methods developed here integrate official fishing effort statistics and industry-based gear information to provide high-resolution pressure maps and indicators, which greatly improve the basis for assessing and managing benthic pressure from bottom trawling. Further they provide quantitative estimates of trawling impact on a continuous scale by which managers can steer.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Institute of Marine Research, Spanish Institute of Oceanography, Swedish University of Agricultural Sciences, IFREMER, Hellenic Centre for Marine Research, Cefas, University of Roma 'Tor Vergata', National Research Council of Italy, Instituto Português do Mar e da Atmosfera, Wageningen IMARES, Marine Scotland Science, Johann Heinrich von Thünen-Institute, Marine Institute, Institute of Marine Biological Resources and Inland Waters, AFBI, Institute for Agricultural and Fisheries Research
Pages: 847-865
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 3
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
The importance of benthic-pelagic coupling for marine ecosystem functioning in a changing world

Benthic-pelagic coupling is manifested as the exchange of energy, mass, or nutrients between benthic and pelagic habitats. It plays a prominent role in aquatic ecosystems and it is crucial to functions from nutrient cycling to energy transfer in food webs. Coastal and estuarine ecosystem structure and function is strongly affected by anthropogenic pressures, however there are large gaps in our understanding of the responses of inorganic nutrient and organic matter fluxes between benthic habitats and the water column. We illustrate the varied nature of physical and biological benthic-pelagic coupling processes and their potential sensitivity to three anthropogenic pressures - climate change, nutrient loading, and fishing - using the Baltic Sea as a case study, and summarize current knowledge on the exchange of inorganic nutrients and organic material between habitats. Traditionally measured benthic-pelagic coupling processes (e.g. nutrient exchange and sedimentation of organic material) are to some extent quantifiable but the magnitude and variability of biological processes are rarely assessed, preventing quantitative comparisons. Changing oxygen conditions will continue to have widespread effects on the processes that govern inorganic and organic matter exchange among habitats while climate change and nutrient load reductions may have large effects on organic matter sedimentation. Many biological processes (predation, bioturbation) are expected to be sensitive to anthropogenetic drivers but the outcomes for ecosystem function are largely unknown. We emphasize how improved empirical and experimental understanding of benthic-pelagic coupling processes and their variability are necessary to inform models that can quantify the feedbacks among processes and ecosystem responses to a changing world. This article is protected by copyright. All rights reserved.
The importance of live-feed traps - farming marine fish species

This article analyses the challenges of different live-feed regimes for the rearing of marine finfish larvae and discusses the potential alternative live feeds to avert a future live-feed trap. Live feeds are indispensable for the successful rearing of larvae of most marine fish species. Brine shrimps (Artemia) and rotifers comprise the live feeds of choice in marine aquaculture today. However, their nutritional composition is deficient in especially essential fatty acids, and enrichment with fish oil is needed. Fish oil is considered a limited resource owing to its origin in fully exploited wild fish stocks. Moreover, fluctuations of the natural population of Artemia will, most likely, influence future availability and prices. This emphasizes the need for optimal exploitation of available live-feed resources and development of new sustainable alternatives, such as copepods. An array of solutions to these problems are presented to avoid a future live-feed trap and to reduce dependence on limited resources that influence future production possibilities, species diversification, price volatility and productivity in the aquaculture sector.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Copenhagen, Roskilde University
Authors: Nielsen, R. (Ekstern), Nielsen, M. (Ekstern), Abate, T. G. (Ekstern), Hansen, B. W. (Ekstern), Jepsen, P. M. (Ekstern), Nielsen, S. L. (Ekstern), Støttrup, J. G. (Intern), Buchmann, K. (Intern)
Pages: 2623-2641
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information

Journal: Aquaculture Research
Volume: 48
Issue number: 6
ISSN (Print): 1355-557X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.23 SJR 0.555 SNIP 0.926
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.79 SNIP 1.1 CiteScore 1.37
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.674 SNIP 0.943 CiteScore 1.23
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.815 SNIP 0.984 CiteScore 1.43
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.77 SNIP 0.958 CiteScore 1.29
ISI indexed (2012): ISI indexed yes
The influence of microplastic inclusion in feed on carryover of environmental pollutants from feed to seabass and salmon

General information
State: Published
Authors: Granby, K. (Intern), Rasmussen, R. R. (Intern), Kotterman, M. (Ekstern), Sloth, J. J. (Intern), Cederberg, T. L. (Intern), Marques, A. T. (Ekstern), Koelmans, A. (Ekstern), Larsen, B. K. (Intern)
Pages: 16-16
Publication date: 2017

Host publication information
Title of host publication: Seafood safety new findings & innovation challenges - abstract book
Place of publication: Brussels, Belgium
Publisher: Royal Flemish Academy of Science and the Arts (KVAB)
Main Research Area: Technical/natural sciences
Conference: Seafood Safety, Brussels, Belgium, 25/01/2017 - 25/01/2017
Electronic versions:
21042f_6f62ebecb4654c2fac338c8587d6be15.pdf
Publication: Research - peer-review » Conference abstract in proceedings – Annual report year: 2017

The influence of ration size on energetics and nitrogen retention in tilapia (Oreochromis niloticus)
Proper nutrient management is essential for the environmental sustainability of aquaculture. While increasing daily rations generally may lead to improved growth rates, this does not necessarily mean that nutrients are utilized more efficiently. To investigate how ration size affects partitioning of dietary nutrient intake, the effects of meal size on growth and metabolism were examined in triplicate groups of adult Nile tilapia (Oreochromis niloticus) receiving daily rations corresponding to 1, 2, 3, or 4% of their biomass. While biomass gain and specific growth rates were positively correlated with ration size, feed
conversion and protein retention were most efficient at ration sizes of 3%. Although the magnitude of the SDA response following feeding also increased with ration size, this was not proportionate to meal size. Therefore the metabolic cost of meal processing (SDA coefficient) was found to be lowest in the 3% ration group. The lowest rates of nitrogen excretion as well as the lowest SDA coefficients were also observed for fish receiving meal sizes corresponding to 3% of their body mass. In contrast, fish fed ration sizes of 1% displayed a reduction in apparent digestibility of protein, nitrogen free extract and dry matter, in addition to excreting a disproportionate amount of ingested nitrogen as ammonia and urea.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Kwame Nkrumah University of Science and Technology
Authors: Skov, P. V. (Intern), Duodu, C. P. (Ekstern), Adjei-Boateng, D. (Ekstern)
Pages: 121-127
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 473
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Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.263
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
The invasive comb jelly *Mnemiopsis leidyi* in Europe and in the Baltic Sea: Invasion history, distribution, phenology and ecosystem impacts

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Oceans and Arctic
Authors: Huwer, B. (Intern), Jaspers, C. (Intern)
Number of pages: 1
Publication date: 2017

**Host publication information**

Title of host publication: Book of Abstracts Sustain 2017
Article number: A-11
Main Research Area: Technical/natural sciences
Conference: Sustain 2017, Kgs. Lyngby, Denmark, 06/12/2017 - 06/12/2017
Electronic versions:
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

The Limfjord stone reef project: Geological and biological investigations in Løgstør Bredning for stone reef restoration

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Geological Survey of Denmark and Greenland
Authors: Al-Hamdani, Z. K. (Ekstern), Nielsen, M. M. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

The one-sample PARAFAC approach reveals molecular size distributions of fluorescent components in dissolved organic matter

Molecular size plays an important role in dissolved organic matter (DOM) biogeochemistry, but its relationship with the fluorescent fraction of DOM (FDOM) remains poorly resolved. Here high-performance size exclusion chromatography (HPSEC) was coupled to fluorescence emission-excitation (EEM) spectroscopy in full spectral (60 emission and 34...
excitation wavelengths) and chromatographic resolution (<1 Hz), to enable the mathematical decomposition of fluorescence on an individual sample basis by parallel factor analysis (PARAFAC). The approach allowed cross-system comparisons of molecular size distributions for individual fluorescence components obtained from independent data sets. Spectra extracted from allochthonous DOM were highly similar. Allochthonous and autochthonous DOM shared some spectra, but included unique components. In agreement with the supramolecular assembly hypothesis, molecular size distributions of the fluorescence fractions were broad and chromatographically unresolved, possibly representing reoccurring fluorophores forming noncovalently bound assemblies of varying molecular size. Samples shared underlying fluorescence components that differed in their size distributions but not their spectral properties. Thus, in contrast to absorption measurements, bulk fluorescence is unlikely to reliably indicate the average molecular size of DOM. The one-sample approach enables robust and independent cross-site comparisons without large-scale sampling efforts and introduces new analytical opportunities for elucidating the origins and biogeochemical properties of FDOM.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Chalmers University of Technology
Authors: Wünsch, U. (Intern), Murphy, K. R. (Ekstern), Stedmon, C. (Intern)
Pages: 11900-11908
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

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Volume: 51
Issue number: 20
ISSN (Print): 0013-936X
Ratings:
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- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 6.26 SJR 2.538 SNIP 1.889
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 2.584 SNIP 1.828 CiteScore 5.61
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 2.777 SNIP 2.017 CiteScore 5.5
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 2.956 SNIP 2.103 CiteScore 5.52
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 3.146 SNIP 2.056 CiteScore 5.17
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 3.178 SNIP 1.953 CiteScore 5.16
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
- Scopus rating (2010): SJR 2.964 SNIP 1.729
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 2
- Scopus rating (2009): SJR 2.835 SNIP 1.803
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 2
The parasitic nematode *Contracaecum osculatum* (liver worm) in Baltic cod: Spatial differences in prevalence and intensity of infection

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Copenhagen
Authors: Sokolova, M. (Intern), Huwer, B. (Intern), Buchmann, K. (Ekstern), Behrens, J. (Intern)
Publication date: 2017
Event: Abstract from Joint spring symposium 2017, Danish Society for Parasitology and Danish Society for Tropical Medicine & International Health, Host-Parasite Communication, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

The Portuguese man-of-war: Gone with the wind
The Portuguese man-of-war (*Physalia physalis*) is a siphonophore that lives at the air–water interface of the sea. The wind is the main mechanism controlling its drift. In August 2010, a significant number of individuals of this species arrived at the Basque coast (southeastern Bay of Biscay), causing a great socio-economic impact. Here we investigate the most likely region of origin and routes of these individuals using the Sediment, Oil spill and Fish Tracking model (SOFT). This model was run backwards in time using only the wind drag velocity (i.e., the wind velocity multiplied by a wind drag coefficient) to estimate the drift of these Portuguese man-of-war for one year and taking into account that the final destination was the Basque coast. The wind data were obtained with the Weather Research and Forecasting model (WRF). Six different simulations were carried out with SOFT using the following wind drag coefficients: 0.02, 0.025, 0.03, 0.035, 0.04 and 0.045. The simulation period covered from the end of August 2010 to the beginning of August 2009. After the first eight months of simulation (i.e., at the beginning of January 2010), the virtual Portuguese man-of-war used in SOFT were located near or on the northwest and southwest coasts of France and England, respectively, and in the English Channel, the southern Celtic Sea and the northwestern Bay of Biscay. However, at the end of the simulation period (i.e., at the beginning of August 2009), most of these Portuguese man-of-war were located between the central part of the Bay of Biscay (~5° W) and the open North Atlantic Ocean (~35° W), depending on the wind drag coefficient. From these results, we conclude that the region of origin of the Portuguese man-of-war arriving at the Basque coast in August 2010 was probably located in the northern part of the North Atlantic Subtropical Gyre. This conclusion is in agreement with the general wind-driven circulation in the North Atlantic Ocean

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Ferrer, L. (Ekstern), Pastor Rollan, A. (Intern)
The pros and cons of sodium percarbonate

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Pedersen, L. (Intern), Jokumsen, A. (Intern)
Pages: 1-7
Publication date: 2017
Main Research Area: Technical/natural sciences

The role of egg cannibalism for the Calanus succession in the Disko Bay, Western Greenland

The present study is the first to describe egg cannibalism in the key Arctic copepod species Calanus finmarchicus, Calanus glacialis, and Calanus hyperboreus. Initially, a series of staining experiments evaluated the application of Neutral Red for staining Calanus eggs. The method was effective and applied in subsequent feeding experiments, where adult females were incubated in bottles with their own eggs. The results showed that all Calanus spp. ingested C. finmarchicus and C. glacialis eggs. However, consumers showed a slight preference for C. finmarchicus eggs when incubated with those of both species. The addition of phytoplankton even at high concentrations did not decrease clearance rates for eggs, suggesting that the presence of alternative food does not afford eggs any protection from cannibalism. To evaluate the potential impact of egg cannibalism on the succession of the three species, we calculated and compared field egg mortality rates with potential egg clearance rates for the Calanus complex based on rates from the experiments. Our results show that in Disko Bay cannibalism by Calanus spp., even at its highest level just before the spring bloom, could only account for about 10% of observed in situ egg mortality, and much less for most of the season

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Marine Ecology and Oceanography, Aarhus University
Authors: Frank-Gopolos, T. (Intern), Friis Møller, E. (Ekstern), Nielsen, T. G. (Intern)
Pages: 865–883
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
DOIs:
10.1002/lno.10472
The role of local adaptation in shaping fish-mussel coevolution

1. The survival of affiliate (dependent) species in a changing environment is determined by the interactions between the affiliate species and their available hosts. However, the patterns of spatial and temporal changes in host compatibility are often unknown despite host shifts having direct impact on the persistence of local populations. Bivalves of the order Unionida (freshwater mussels) are a functionally important but declining group of affiliate species, which are dependent on freshwater fish to host their parasitic larvae. The role of local adaptations and host fish resistance in shaping freshwater mussel host relationships remains poorly understood.

2. We used an invasive East Asian unionid bivalve, Sinanodonta woodiana, and its potential host fishes to study the mechanisms shaping fish-mussel coevolution using a combination of laboratory cross-exposure methods and field-collected data. We tested whether generalist host use of S. woodiana is pertinent to native host species, with special attention to bitterling fishes (Cyprinidae: Acheilognathinae) that are characterised by a mutual association with freshwater mussels. We also tested whether the pattern of the parasite-host association varies temporally (between areas of ancient and recent sympatry) and spatially (at a sub-basin level in its native range).

3. Results revealed the ability of S. woodiana to widely exploit non-bitterling host fishes at a global scale. In contrast, the ability of S. woodiana to exploit closely associated bitterling fishes was low in its native range (with ancient sympatry). In areas of recent sympathy (non-native S. woodiana range in Europe), S. woodiana glochidia were demonstrated to readily parasitise local, evolutionarily naive bitterling species at high density.

4. The results of a population-level experiment with three native populations of S. woodiana and rose bitterling, Rhodeus ocellatus, from various sub-basins of the River Yangtze confirmed that mussel populations vary in their compatibility with particular host populations. However, there was no evidence of population-specific adaptive coevolution.

5. This study provides the first evidence for a role of fish counter-adaptations against freshwater mussel glochidia, and documents the importance of population-level variation in shaping compatibility between glochidia and their host fishes. This outcome can inform predictions on the impact of biotic homogenisation on endangered affiliate species in general and freshwater mussels in particular.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Czech University of Life Sciences Prague, Chinese Academy of Sciences, Academy of Sciences of the Czech Republic
Authors: Douda, K. (Ekstern), Liu, H. (Ekstern), Yu, D. (Ekstern), Rouchet, R. (Ekstern), Liu, F. (Ekstern), Tang, Q. (Ekstern), Methling, C. (Intern), Smith, C. (Ekstern), Reichard, M. (Ekstern)
Pages: 1858-1868
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Freshwater Biology
Volume: 62
Issue number: 11
ISSN (Print): 0046-5070
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.568 SNIP 1.41
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.537 SNIP 1.371 CiteScore 2.95
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.487 SNIP 1.473 CiteScore 3.03
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.045 SNIP 1.9 CiteScore 4.02
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.075 SNIP 1.755 CiteScore 3.76
ISI indexed (2012): ISI indexed yes
The structuring role of fish in Greenland lakes: an overview based on contemporary and paleoecological studies of 87 lakes from the low and the high Arctic

Lakes in Greenland are species-poor ecosystems and many are fishless. We studied the structuring role of fish in lakes in high- and low-Arctic Greenland. Major differences were observed in the trophic structure of the 87 lakes studied. Pelagic zooplankton biomass was on average 3-4-fold higher in the fishless lakes and dominated by large-bodied taxa such as Daphnia, the phyllopod Branchinecta and the tadpole shrimp Lepidurus. In contrast, small-bodied crustaceans dominated the lakes with fish. Analysis of microcrustacean remains in the surface sediment and contemporary benthic invertebrates also showed a marked influence of fish on community structure and the size of the taxa present. The cascading effect of fish on the microbial communities was modest, and no differences were observed for chlorophyll a. The cascading effect of fish on invertebrates depended, however, on the species present, being largest between fishless lakes and lakes hosting only sticklebacks (Gasterosteus aculeatus), while lakes with both Arctic charr (Salvelinus arcticus) and stickleback revealed a more modest response, indicating that presence of charr modulates the predation effect of sticklebacks. It is predicted that more lakes in Greenland will be colonised by fish in a future warmer climate, and this will substantially alter these vulnerable ecosystems.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Aarhus University, University of Copenhagen, Greenland Institute of Natural Resources
Authors: Jeppesen, E. (Ekstern), Lauridsen, T. L. (Ekstern), Christoffersen, K. S. (Ekstern), Landkildehus, F. (Ekstern), Geertz-Hansen, P. (Intern), Amsinck, S. L. (Ekstern), Søndergaard, M. (Ekstern), Davidson, T. A. (Ekstern), Rigét, F. (Ekstern)
Pages: 99-113
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Hydrobiologia
Volume: 800
Issue number: 1
Scientific interest in the sub-polar gyre of the North Atlantic Ocean has increased in recent years. The sub-polar gyre has contracted and weakened, and changes in circulation pathways have been linked to changes in marine ecosystem productivity. To aid fisheries and environmental scientists, we present here a time series of the Sub-Polar Gyre Index (SPG-I) based on monthly mean maps of sea surface height. The established definition of the SPG-I is applied, and the first EOF (empirical orthogonal function) and PC (principal component) are presented. Sensitivity to the spatial domain and time series length are explored but found not to be important factors in terms of the SPG-I's interpretation. Our time series compares well with indices presented previously. The SPG-I time series is freely available online (http://dx.doi.org/10.7489/1806-1), and we invite the community to access, apply, and publish studies using this index time series.
Towards a mechanistic understanding of vulnerability to hook-and-line fishing: Boldness as the basic target of angling-induced selection

In passively operated fishing gear, boldness-related behaviors should fundamentally affect the vulnerability of individual fish and thus be under fisheries selection. To test this hypothesis, we used juvenile common-garden reared carp (Cyprinus carpio) within a narrow size range to investigate the mechanistic basis of behavioral selection caused by angling. We focused on one key personality trait (i.e., boldness), measured in groups within ponds, two morphological traits (body shape and head shape), and one life-history trait (juvenile growth capacity) and studied mean standardized selection gradients caused by angling. Carp behavior was highly repeatable within ponds. In the short term, over seven days of fishing, total length, not boldness, was the main predictor of angling vulnerability. However, after 20 days of fishing, boldness turned out to be the main trait under selection, followed by juvenile growth rate, while morphological traits were only weakly related to angling vulnerability. In
addition, we found juvenile growth rate to be moderately correlated with boldness. Hence, direct selection on boldness will also induce indirect selection on juvenile growth and vice versa, but given that the two traits are not perfectly correlated, independent evolution of both traits is also possible. Our study is among the first to mechanistically reveal that energy-acquisition-related behaviors, and not growth rate per se, are key factors determining the probability of capture, and hence, behavioral traits appear to be the prime targets of angling selection. We predict an evolutionary response toward increased shyness in intensively angling-exploited fish stocks, possibly causing the emergence of a timidity syndrome.
and resource management, to identify available indicators that can be used to inform marine management. Standard evaluation criteria (availability and quality of data, conceptual basis, communicability, relevancy to management) were implemented to identify practical food-web indicators ready for operational use and indicators that hold promise for future use in policy and management. The major attributes of the final suite of operational food-web indicators were structure and functioning. Indicators that represent resilience of the marine ecosystem were less developed. Over 60 potential food-web indicators were evaluated and the final selection of operational food-web indicators includes: the primary production required to sustain a fishery, the productivity of seabirds (or charismatic megafauna), zooplankton indicators, primary productivity, integrated trophic indicators, and the biomass of trophic guilds. More efforts should be made to develop thresholds-based reference points for achieving Good Environmental Status. There is also a need for international collaborations to develop indicators that will facilitate management in marine ecosystems used by multiple countries.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Queen Mary University of London, NOAA, NOAA, IFREMER, Fisheries and Oceans Canada, Istituto Nazionale Di Oceanografia E Geofisica Sperimentale, Trieste, Stockholm University, Wageningen IMARES, Ca’ Foscari University of Venice, Universite de Caen, Marine Scotland Science, European Commission - Joint Research Center, Swedish Meteorological and Hydrological Institute, Instituto Espanol de Oceanografia, Scottish Association for Marine Science, Institute of Marine Research, Queen's University Belfast, Swedish University of Agricultural Sciences, Klaipeda University
Pages: 2040-2052
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**

Journal: ICES Journal of Marine Science
Volume: 74
Issue number: 7
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Ratings:

BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Web of Science (2016): Indexed yes
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
BFI (2013): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Toxicity of emerging chemical contaminants evaluated in vivo with classic and alternative approaches using the zebrafish animal model

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, National Food Institute, Research Group for Analytical Food Chemistry
Authors: Rainieri, S. (Ekstern), Conlledo, N. (Ekstern), Larsen, B. K. (Intern), Granby, K. (Intern), Barranco, A. (Ekstern)
Pages: 13-13
Publication date: 2017

Host publication information
Title of host publication: Seafood safety new findings & innovation challenges - abstract book
Place of publication: Brussels, Belgium
Publisher: Royal Flemish Academy of Science and the Arts (KVAB)
Main Research Area: Technical/natural sciences
Conference: Seafood Safety, Brussels, Belgium, 25/01/2017 - 25/01/2017
Electronic versions:
21042f_6f62ebc4654c2fac338ce587d66be15.pdf
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Toxicity of peracetic acid to fish: Variation among species and impact of water chemistry: PAA toxicity to various fish
There has been strong interest in the use of peracetic acid (PAA) in aquaculture as it can be used to disinfect water and hard surfaces and thereby eliminate or lower the burden of fish pathogens. Unfortunately, there has been little research on the toxicity of PAA to fish. Twelve species of fingerling fish that are important to aquaculture were exposed to PAA for 24 h in static toxicity bioassays in well water. These fish were: fathead minnow, Pimephales promelas; black-nose crappie, Pomoxis nigromaculatus; bluegill, Lepomis macrochirus; blue tilapia, Oreochromis aureus; channel catfish, Ictalurus punctatus; golden shiner, Notemigonus crysoleucas; goldfish, Carassius auratus; grass carp, Ctenopharyngodon idella; largemouth bass, Micropterus salmoides; rainbow trout, Oncorhynchus mykiss; sunshine bass, Morone chrysops × M. saxatilis; and walleye, Sander vitreus. Median lethal concentration (LC50) values were estimated with the trimmed Spearman–Karber method using nominal PAA concentrations. The mean 24-h LC50 values ranged from 2.8 to 9.3 mg/L PAA. Fathead minnow were very sensitive and blue tilapia were very tolerant to PAA exposure; LC50 values of other species tested were within the range of 4.1–6.2 mg/L PAA. More importantly, the 24-h no-observed-effect concentration (NOEC) ranged from 1.9 to 5.8 mg/L PAA; the NOEC would be considered as the safe range for culturists to investigate the use of PAA. Decreased alkalinity/hardness increased the toxicity of PAA, while a small increase of dissolved organic content had no effect on PAA toxicity. Results of the present study are important information on the safe application of PAA for the aquaculture industry
Trait-based approaches to ocean life

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Kiørboe, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Trait-based model of mixotrophy in plankton

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Copenhagen
Authors: Andersen, K. H. (Intern), Berge, T. (Ekstern), Chakraborty, S. (Intern), Hansen, P. J. (Ekstern)
Publication date: 2017
Event: Abstract from Dansk Havforskermøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Transforming waste into new resources: optimizing sludge hydrolysis to improve nitrogen removal in aquaculture through denitrification

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Letelier-Gordo, C. O. (Intern), Pedersen, P. B. (Intern), Dalsgaard, A. J. T. (Intern)
Number of pages: 119
Publication date: 2017

Publication information
Publisher: Technical University of Denmark, National Institute for Aquatic Resources
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Ph.D. thesis – Annual report year: 2017

Transgenerational interactions between a pesticide and warming in a vector mosquito.
Climate change imposes a strong pressure on the persistence of natural populations and together with pollution it exerts a global threat to biodiversity. While many transgenerational studies have revealed the capacity of species to adapt to a temperature increase, it remains unknown if this ability may change in a polluted environment. We set up a full-factorial transgenerational experiment where Culex pipiens vector mosquitoes were reared at two temperatures (20°C vs 24°C) and, when they reached the final larval stage, exposed to one of two chlorpyrifos treatments (absent vs present). We studied effects on larval survival and age and size at metamorphosis. In both generations, warming and the pesticide reduced larval survival and accelerated development in the survivors. While warming reduced size at metamorphosis, pesticide exposure did not affect size. As expected, the effect of chlorpyrifos on mortality was stronger under warming. We could show delayed effects of parental rearing temperature on their offspring with parents reared at 24°C producing offspring with a lower survival, slower development, but a larger size at metamorphosis. For survival the effect was particularly strong in offspring that was reared at 20°C, thereby providing evidence for transgenerational acclimation resulting in poor offspring performing under thermal conditions different from their parents. Parental pesticide exposure influenced the response of the offspring to both stressors, with offspring from parents exposed to the pesticide being more susceptible.
to warming in terms of survival, but performing better when also exposed to the pesticide in terms of size at metamorphosis. Our results indicate some signals of transgenerational acclimation to the pesticide: offspring exposed to the pesticide did better when the parents were also exposed to the pesticide. However, when combining stressors, we could show that parental pesticide exposure increased the vulnerability to warming indicating the complexity of transgenerational acclimation. This highlights the importance of looking at the combined impact of pesticides and warming increase across generations to come to a better understanding of the impact of pesticides in a warming world.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, University of Leuven
Authors: Tran, T. (Ekstern), Dinh, K. V. (Intern), Stoks, R. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 132116833
Publication: Research › Poster – Annual report year: 2017

Translating advances in Arctic climate science to climate services across the Northern Hemisphere

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Miller, R. (Ekstern), Payne, M. (Intern), Keil, K. (Ekstern), Kolstad, E. W. (Ekstern), Ballester, J. (Ekstern), Lesser, P. (Ekstern), Vangsbo, P. (Ekstern)
Publication date: 2017
Event: Poster session presented at European Climate Change Adaptation Conference , Glasgow, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2017

TropFishR: an R package for fisheries analysis with length-frequency data
1. The R package TropFishR is a new analysis toolbox compiling single-species stock assessment methods specifically designed for data-limited fisheries analysis using length-frequency data.
2. It includes methods for (i) estimating biological stock characteristics such as growth and mortality parameters, (ii) exploring technical aspects of the fisheries (e.g. exploitation rate and selectivity characteristics), (iii) assessing size and composition of a fish stock by means of virtual population analysis (VPA), and (iv) assessing stock status with yield prediction and production models.
3. This paper introduces the package and demonstrates the functionality of a selection of its core methods.
4. TropFishR modernises traditional stock assessment methods by easing application and development and by combining it with advanced statistical approaches

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Johann Heinrich von Thünen-Institute, Leibniz Centre for Tropical Marine Research
Authors: Mildenberger, T. (Intern), Taylor, M. H. (Ekstern), Wolff, A. (Ekstern)
Pages: 1520-1527
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Methods in Ecology and Evolution
Volume: 8
Issue number: 11
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Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Trophic impact of Atlantic bluefin tuna migrations in the North Sea

Large highly migratory predators can have major impacts on local marine ecosystems by reducing prey populations and leading to trophic cascades that affect the entire fish community. These trophic interactions are typically non-linear and can alter both the migratory behaviour of the predator and the stability of the fish community. The impact of a migrating top-predator is investigated here for Atlantic bluefin tuna in the North Sea. Bluefin tuna has been absent from the region for half-century, but recent years have seen recovery of migrations and a return of bluefin tuna in the area. We use a size spectrum model to analyse the trophic impact of the returning tuna on the entire fish community, under scenarios with varying levels of tuna consumption and fishing mortality on the prey. We show that with high level of prey fishing mortality in the North Sea, the effect of a tuna re-colonization results in only limited trophic cascades. However, high tuna consumption or changes in fishing mortality may result in a sudden recruitment failure of small-pelagic fish due to cascading effects on the fish community. In present-day conditions, the level of tuna consumption that triggers recruitment failure is lower at increasing fishing mortalities on their prey, providing indications for the future sustainable management of both small-pelagics and bluefin tuna in the area.
Trophic interactions in the Baltic Sea: Clupeid predation on cod early life stages

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Institute Management, Section for Ecosystem based Marine Management
Authors: Neumann, V. (Intern), Köster, F. (Intern), Eero, M. (Intern), Schaber, M. (Ekstern)
Publication date: 2017
Event: Abstract from ICES Annual Science Conference 2017, Fort Lauderdale, United States.
Main Research Area: Technical/natural sciences

Bibliographical note
ICES CM 2017/P:454
Publication: Research › Conference abstract for conference – Annual report year: 2017
Trophic interactions in the Baltic Sea: Clupeid predation on cod early life stages

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Institute Management, Section for Ecosystem based Marine Management
Authors: Neumann, V. (Intern), Köster, F. (Intern), Eero, M. (Intern), Schaber, M. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Trophic Interactions in the Baltic Sea: Predation on cod eggs by clupeids
Cod (Gadus morhua), sprat (Sprattus sprattus) and herring (Clupea harengus) are key species of the upper trophic levels in the Baltic Sea ecosystem and are strongly interlinked: The piscivore cod is the main predator on the planktivores sprat and herring, which feed, amongst others, on cod eggs. Egg predation by sprat and herring has earlier been suggested as one of the factors limiting cod recruitment success in the Baltic Sea in the 1990s. Since then, changes have taken place in cod recruitment as well as in the ecological factors potentially influencing egg predation. The overall aim of this thesis is to elucidate possible changes in predation pressure on cod early life stages in the 2000s compared to the 1990s, as well as to enhance our understanding of the processes impacting on egg predation and its implications for cod recruitment. The investigations of this thesis are based on extensive datasets on stomach contents of sprat and herring, ambient hydrographic conditions, ichthyoplankton distribution and abundance as well as predator distribution and abundance from hydroacoustic data for the 1990s and 2004-2008. Changes in diet composition of sprat and herring were investigated, including temporal and spatial variability in egg predation. The changes were driven by ambient hydrographic conditions, cod egg abundance, predator-prey overlap as well as abundance of alternative prey (Paper I). Next, cod egg consumption by herring and sprat was quantified and compared with revised estimates from the 1990s to elucidate potential changes in predation mortality of cod eggs (Paper II). A major methodological focus in this investigation was related to resolving the spatial distribution of sprat and herring to obtain realistic estimates of predator abundances in the area overlapping with cod eggs. As a next step, predation pressure was quantified separately for egg development stages, both for cod and sprat (Paper III). Furthermore, ichthyoplankton prey selection by clupeids was investigated, with specific focus of predation on different fish egg species and development stages, to improve our understanding of the mechanisms underlying egg predation. Finally, the results on predation pressure on cod eggs were reviewed in the context of other processes acting on early life stage survival and influencing cod recruitment in the Baltic Sea (Paper IV). The results showed that diet composition of both sprat and herring in terms of major taxonomic groups was generally similar in the 1990s and 2000s. Although higher proportions of cod eggs occurred in the diet in the 2000s, the overall quantities of cod eggs in the diet were generally lower in the 2000s compared to the 1990s (Paper I). This suggests reduced predation on cod eggs in latter period, which was further confirmed in quantitative analyses of predation mortality on cod eggs (Paper II). The lower predation pressure on cod eggs in the 2000s compared to the 1990s was related to a combination of reduced predator abundance and lower daily rations by individual predators. Reduced predation pressure was identified as one of the factors contributing to relatively higher year-classes of cod recruitment in the 2000s (Paper IV). Predation was found to affect mainly eggs at older development stages (mainly stage III), i.e. those eggs which have survived two out of three critical development phases in the often detrimental hydrographic conditions in and below the permanent halocline (Paper III). This suggests a higher impact of predation on cod recruitment than formerly thought. In contrast, investigations on sprat egg mortality (Paper III) found that consumption rates of sprat eggs at all development stages relative to production rates were considerably lower compared to cod, suggesting egg predation to be of a lesser importance for sprat recruitment. The results of this thesis provide new knowledge on clupeid foraging, including identifying processes and mechanisms behind fish egg consumption in the central Baltic. Further, the thesis contributes improved methodology for quantifying cod and sprat egg predation by egg development stages. Both in combination can be considered as a major advancement in this field of research, as predation pressure on early life stages is generally extremely difficult to quantify and comparable studies are scarce. Hence, the thesis provides useful ecological and methodological input to other ecosystems and investigations, where predation on early life stages is an important factor in influencing fish recruitment.
Trophic strategies of unicellular plankton

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Chakraborty, S. (Intern), Nielsen, L. T. (Intern), Andersen, K. H. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Trophic strategies of unicellular plankton

Unicellular plankton employ trophic strategies ranging from pure photoautotrophs over mixotrophy to obligate heterotrophs (phagotrophs), with cell sizes from 10-8 to 1 μg C. A full understanding of how trophic strategy and cell size depend on resource environment and predation is lacking. To this end, we develop and calibrate a trait-based model for unicellular planktonic organisms characterized by four traits: cell size and investments in phototrophy, nutrient uptake, and phagotrophy. We use the model to predict how optimal trophic strategies depend on cell size under various environmental conditions, including seasonal succession. We identify two mixotrophic strategies: generalist mixotrophs investing in all three investment traits and obligate mixotrophs investing only in phototrophy and phagotrophy. We formulate two conjectures: (1) most cells are limited by organic carbon; however, small unicellulars are colimited by organic carbon and nutrients, and only large photoautotrophs and smaller mixotrophs are nutrient limited; (2) trophic strategy is bottom-up selected by the environment, while optimal size is top-down selected by predation. The focus on cell size and trophic strategies facilitates general insights into the strategies of a broad class of organisms in the size range from micrometers to millimeters that dominate the primary and secondary production of the world's oceans.
Udbredelsen af blåhvilling (Micromesistious poutassou) omkring Grønland

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Johann Heinrich von Thünen-Institute
Authors: Post, S. L. (Intern), Fock, H. (Ekstern), Jansen, T. (Intern)
Publication date: 2017
Event: Abstract from Dansk Havforskmøde, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Udsætning af signalkrebs i naturen kan medføre alvorlig straf

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern), Berg, S. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/09/signalkrebs-udsætning-strafbart?id=8a0a521a-f2de-44d1-a8a7-d8013296790b&utm_source=newsletter&utm_media=mail&utm_campaign=2017_09_12_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2017
Uncontrollable chronic stress reduces growth disparities in farmed Atlantic salmon

Individual variation in behavior and physiological traits in a wide variety of animals has been the focus of numerous studies in recent years. In this context, early life experiences shape responses that individuals have to subsequent environments, i.e. developmental plasticity. In this experiment, we subjected 10-month old fish to an unpredictable chronic stress (UCS) regime or no stress (control) for 3 weeks. These individuals then underwent the parr-smolt transformation, when salmonids become adapted for the seawater environment, and were subsequently transferred into seawater before the final sampling. Biometric data was collected at the end of each period. Sampling on the final day was conducted in order to analyze basal monoaminergic activity in the brain stem and hypothalamus, as well as gene expression of target genes in the telencephalon. We found that post-hoc sorting of individuals by their serotonergic activity (high and low) resulted in the elucidation of growth and gene expression differences. UCS groups were found to have less growth disparities throughout the experiment, compared to control fish. Furthermore, we found brain serotonergic signaling and corticotropic releasing factor binding protein expression were positively associated with brain stem serotonergic activity, which is consistent with fish showing a stress reactivity neurophysiological profile. In conclusion, we here submit evidence that sorting individuals by their basal serotonergic activity levels may be a useful tool in the study of developmental plasticity. These results may thus apply directly to improving husbandry practices in aquaculture and elucidating neural mechanisms for coping behavior.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Uni Research AS, Institute of Marine Research, Norwegian University of Life Sciences, Norwegian University of Science and Technology
Authors: Vindas, M. A. (Ekstern), Madaro, A. (Ekstern), Fraser, T. W. (Ekstern), Höglund, E. (Intern), Olsen, R. E. (Ekstern), Kristiansen, T. S. (Ekstern), Øverli, Ø. (Ekstern)
Pages: 246-252
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication information
Journal: Physiology & Behavior
Volume: 179
ISSN (Print): 0031-9384
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.53 SJR 1.05 SNIP 0.856
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.286 SNIP 1.006 CiteScore 2.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.489 SNIP 1.081 CiteScore 3.17
Undersøgelse af lystfiskeri i Øresund er godt i gang

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2017

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.aqua.dtu.dk/nyheder/2017/03/rekrea-oeresund-marts17?id=f1043430-29f8-4460-82a3-4fa3600f847c&utm_source=newletter&utm_media=mail&utm_campaign=2017_03_30_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2017

Undersøgelser af pighvar i Roskilde fjord

General information
State: Published
Unplanned ecological engineering

Fisheries can double the production of protein and revenue by abandoning current single-species management. This provocative prediction is the implication of the work in PNAS by Szuwalski et al. (1). Using the East China Sea as a case, they show how an indiscriminate fishery can support unexpectedly large catches by removing predators from the ecosystem. Such ecosystem engineering stands in stark contrast to reigning management paradigms that do not allow fishing down predators to increase the productivity of their prey.

The theoretical support for such a feat of ecosystem engineering is well developed (2, 3). Trusting the Chinese catch statistics, Szuwalski et al. (1) provide empirical evidence that theory may be turned into practice. But their work is more than “just another fisheries paper;” it underscores highly controversial issues about the unavoidable trade-offs in managing fisheries and ecosystems. If we narrowly consider food security, maximizing fisheries catch from the ecosystem is a “no-brainer,” but from a conservation point of view, the loss of biodiversity in the East China Sea may seem like Aquacalypse come true (4). Can we really double fisheries’ production by turning the oceans into mega-scale mariculture operations? Is it what we want?
Use of fluorescence spectroscopy to control ozone dosage in recirculating aquaculture systems

The aim of this study was to investigate the potential of fluorescence spectroscopy to be used as an ozone dosage determination tool in recirculating aquaculture systems (RASs), by studying the relationship between fluorescence intensities and dissolved organic matter (DOM) degradation by ozone, in order to optimise ozonation treatment. Water samples from six different Danish facilities (two rearing units from a commercial trout RAS, a commercial eel RAS, a pilot RAS and two marine water aquariums) were treated with different O3 dosages (1.0–20.0 mg/L ozone) in bench-scale experiments, following which fluorescence intensity degradation was eventually determined. Ozonation kinetic experiments showed that RAS water contains fluorescent organic matter, which is easily oxidised upon ozonation in relatively low concentrations (0–5 mg O3/L). Fluorescence spectroscopy has a high level of sensitivity and selectivity in relation to associated fluorophores, and it is able to determine accurately the ozone demand of each system. The findings can potentially be used to design offline or online sensors based on the reduction by ozone of natural fluorescent-dissolved organic matter in RAS. The suggested indirect determination of ozone delivered into water can potentially contribute to a safer and more adequate ozone-based treatment to improve water quality.

General information
State: Published
Authors: Spiliotopoulou, A. (Intern), Martin, R. (Ekstern), Pedersen, L. (Intern), Andersen, H. R. (Intern)
Pages: 357-365
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Water Research
Volume: 111
ISSN (Print): 0043-1354
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.49 SJR 2.629 SNIP 2.558
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.689 SNIP 2.507 CiteScore 6.63
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.957 SNIP 2.727 CiteScore 6.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.956 SNIP 2.693 CiteScore 6.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.966 SNIP 2.456 CiteScore 5.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.867 SNIP 2.374 CiteScore 5.43
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.582 SNIP 2.196
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Using accelerometry to quantify prey attack and handling behaviours in piscivorous pike Esox lucius

Accelerometer technology was used to evaluate behaviours in the teleost ambush predator pike Esox lucius foraging on crucian carp Carassius carassius. Automated rule-based estimates of prey-size determined handling time were obtained and are compared with video-recorded behaviours. Solutions to tag attachment and the limitations imposed by battery-time and data-logging capacities are evaluated.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Lund University, Institute of Fisheries of the National Academy of Agrarian Sciences of Ukraine
Authors: Deurs, M. V. (Intern), Andersson, A. (Ekstern), Vinterstare, J. (Ekstern), Didenko, A. (Ekstern), Persson, A. (Ekstern), Brönmark, C. (Ekstern), Nilsson, P. (Ekstern)
Pages: 2462-2469
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 90
Issue number: 6
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Using genetics to identify management units of European flounder in the Baltic Sea

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Swedish University of Agricultural Sciences
Authors: Florin, A. (Ekstern), Palm, S. (Ekstern), Ustups, D. (Ekstern), Hüussy, K. (Intern), Casini, M. (Ekstern), Nissling, A. (Ekstern), Limburg, K. (Ekstern), Schade, F. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Utilizing differences in behaviour to improve catch efficiency in the Nephrops directed fisheries

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF Fisheries and Aquaculture, Aalborg University
Authors: Krag, L. A. (Intern), Frandsen, R. P. (Intern), Dinesen, G. E. (Intern), Hermann, B. (Ekstern), Lund, H. S. (Ekstern), Karlsen, J. D. (Intern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Bibliographical note
ICESCM 2017/SSGIEM:13
Publication: Research › Conference abstract for conference – Annual report year: 2018

Vådområder kan påvirke de naturlige fiskebestande negativt

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Schwinn, M. (Intern), Nielsen, J. (Intern), Koed, A. (Intern)
Publication date: 2017

**Publication information**
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2017/01/vaadomraader-oerredsmolt-tab-paavirke-fiskebestande-negativt?id=9ff8fd85-7f3f-44d0-9791-a841f158e930&utm_source=newsletter&utm_media@mail&utm_campaign=2017-01-20
Publication: Communication › Internet publication – Annual report year: 2017

Validation of ecological state space models using the Laplace approximation

Many statistical models in ecology follow the state space paradigm. For such models, the important step of model validation rarely receives as much attention as estimation or hypothesis testing, perhaps due to lack of available algorithms and software. Model validation is often based on a naive adaptation of Pearson residuals, i.e. the difference between observations and posterior means, even if this approach is flawed. Here, we consider validation of state space models through one-step prediction errors, and discuss principles and practicalities arising when the model has been fitted with a tool for estimation in general mixed effects models. Implementing one-step predictions in the R package Template Model Builder, we demonstrate that it is possible to perform model validation with little effort, even if the ecological model is multivariate, has non-linear dynamics, and whether observations are continuous or discrete. With both simulated data, and a real data set related to geolocation of seals, we demonstrate both the potential and the limitations of the techniques. Our results fill a need for convenient methods for validating a state space model, or alternatively, rejecting it while indicating useful directions in which the model could be improved.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Department of Applied Mathematics and Computer Science
Variation that can be expected when using particle tracking models in connectivity studies

• A suite of ocean circulation and Lagrangian models were compared to determine inter-model uncertainty and variation.
• Absolute results (positions, temperatures, etc.) varied between models, but trends were comparable.
• More plaice than sole larvae reached a marine protected area although released in the same area but at different times.
• About 10% of all herring larvae released in the southern North Sea were located in a wind-park area when becoming juvenile.
Water mass characteristics and associated fauna of a recently discovered Lophelia pertusa (Scleractinia: Anthozoa) reef in Greenlandic waters

The first living sample of Lophelia pertusa from Greenlandic waters was inadvertently collected at 60.3675°, −48.45528°, entangled together with other corals to a seawater sampler and property sensor (CTD) package. We collected in situ photographs taken at two sites in the same area in order to determine whether a reef was present. We identified reef-like
structures formed by living and dead L. pertusa at 886–932 m depth on a steep slope. We assembled and analyzed
hydrographic data to characterize the reef environment in order to facilitate future localization of other reefs and
predictions of the impacts of climate change. We showed that the reef was located in a layer of modified Atlantic Water of
relatively stable bottom temperature (4.1–5.0 °C) and salinity (34.90–34.98) with density slightly higher (27.62–27.71 kg
m–3) than that reported for the occurrence of reefs in the northeast Atlantic, and in an area with exceptionally and
persistently high currents of >15 cm s−1 at 1000 m. The intermediate-depth salinity maximum was found in the depth
range where the corals were found. We discovered signals of consistent vertical and horizontal transports at 700–900 m
over the reef area. Although this area is not directly influenced by intermediate and deep convection in the Labrador Sea,
the seasonal evolution of near-bottom temperature, salinity and density for the 700–900 m depth range revealed strong
seasonal patterns with both temperature and salinity reducing to their annual minimal values at the end of March and
staying low for 1 month with an indication of a second minimum in June, 3 months later. The occurrence and temporal
extent of these minima likely arose through a combination of local convection from the surface and advection of cooled
and freshened waters at depth from the Irminger Sea. A diversified associated fauna was described; the short list of
species compiled from our limited sample comprised species common in the area, as well as rare species, species new to
Greenland, and species new to science

General information
State: Published
Organisations: Arctic Section, National Institute of Aquatic Resources, Section for Oceans and Arctic, Bedford Institute of
Oceanography, University of Copenhagen
Authors: Kenchington, E. (Ekstern), Yashayaev, I. (Ekstern), Tendal, O. S. (Ekstern), Jørgensbye, H. (Intern)
Pages: 321–337
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Polar Biology
Volume: 40
Issue number: 2
ISSN (Print): 0722-4060
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.72 SJR 0.866 SNIP 0.761
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.985 SNIP 0.751 CiteScore 1.62
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.931 SNIP 0.81 CiteScore 1.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.109 SNIP 1.054 CiteScore 2.07
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.029 SNIP 0.891 CiteScore 1.89
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.857 SNIP 0.925 CiteScore 1.77
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.868 SNIP 0.885
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.785 SNIP 0.871
When in life does density dependence occur in fish populations?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Living Resources, Section for Marine Ecology and Oceanography
Authors: Andersen, K. H. (Intern), Jacobsen, N. S. (Intern), Jansen, T. (Intern), Beyer, J. E. (Intern)
Pages: 656-667
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Fish and Fisheries
Volume: 18
Issue number: 4
ISSN (Print): 1467-2960
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.7 SJR 3.606 SNIP 3.245
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.668 SNIP 3.034 CiteScore 7.05
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.462 SNIP 3.327 CiteScore 7.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.488 SNIP 3.12 CiteScore 6.19
ISI indexed (2013): ISI indexed yes
Will salinity hinder the ongoing northward dispersal of the invasive round goby into the oceanic North Sea?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Marine Ecology and Oceanography
Authors: Behrens, J. (Intern), van Deurs, M. (Intern), Christensen, E. A. F. (Intern)
Number of pages: 1
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
SustainAbstracts2017c.compressed_6.pdf
Publication: Research › Conference abstract for conference – Annual report year: 2017

Zooplankton in a global perspective: Will climate change favor a more gelatinous marine food web?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Jaspers, C. (Intern)
Publication date: 2017
Event: Abstract from Aarhus University Marine Ecology Seminar Series, Aarhus, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017
Zooplankton motile behavior: traits and trade-offs in planktonic copepods

Research on planktonic copepod ecology is vital to understand the factors controlling marine food web dynamics since copepods are the major components of zooplankton communities and the main link between trophic levels in marine environments. Despite their taxonomic diversity, copepods share certain phenotypic characteristics, or ‘traits’, that are essential in determining trophic interactions and fitness. One important characteristic that decisively influences organism interactions is behavior. Copepods display two distinct behavioral strategies in terms of motility: ‘active’ (feeding-current and cruising feeding) or ‘passive’ (ambush feeding). Differences in motile behavior between strategies imply different consequences for encounter rates with prey, sex partners, and potential predators. This thesis aims to provide a mechanistic understanding of how the different behavioral strategies in zooplankton result in different trade-offs between efficient feeding, mate finding, and predation risk. We experimentally quantified i) swimming behavior, ii) feeding rates on different prey, iii) escape capability and iv) predation risk in various copepod life stages and genders with different motile and feeding behavior. We found that an active feeding behavior resulted in high feeding efficiency on both motile and immotile prey, but also high predation mortality from rheotactic predators. In contrast, ambush feeding was inefficient for non-motile prey (one of order of magnitude lower than for active feeders), but least risky in term of predation risk (up to eight times lower than for active feeders). Strict ambush feeders, which depend on the fluid disturbance generated to perceive the prey, are therefore more constrained in terms of prey availability than other feeding strategies. Hence, a high feeding efficiency is traded off against a high predation risk in zooplankton. We show that differences in predation rates and feeding efficiency between copepod genders are dependent on the feeding behavior. In ambush feeders (Oithona spp), where feeding and mate finding are conflicting activities, males have to sacrifice feeding time to search for females and display high-velocity mate-searching behavior. Consequently, males showed a lower feeding efficiency and significantly higher predation mortality than females. On contrast, in active feeders both sexes moved more during feeding and showed small differences between genders in feeding efficiency and predation risk. Finally, we also found that foraging activity decreased with increasing food availability, especially in active feeding strategies, resulting in a decrease in predation risk. Therefore, changes in behavior depending on food availability have implications on zooplankton predation risk (“bottom-up behavioral cascades”) in marine plankton food webs. Our overall conclusion is that behavior is a key trait in copepods that plays a decisive role in the trade-off between feeding, mate finding, and survival. The optimality of each behavioral strategy is determined by the environmental conditions particularly by prey availability, prey type, and predation pressure. Copepod behavior is therefore a determining factor of grazing impact, distribution and composition of zooplankton in the marine environment.
1.500 mærkede torsk skal give bedre bestandsvurdering

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Monitoring and Data, Danish Fishermen's Producers' Organization
Authors: Hüssy, K. (Intern), Olesen, H. J. (Intern), Hansen, K. K. (Ekstern), Lund, H. S. (Ekstern)
Pages: 11
Publication date: 2016

**Publication information**
Pages (from-to): 11
Newspaper: Fiskeritidende
Volume: 23
No.: 37
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Main Research Area: Technical/natural sciences
Publication: Communication › Newspaper article – Annual report year: 2016

Åbent hus på Lundby Dambrug

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Dalsgaard, A. J. T. (Intern)
Pages: 3-4
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Dansk Akvakultur. Nyhedsbrev
ISSN (Print): 1902-276X
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2016

Aborrer og gedder i brakvand - betydningen af ferskvandsområder for gydning

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Marine Ecology and Oceanography, University of Copenhagen
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern), Nielsen, J. (Intern), Aarestrup, K. (Intern), Jepsen, N. (Intern), Christensen, E. A. F. (Intern), Skovrind, M. (Ekstern), Højrup, L. B. (Ekstern)
Publication date: 2016
Event: Poster session presented at Dansk Ferskvandsymposium 2016, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016
Abundance of specific mRNA transcripts impacts hatching success in European eel, Anguilla anguilla L

Maternal mRNA governs early embryonic development in fish and variation in abundance of maternal transcripts may contribute to variation in embryonic survival and hatch success in European eel, Anguilla anguilla. Previous studies have shown that quantities of the maternal gene products β-tubulin, insulin-like growth factor 2 (igf2), nucleoplasm (npm2), prohibitin 2 (phb2), phosphatidylinositol glycan biosynthesis class F protein 5 (pigf5), and carnitine O-palmitoyltransferase liver isoform-like 1 (cpt1) are associated with embryonic developmental competence in other teleosts. Here, the relations between relative mRNA abundance of these genes in eggs and/or embryos and egg quality, was studied and analyzed. We compared egg quality of the two groups: i) batches with hatching and ii) batches with no hatching. Results showed no significant differences in relative mRNA abundance between the hatch and no hatching groups for any of the selected genes at 0, 2.5, and 5 HPF. However, at 30 HPF the hatch group showed significantly higher abundance of cpt1a, cpt1b, β-tubulin, phb2, and pigf5 transcripts than the no hatch group. Therefore, these results indicate that up-regulation of the transcription of these genes in European eel after the mid-blastula transition, may be needed to sustain embryonic development and hatching success.

General information
State: Published
Organisations: Section for Ecosystem based Marine Management, National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, IFREMER
Authors: Rozenfeld, C. (Intern), Butts, I. A. (Intern), Tomkiewicz, J. (Intern), Zambonino-Infante, J. (Ekstern), Mazurais, D. (Ekstern)
Pages: 59-65
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Comparative Biochemistry and Physiology. Part A: Molecular & Integrative Physiology
Volume: 191
ISSN (Print): 1095-6433
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.16 SJR 0.794 SNIP 0.879
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.917 SNIP 0.915 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.983 SNIP 0.94 CiteScore 2.18
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.956 SNIP 1.058 CiteScore 2.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.773 SNIP 1.032 CiteScore 2.18
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.858 SNIP 1.048 CiteScore 2.2
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.836 SNIP 1.041
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.794 SNIP 0.944
A carbon budget for the Amundsen Sea Polynya, Antarctica: Estimating net community production and export in a highly productive polar ecosystem

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Rutgers University, University of Colorado, Columbia University, Georgia Institute of Technology, Bangor University, Stanford University, University of Georgia, University of Copenhagen, Uppsala University, Institute of Marine Science (CSIC), Florida Atlantic University
Authors: Yager, P. L. (Ekstern), Sherrell, R. M. (Ekstern), Stammerjohn, S. E. (Ekstern), Ducklow, H. W. (Ekstern), Schofield, O. M. E. (Ekstern), Ingall, E. D. (Ekstern), Wilson, S. E. (Ekstern), Lowry, K. E. (Ekstern), Williams, C. M. (Ekstern), Riemann, L. (Ekstern), Bertilsson, S. (Ekstern), Alderkamp, A. C. (Ekstern), Dinasquet, J. (Ekstern), Logares, R. (Ekstern), Melara, A. J. (Ekstern), Mu, L. (Ekstern), Newstead, R. G. (Ekstern), Post, A. (Ekstern), Swalethorpe, R. (Intern), van Dijken, G. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Elementa: Science of the Anthropocene
ISSN (Print): 2325-1026
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Web of Science (2016): Indexed yes
Original language: English
Electronic versions:
Publishers version
DOIs:
10.12952/journal.elementa.000140
Links:
https://www.elementascience.org/articles/140/tabs/article_info
Publication: Research - peer-review › Journal article – Annual report year: 2015

Accounting for correlated observations in an age-based state-space stock assessment model
Fish stock assessment models often rely on size- or age-specific observations that are assumed to be statistically independent of each other. In reality,
these observations are not raw observations, but rather they are estimates from a catch-standardization model or similar summary statistics based on observations from many fishing hauls and subsamples of the size and age composition of the data. Although aggregation mitigates the strong intra-haul correlation between sizes/ages that is usually found in haul-by-haul data, violations of the independence assumption can have a large impact on the results and specifically on reported confidence bounds. A state-space assessment model that allows for correlations between age groups within years in the observation model for catches and surveys is presented and applied to data on several North Sea fish stocks using various correlation structures. In all cases the independence assumption is rejected. Less fluctuating estimates of the fishing mortality is obtained due to a reduced process error. The improved model does not suffer from correlated residuals unlike the independent model, and the variance of forecasts is decreased.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Berg, C. W. (Intern), Nielsen, A. (Intern)
Pages: 1788-1797
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 73
Issue number: 7
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
Accounting for potential physiological, behavioral, and community-level responses to reintroduction

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jachowski, D. S. (Ekstern), Bremner-Harrison, S. (Ekstern), Steen, D. A. (Ekstern), Aarestrup, K. (Intern)
Number of pages: 408
Pages: 185-215
Publication date: 2016

Host publication information
Title of host publication: Reintroduction of Fish and Wildlife Populations
Publisher: University of California Press
Editors: Jachowski, D. S., Millspaugh, J. J., Angermeier, P. L., Slotow, R.
ISBN (Print): 9780520284616
ISBN (Electronic): 9780520960381
Chapter: 9
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2016

Accumulation, transformation and breakdown of DSP toxins from the toxic dinoflagellate Dinophysis acuta in blue mussels, Mytilus edulis

Okadaic acid (OA), dinophysistoxins (DTX) and pectenotoxins (PTX) produced by the dinoflagellates Dinophysis spp. can accumulate in shellfish and cause diarrhetic shellfish poisoning upon human consumption. Shellfish toxicity is a result of algal abundance and toxicity as well as accumulation and depuration kinetics in mussels. We mass-cultured Dinophysis acuta containing OA, DTX-1b and PTX-2 and fed it to the blue mussel, Mytilus edulis under controlled laboratory conditions for a week to study toxin accumulation and transformation. Contents of OA and DTX-1b in mussels increased linearly with incubation time, and the net toxin accumulation was 66% and 71% for OA and DTX-1b, respectively. Large proportions (~50%) of both these toxins were transformed to fatty acid esters. Most PTX-2 was transformed to PTX-2 sec-o-acid and net accumulation was initially high, but decreased progressively throughout the experiment, likely due to esterification and loss of detectability. We also quantified depuration during the subsequent four days and found half-life times of 5-6 days for OA and DTX-1b. Measurements of dissolved toxins revealed that depuration was achieved through excreting rather than metabolizing toxins. This is the first study to construct a full mass balance of DSP toxins during both accumulation and depuration, and we demonstrate rapid toxin accumulation in mussels at realistic in situ levels of Dinophysis. Applying the observed accumulation and depuration kinetics, we model mussel toxicity, and demonstrate that a concentration of only 75 Dinophysis cells l-1 is enough to make 60 mm long mussels exceed the regulatory threshold for OA equivalents

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Copenhagen, Alfred Wegener Institute for Polar and Marine Research
Authors: Nielsen, L. T. (Intern), Hansen, P. J. (Ekstern), Krock, B. (Ekstern), Vismann, B. (Ekstern)
A comprehensive survey on selective breeding programs and seed market in the European aquaculture fish industry

The use of selective breeding is still relatively limited in aquaculture species. Information on such activities is sparse, hindering an overall evaluation of their success. Here, we report on the results of an online survey of the major aquaculture breeding companies operating in Europe. Six main reared fish species were targeted. A total of 31 respondents contributed to the survey, representing 75% of European breeding organizations. Family-based breeding schemes were predominant, but individual selection was more frequently applied in marine species. Artificial fertilization is the preferred means of reproduction; however, mass spawning is often used as a fallback method. The most frequently selected trait is growth performance, but the number of selected traits has been increasing over the years through the addition of traits such as disease resistance or product quality. The use of molecular tools is now common in all programs, mainly for pedigree traceability. An increasing number of programs use either genomic or marker-assisted selection. Results related to the seed production market confirmed that for Atlantic salmon there are a few dominant players at the European level, with 30–50% market share. Only part of the European fish aquaculture industry today fully exploits selective breeding to the best advantage. A larger impact assessment still needs to be made by the remainder, particularly on the market share of fish seed (eggs, larvae or juveniles) and its consequences for hatchery stability.
Acute toxicity of peracetic acid to fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Agricultural Research Service, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Authors: Straus, D. L. (Ekstern), Ledbetter, C. (Ekstern), Farmer, B. (Ekstern), Meinelt, T. (Ekstern), Pedersen, L. (Intern)
Publication date: 2016
Event: Abstract from Aquaculture America 2016, Las Vegas, United States.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

A dark hole in our understanding of marine ecosystems and their services: Perspectives from the mesopelagic community

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Research Secretariat, Centre for Ocean Life, AZTI-Tecnalia, National Oceanography Centre, University of the Azores
Authors: St. John, M. (Intern), Borja, Á. (Ekstern), Chust, G. (Ekstern), Grigorov, I. (Intern), Mariani, P. (Intern), Martin, A. P. (Ekstern), Santos, R. S. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
A diffusion approximation based on renewal processes with applications to strongly biased run–tumble motion

We consider organisms which use a renewal strategy such as run–tumble when moving in space, for example to perform chemotaxis in chemical gradients. We derive a diffusion approximation for the motion, applying a central limit theorem due to Anscombe for renewal-reward processes; this theorem has not previously been applied in this context. Our results extend previous work, which has established the mean drift but not the diffusivity. For a classical model of tumble rates applied to chemotaxis, we find that the resulting chemotactic drift saturates to the swimming velocity of the organism when the chemical gradients grow increasingly steep. The dispersal becomes anisotropic in steep gradients, with larger dispersal across the gradient than along the gradient. In contrast to one-dimensional settings, strong bias increases dispersal. We next include Brownian rotation in the model and find that, in limit of high chemotactic sensitivity, the chemotactic drift is 64 % of the swimming velocity, independent of the magnitude of the Brownian rotation. We finally derive characteristic timescales of the motion that can be used to assess whether the diffusion limit is justified in a given situation. The proposed technique for obtaining diffusion approximations is conceptually and computationally simple, and applicable also when statistics of the motion is obtained empirically or through Monte Carlo simulation of the motion.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Centre for Ocean Life
Authors: Thygesen, U. H. (Intern)
Pages: 556-579
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Bulletin of Mathematical Biology
Volume: 78
Issue number: 3
ISSN (Print): 0092-8240
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 1.4 SJR 0.684 SNIP 0.833
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 0.768 SNIP 0.76 CiteScore 1.34
BFI (2014): BFI-level 2
Adult and offspring size in the ocean: a database of size metrics and conversion factors

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Copenhagen, University of Hawaii, University of Göttingen, Linnaeus University
Authors: Neuheimer, A. B. (Intern), Hartvig, M. (Intern), Heuschele, J. (Intern), Hylander, S. (Intern), Kiørboe, T. (Intern), Olsson, K. H. (Intern), Sainmont, J. (Intern), Andersen, K. H. (Intern)
Pages: 1083
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology
Volume: 97
Issue number: 4
ISSN (Print): 0012-9658
Adult lifetime reproductive value in fish depends on size and fecundity type

In a stable population, the adult lifetime reproductive value must be balanced against early life survival. Although delaying maturity may increase fecundity, it also reduces survival. Larger size at maturity therefore not only allows for higher fecundity, but requires it. Using simple arguments from life history, we derive a direct proportionality relationship between...
the adult lifetime reproductive value and weight at maturation and find that this relationship is consistent with empirical
evidence from 28 stocks and species of bony fish from temperate–boreal environments. However, the expected
proportionality falls off if
mortality increases to include fishing. Furthermore, we find that the fecundity type (determinate or indeterminate) affects
the predicted adult reproductive value, which is significantly (10-fold) higher for an indeterminate spawner than for a
determinate spawner of the same weight. These differences may relate to trade-offs in the adult life history traits and (or)
to seasonality in the
spawning environment, with subsequent consequences for early life stage survivorship.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for
Ecosystem based Marine Management
Pages: 1405-1412
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 73
Issue number: 9
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.451 SNIP 1.196
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.589 SNIP 1.379
Web of Science (2008): Indexed yes
A global synthesis of seasonal temperature-size responses in copepods: Seasonal temperature-size responses in copepods

Aim Body size is a master trait with significant ecological importance. Seasonal changes in body size within diverse ectothermic species can result from different environmental conditions experienced during ontogeny in subsequent generations. Whilst intraspecific changes in adult size have been well studied under controlled experimental conditions and across geographical ranges, comprehensive analyses of temporal changes are lacking, and there remains considerable unexplained variation in body size responses within aquatic taxa. Using planktonic copepods as an exemplar taxon, we quantify variation in adult body mass within seasonally varying marine and freshwater environments. We describe how size variation relates to temperature, food concentration (chlorophyll-a) and life-history characteristics, including feeding strategy.

Location Global.

Methods Using a meta-analytic approach we extract quantitative data from published literature on seasonal size responses of copepods. We analyse competing models to determine the best predictors of these responses, and compare the relative importance of temperature and chlorophyll-a concentration in explaining variation in body size.

Results We quantify 140 seasonal size responses from 33 different global locations, representing 48 planktonic copepod species from four taxonomic orders. We find that temperature (r(2) = 0.50), rather than food (r(2) = 0.22), is the dominant explanatory variable of changes in adult body size across seasons. A striking outcome is that calanoid copepods, which utilize feeding currents to capture prey, exhibit a four-fold greater reduction in adult body mass per degrees C (-3.66%) compared with cyclopoid copepods (-0.91%), which are ambush feeders. By contrast, species body size or reproductive strategy did not explain variation in the seasonal temperature-size response.

Main conclusions Our findings lead us to suggest that feeding strategies may play a significant role in dictating the magnitude of seasonal temperature-size responses in copepods, with potential implications for other ectotherms with diverse feeding methods. Seasonal temperature-size responses were typically much more variable than responses in laboratory studies that provided excess food, suggesting that field conditions modify the temperature-size response.
A holistic approach to provide recommendations for potential updates of the EU organic aquaculture regulation

General information
State: Published
Ålen overrasker igen

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.aqua.dtu.dk/nyheder/2016/10/aalen-kommer-for-sent?id=45eb0d88-2bd3-409c-98cc-6f45f083dd0d&utm_source=newsletter&utm_media=mail&utm_campaign=2016-10-11
Publication: Communication › Internet publication – Annual report year: 2016

Åleudsætninger skal hjælpe bestanden: Mere end 1,5 millioner sætteål blev udsat i år

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Pedersen, M. I. (Intern)
Pages: 9-11
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 36
Issue number: 2
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2016

Altid masser af ørredyngel siden opstemning blev fjernet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2016/08/oerredbestanden-gudenaa-vilholt-2016?id=dc184326-b722-42d7-ab6e-43b513d72b0d&utm_source=newsletter&utm_media=mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2016
A mere fluke: can parasites help predators limit fish invasions?

Analysis of trophic interactions reveals highly plastic response to climate change in a tri-trophic High-Arctic ecosystem

As a response to current climate changes, individual species have changed various biological traits, illustrating an inherent phenotypic plasticity. However, as species are embedded in an ecological network characterised by multiple consumer-resource interactions, ecological mismatches are likely to arise when interacting species do not respond homogeneously. The approach of biological networks analysis calls for the use of structural equation modelling (SEM), a multidimensional analytical setup that has proven particularly useful for analysing multiple interactions across trophic levels. Here we apply SEM to a long-term dataset from a High-Arctic ecosystem to analyse how phenological responses across three trophic levels are coupled to snowmelt patterns and how changes may cascade through consumer-resource interactions. Specifically, the model included the effect of snowmelt on a High-Arctic tri-trophic system of flowers, insects and waders (Charadriiformes), with latent factors representing phenology (timing of life history events) and performance (abundance or reproduction success) for each trophic level. The effects derived from the model demonstrated that the time of snowmelt directly affected plant and arthropod phenology as well as the performance of all included trophic levels. Additionally, timing of snowmelt appeared to indirectly influence wader phenology as well as plant, arthropod and wader performance through effects on adjacent trophic levels and lagged effects. The results from the tri-trophic community presented here emphasise that effects of climate on species in consumer-resource systems may propagate through trophic levels
An assessment of the Norwegian Deep/Skagerrak shrimp stock using the Stock Synthesis statistical framework

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences, Institute of Marine Research
Authors: Bergenius, M. (Ekstern), Cardinale, M. (Ekstern), Eigaard, O. R. (Intern), Søvik, G. (Ekstern), Ulmestrand, M. (Ekstern)
Number of pages: 20
Publication date: 2016
Main Research Area: Technical/natural sciences

Bibliographical note
NAFO SCR Doc. 16/055
Publication: Research › Paper – Annual report year: 2016

An important step towards accurate estimation of diet composition and consumption rates for the harbor porpoise (Phocoena phocoena)

General information
State: Published
An indicator for ecosystem externalities in fishing
Ecosystem externalities arise when one use of an ecosystem affects its other uses through the production functions of the ecosystem. We use simulations with a size-spectrum ecosystem model to investigate the ecosystem externality created by fishing of multiple species. The model is based upon general ecological principles and is calibrated to the North Sea. Two fleets are considered: a "forage fish" fleet targeting species that mature at small sizes and a "large fish" fleet targeting large piscivorous species. Based on the marginal analysis of the present value of the rent, we develop a benefit indicator that explicitly divides the consequences of fishing into internal and external benefits. This analysis demonstrates that the forage fish fleet has a notable economic impact on the large fish fleet, but the reverse is not true. The impact can be either negative or positive, which entails that for optimal economic exploitation, the forage fishery has to be adjusted according to the large fish fishery. With the present large fish fishery in the North Sea, the two fisheries are well adjusted; however, the present combined exploitation level is too high to achieve optimal economic rents.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Southern Denmark
Authors: Ravn-Jonsen, L. (Ekstern), Andersen, K. H. (Intern), Vestergaard, N. (Ekstern)
Pages: 400-425
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Natural Resource Modeling
Volume: 29
Issue number: 3
ISSN (Print): 0890-8575
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.64 SJR 0.286 SNIP 0.466
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.416 SNIP 0.655 CiteScore 1.16
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.684 SNIP 0.898 CiteScore 1.23
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.49 SNIP 0.561 CiteScore 0.86
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.438 SNIP 0.805 CiteScore 0.82
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.314 SNIP 0.32 CiteScore 0.57
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.373 SNIP 0.608
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Web of Science (2007): Indexed yes
Original language: English
Electronic versions:
Postprint
A novel role for pigment genes in the stress response in rainbow trout (Oncorhynchus mykiss)

In many vertebrate species visible melanin-based pigmentation patterns correlate with high stress- and disease-resistance, but proximate mechanisms for this trait association remain enigmatic. Here we show that a missense mutation in a classical pigmentation gene, melanocyte stimulating hormone receptor (MC1R), is strongly associated with distinct differences in steroidogenic melanocortin 2 receptor (MC2R) mRNA expression between high- (HR) and low-responsive (LR) rainbow trout (Oncorhynchus mykiss). We also show experimentally that cortisol implants increase the expression of agouti signaling protein (ASIP) mRNA in skin, likely explaining the association between HR-traits and reduced skin melanin patterning. Molecular dynamics simulations predict that melanocortin 2 receptor accessory protein (MRAP), needed for MC2R function, binds differently to the two MC1R variants. Considering that mRNA for MC2R and the MC1R variants are present in head kidney cells, we hypothesized that MC2R activity is modulated in part by different binding affinities of the MC1R variants for MRAP. Experiments in mammalian cells confirmed that trout MRAP interacts with the two trout MC1R variants and MC2R, but failed to detect regulation of MC2R signaling, possibly due to high constitutive MC1R activity.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Rochester Medical Center, King Abdullah University of Science and Technology, University of Oslo, Norwegian School of Veterinary Medicine, Norwegian Institute for Water Research, Norwegian University of Life Sciences
Authors: Khan, U. W. (Ekstern), Øverli, Ø. (Ekstern), Hinkle, P. M. (Ekstern), Pasha, F. A. (Ekstern), Johansen, I. B. (Ekstern), Berget, I. (Ekstern), Silva, P. I. M. (Ekstern), Kittilsen, S. (Ekstern), Höglund, E. (Intern), Omholt, S. W. (Ekstern), Våge, D. I. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Scientific Reports
Volume: 6
Article number: 28969
ISSN (Print): 2045-2322
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.625 SNIP 1.401
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.057 SNIP 1.684 CiteScore 5.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.103 SNIP 1.544 CiteScore 4.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.458 SNIP 0.896 CiteScore 2.44
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Anoxia-mediated release of dissolved organic matter from Baltic coastal sediments stimulate further hypoxia

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life
Authors: Reader, H. (Intern), Stedmon, C. (Intern), Kowalczuk, P. (Ekstern), Magnusson, Å. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Antiporewater dissolved organic matter lend insight into the role of the coastal filter over time?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Reader, H. (Intern), Stedmon, C. (Intern)
Publication date: 2016
Event: Poster session presented at ECSA 56 Coastal systems in transition, Bremen, Germany.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2017

Antarctic krill and ecosystem monitoring survey at South Orkney Islands in 2016

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Institute of Marine Research
Authors: Krafft, B. A. (Ekstern), Skaret, G. (Ekstern), Krag, L. A. (Intern), Rustand, T. (Ekstern), Pedersen, R. (Ekstern)
Number of pages: 22
Publication date: 2016

Publication information
Original language: English
Series: Institute of Marine Research Report
Number: 20
Main Research Area: Technical/natural sciences
Publication: Research › Report – Annual report year: 2016

Approaches to ensure an effective coastal zone management in the Baltic and beyond

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Schernewski, G. (Ekstern), Stettrup, J. G. (Intern), Boslough, R. (Ekstern)
Pages: 4-5
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Coastal and Marine
Aquaculture and feeding ecology: Feeding behaviour in turbot larvae

The period of first feeding, characterized by the shift from internal (yolk-sac) to external food sources, is considered particularly critical for the survival of marine fish, but the underlying causes are still unknown. The larval stage, characterized by high mortality rates, is particularly challenging for larval rearing. After the start of exogenous feeding, another intense and likely critical period of change occurs in the early life stages of fish. This stage is the metamorphosis, during which the larvae transform organs and body morphology to become juveniles. Compared to other teleosts, larvae of flatfishes undergo a particularly evident and dramatic metamorphosis, because flatfishes completely reprogram their body to move from the pelagic habitat, in the water column, to the benthic habitat, on the sea floor. Due to the complex morphological and physiological changes, in aquaculture metamorphosis in flatfish species is often unsuccessful, resulting in different types of abnormal development.

The objective of this thesis was to analyse the feeding behaviour of the flatfish species turbot (Psetta maxima L.) larvae during the two crucial life periods, 1) first feeding and 2) metamorphosis. To analyse whether these two periods are critical for the correct development and survival of turbot, feeding behaviours of larvae during the period of first feeding and during the first stages of metamorphosis was studied using video recordings. This provided qualitative and quantitative descriptions of behavioural parameters, including modal action patterns (e.g. Pause, S-shape, and Attack), attack rate, capture success rate, and swimming speeds of predator and prey. The feeding behaviour of turbot larvae could also be influenced by prey swimming behaviours. To test the effect of two common types of copepod swimming behaviours, turbot larvae were exposed to two species of copepod nauplii. The results presented in this thesis indicate that neither the period of first feeding nor the period of transition from an upright to a tilted swimming position seem to be critical for turbot larvae. First feeding and metamorphosis rather represent periods of adjustments to new morphological and physiological conditions, such as the depletion of yolk-sac during first feeding, and the migration of one eye when metamorphosis starts. Moreover, the behaviour of prey appears to have limited or no influence on larval turbot capture success.

This thesis is part of a large international project aimed at improving the rearing techniques of high value fish species larvated with calanoid copepods, their natural prey, to achieve high levels of survival and quality. In fact, fish aquaculture is becoming increasingly important as source of food. However, several bottlenecks during the larval stage still affect its production efficiency. The larvae of turbot were chosen as a model species because turbot is a highly prized flatfish species, which is particularly difficult to rear.
to the tanks 30 min before an acute chasing stress is effective in reducing the intensity of the stress response in fish from its beginning, as evidenced by the attenuated and delayed cortisol response in MEL-exposed animals. The hypothalamic levels of serotonergic activity and the mRNA levels of corticotropin-releasing factor were also attenuated in MEL-treated fish, suggesting that MEL effects occur through its inhibitory actions on the CNS pathways controlling the stress response in Senegalese sole. In view of the observed anti-stress effects of MEL, further research is warranted in order to optimize doses and timing of application to improve the effectiveness of the MEL treatment for aquaculture purposes.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Vigo
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Main Research Area: Technical/natural sciences

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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
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BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.263
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
Assessing the effectiveness of peracetic acid to remediate post-vaccination Saprolegnia spp.-associated mortality in Atlantic salmon Salmo salar parr in recirculation aquaculture systems

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Good, C. (Ekstern), Davidson, J. (Ekstern), Straus, D. (Ekstern), Wolters, W. (Ekstern), Peterson, B. (Ekstern), Pedersen, L. (Intern)
Publication date: 2016
Event: Abstract from International Conference on Recirculating Aquaculture, Roanoke, VA, United States.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2015

Assessing the role of environmental factors on Baltic cod recruitment, a complex adaptive system emergent property

General information
State: Published
Organisations: Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Centre for Ocean Life, Institute of Oceanology of the Polish Academy of Sciences
Authors: Krekoukiotis, D. (Intern), Palacz, A. P. (Intern), St John, M. A. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016
Assessment of mortality of Antarctic krill (Euphausia superba) escaping from a trawl

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Institute of Marine Research
Authors: Krafft, B. A. (Ekstern), Krag, L. A. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

Assessment of the Greenland halibut stock component in NAFO Subarea 0 + Division 1A Offshore + Divisions 1B-1F

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Jørgensen, O. A. (Intern), Treble, M. A. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Paper – Annual report year: 2016

Assumptions behind size-based ecosystem models are realistic: Comment

A recent publication about balanced harvesting (Froese et al., ICES Journal of Marine Science; doi:10.1093/icesjms/fsv122) contains several erroneous statements about size-spectrum models. We refute the statements by showing that the assumptions pertaining to size-spectrum models discussed by Froese et al. are realistic and consistent. We further show that the assumption about density-dependence being described by a stock recruitment relationship is responsible for determining whether a peak in the cohort biomass of a population occurs late or early in life. Finally, we argue that there is indeed a constructive role for a wide suite of ecosystem models to evaluate fishing strategies in an ecosystem context

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Ecosystem based Marine Management, University of Tasmania, Commonwealth Scientific and Industrial Research Organisation, Wageningen IMARES
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Pages: 1651-1655
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Journal: ICES Journal of Marine Science
Volume: 73
Issue number: 6
A trait database for marine copepods

The trait-based approach is gaining increasing popularity in marine plankton ecology but the field urgently needs more and easier accessible trait data to advance. We compiled trait information on marine pelagic copepods, a major group of zooplankton, from the published literature and from experts, and organised the data into a structured database. We collected 9345 records for 14 functional traits. Particular attention was given to body size, feeding mode, egg size, spawning strategy, respiration rate and myelination (presence of nerve sheathing). Most records were reported on the species level, but some phylogenetically conserved traits, such as myelination, were reported on higher taxonomic levels, allowing the entire diversity of around 10 800 recognized marine copepod species to be covered with few records. Besides myelination, data coverage was highest for spawning strategy and body size while information was more limited for
quantitative traits related to reproduction and physiology. The database may be used to investigate relationships between traits, to produce trait biogeographies, or to inform and validate trait-based marine ecosystem models. The data can be downloaded from PANGAEA, doi:10.1594/PANGAEA.862968.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Brun, P. G. (Intern), Payne, M. R. (Intern), Kierboe, T. (Intern)
Pages: 1-33
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Main Research Area: Technical/natural sciences

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Source: FindIt
Source-ID: 2306809783
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A trait database for marine copepods

General information
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Authors: Brun, P. G. (Intern), Payne, M. (Intern), Kierboe, T. (Intern)
Publication date: 2016

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Original language: English
Main Research Area: Technical/natural sciences
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Publication: Research › Dataset – Annual report year: 2017

A trans-Atlantic examination of haddock Melanogrammus aeglefinus food habits
The food habits of Melanogrammus aeglefinus were explored and contrasted across multiple north-eastern and north-western Atlantic Ocean ecosystems, using databases that span multiple decades. The results show that among all ecosystems, echinoderms are a consistent part of M. aeglefinus diet, but patterns emerge regarding where and when M. aeglefinus primarily eat fishes v. echinoderms. Melanogrammus aeglefinus does not regularly exhibit the increase in piscivory with ontogeny that other gadoids often show, and in several ecosystems there is a lower occurrence of piscivory. There is an apparent inverse relationship between the consumption of fishes and echinoderms in M. aeglefinus over time, where certain years show high levels of one prey item and low levels of the other. This apparent binary choice can be viewed as part of a gradient of prey options, contingent upon a suite of factors external to M. aeglefinus dynamics. The energetic consequences of this prey choice are discussed, noting that in some instances it may not be a choice at all

General information
State: Published
Attraction and repulsion measures for safe bypass of Atlantic salmon smolts

General information
State: Published
Authors: Fjeldstad, H. (Ekstern), Gjelland, K. Ø. (Ekstern), Silva, A. T. (Ekstern), Uglem, I. (Ekstern), Baktoft, H. (Intern), Forseth, T. (Ekstern), Økland, F. (Ekstern)
Number of pages: 5
Publication date: 2016
Main Research Area: Technical/natural sciences
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Ballastvand – Værktøj til afgrænsning af "Same Risk Area"

General information
State: Published
Organisations: National Institute of Aquatic Resources, Arctic Section, Section for Marine Living Resources
Authors: Hansen, F. T. (Intern), Christensen, A. (Intern)
Number of pages: 20
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Baltic cod recruitment – the impact of changing environmental conditions

General information
State: Published
Baltic Sea coccolithophores - an overview of insights into their taxonomy and ecology from the last 40 years

It is an established fact that coccolithophores are of little importance with respect to biomass and diversity in the Baltic proper. The likely biogeochemical and environmental reasons for this have recently been critically analyzed and reviewed. The main conclusion is that the calcium carbonate saturation of the Baltic Sea is the main controlling feature, and that in particular an undersaturation during wintertime remains the critical bottleneck for coccolithophores to prevail in the Baltic proper. While there is no reason to question these observations, it is still relevant to put on record the actual findings of coccolithophores from the Baltic proper. Examinations of Baltic Sea material from the Bothnian Sea, the Bothnian Bay and the Gulf of Finland prepared for transmission electron microscopy has thus revealed a consistent presence of a low diversity community of lightly calcified coccolithophores (i.e. Balaniger virgulosa HOL and HET, Papposphaera arctica HOL cfr. and Papposphaera iugifera). When including here also material examined from the Danish transitional waters connecting the North Sea and the Baltic proper, it is possible to generally support the presence in the western Baltic, the Sounds and the Kattegat of a contingent of coccolithophores that appear to be either persistently present within the area or episodically occurring as determined by larger scale hydrographical events within the North Sea/Baltic Sea confluence area.

Behavior as key trait in zooplankton predation risk

Behavior-dependent predation risk in marine planktonic copepods - an experimental and modelling approach
Behaviour-dependent predation risk in marine zooplankton: an experimental and modelling approach

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: van Someren Gréve, H. (Intern), Almeda, R. (Intern), Kiørboe, T. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Behov av nordiskt samarbete i skarvfrågan

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Pages: 9-12
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Fiskeritidsskrift för Finland
Issue number: 2
Original language: Swedish
Publication: Research › Journal article – Annual report year: 2016

Bell-shaped size selection in a bottom trawl: A case study for Nephrops directed fishery with reduced catches of cod

Monotonous size selection curves have traditionally been sufficient to describe the size selection in the aft end of a bottom trawl. Such modelling is a good approximation when the size selective system consists of a single selective device. However, in some fisheries the demands for species and size selectivity have motivated the development of selective systems in trawl fisheries that utilize more than one selective device simultaneously. An example can be found in the Swedish demersal trawl fishery targeting Norway lobster (Nephrops norvegicus), which simultaneously aims at avoiding catches of Atlantic cod (Gadhus morhua). In this fishery, the selective system consists of a Nordmøre type sorting grid followed by a size selective square mesh codend. The size selection curve for this system has a characteristic bellshaped curvature, which cannot be sufficiently described by a monotonous selection curve. An approach that can handle a bell shaped curvature is to use a more flexible empirical size selection model. However, such models primarily use a curve fitting procedure, and do not allow the possibility to investigate the contribution of the individual parts of the selection system. Therefore, we choose to use a structural based model that directly models the contributions of the individual selectivity devices to the overall performance of the system. We demonstrate that this approach can appropriately describe the experimental size selection data for both Nephrops and cod in a system composed of a sorting grid followed by a size selective codend. Furthermore, this approach provides a direct quantification of the selective processes of the individual parts of the system to the overall size selection in the fishing gear. In addition, we demonstrate how this approach can provide fisheries managers with a new tool when trying to develop more sustainable fisheries through improving fishing gear size and species selectivity

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences, SINTEF Fisheries and Aquaculture
Authors: Lövgren, J. (Ekstern), Herrmann, B. (Ekstern), Seekings, J. P. (Intern)
Pages: 26-35
Publication date: 2016
Main Research Area: Technical/natural sciences
Best practice for restoration of stone reefs in Denmark (codes of conduct)

This report includes recommendations for all phases of a boulder reef restoration project. The document includes an initial identification of relevant objectives for restoration, public involvement and identifies possible sources of relevant historic information as well as risks to be considered. A set of specific biological and environmental objectives that can influence the choice of design of the new reef structure is also presented. The report also includes a set of recommendations for the construction phase, requirements for safety navigation when the restoration work is finalized and presents suggestions for monitoring and management efforts.

General information
State: Published
Authors: Dahl, K. (Ekstern), Støttrup, J. G. (Intern), Stenberg, C. (Intern), Berggren, U. C. (Ekstern), Jensen, J. H. (Ekstern)
Number of pages: 33
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Publication: Research › Report – Annual report year: 2016

Biological introduction risks from shipping in a warming Arctic

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Tromsø University Museum, UiT The Arctic University of Norway, Flødevign Research Station, Danish Meteorological Institute, Commonwealth Scientific and Industrial Research Organisation, Russian Academy of Sciences, Polish Academy of Sciences, University of Fribourg
Authors: Ware, C. (Ekstern), Berge, J. (Ekstern), Jelmert, A. (Ekstern), Olsen, S. M. (Ekstern), Pellissier, L. (Ekstern), Wisz, M. (Intern), Kriticos, D. (Ekstern), Semenov, G. (Ekstern), Kwaśniewski, S. (Ekstern), Alsos, I. G. (Ekstern)
Pages: 340-349
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Main Research Area: Technical/natural sciences

Publications information
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BFI (2017): BFI-level 2
Biomass and abundance of demersal fish stocks off West and East Greenland estimated from the Greenland Institute of Natural resources shrimp fish survey, 1988-2015

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Greenland Institute of Natural Resources
Authors: Nygaard, R. (Ekstern), Jørgensen, O. A. (Intern)
Publication date: 2016
Blue carbon stocks in Baltic Sea eelgrass (Zostera marina) meadows

Although seagrasses cover only a minor fraction of the ocean seafloor, their carbon sink capacity accounts for nearly one-fifth of the total oceanic carbon burial and thus play a critical structural and functional role in many coastal ecosystems. We sampled 10 eelgrass (Zostera marina) meadows in Finland and 10 in Denmark to explore seagrass carbon stocks (C-org stock) and carbon accumulation rates (C-org accumulation) in the Baltic Sea area. The study sites represent a gradient from sheltered to exposed locations in both regions to reflect expected minimum and maximum stocks and accumulation. The C-org stock integrated over the top 25 cm of the sediment averaged 627 g C m(-2) in Finland, while in Denmark the average C-org stock was over 6 times higher (4324 g Cm-2). A conservative estimate of the total organic carbon pool in the regions ranged between 6.98 and 44.9 t C ha(-1). Our results suggest that the Finnish eelgrass meadows are minor carbon sinks compared to the Danish meadows, and that majority of the C-org produced in the Finnish meadows is exported. Our analysis further showed that >40% of the variation in the C-org stocks was explained by sediment characteristics, i.e. dry density, porosity and silt content. In addition, our analysis show that the root : shoot ratio of Z. marina explained >12% and the contribution of Z. marina detritus to the sediment surface C-org pool explained >10% of the variation in the C-org stocks. The mean monetary value for the present carbon storage and carbon sink capacity of eelgrass meadows in Finland and Denmark, were 281 and 1809 EUR ha(-1), respectively. For a more comprehensive picture of seagrass carbon storage capacity, we conclude that future blue carbon studies should, in a more integrative way, investigate the interactions between sediment biogeochemistry, seascape structure, plant species architecture and the hydrodynamic regime.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Åbo Academy University, University of Southern Denmark
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Pages: 6139-6153
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Biogeosciences
Volume: 13
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Bonanza – Den dag Sundet kogte over

General information
Boosting impact and citations: Why talking to journalists might actually be a good idea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
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Event: Abstract from International Marine Science Communication Conference (CommOCEAN), Brugge, Belgium.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Bottom trawling affects fish condition through changes in the ratio of prey availability to density of competitors

1. Bottom-trawl fisheries are widespread and cause mortality of benthic invertebrates, which in turn may lead to a decrease in the availability of prey for target fish species. Exploitation also reduces the abundance of the fish species themselves. Modelling studies have shown that bottom trawling could lead to both increases and decreases in fish production, but so far empirical evidence to test these ideas has been very limited. We hypothesize that the effect of bottom trawling on the food intake and condition of fish depends on how the ratio of prey to consumers changes with increasing fishing pressure. 2. We assessed the impact of bottom trawling on the food availability, condition and stomach contents of three flatfishes and the Norway lobster in an area in the Kattegat hat is characterized by a steep commercial bottom-trawling gradient due to the establishment of an area closed to all fisheries, but otherwise has homogeneous environmental conditions. 3. For plaice, prey biomass initially decreased at a slower rate with trawling than the biomass of fish, and as a result, the amount of food available per plaice increased before decreasing at trawling frequencies >5 times year 1. This pattern was mirrored in both the condition and stomach contents of plaice and for long-rough dab. 4. No effect of trawling on dab prey and condition was found. Conversely, the condition of the main target species – Norway lobster – increased as its biomass decreased with increased trawling intensities. 5. Together, these results support the idea that when the abundance of the prey declines in response to exploitation, the ratio of the prey to consumer biomass will determine whether exploitation will result in an increase or a decrease in the food intake and condition of the predator. 6. Synthesis and applications. Our study indicates that fish production may be maximized by keeping bottom-trawling intensities relatively low, although this may negatively affect the economically more important Nephrops fishery. The effects of bottom trawls may be mitigated by switching to gears, which affect prey availability to a lesser extent, such as pots or creels.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences, Bangor University, Instituto Español de Oceanografía, University of Wales Bangor Menai Bridge
Authors: Hiddink, J. G. (Ekstern), Moranta, J. (Ekstern), Balestreni, S. (Ekstern), Sciberras, M. (Ekstern), Cendrier, M. (Ekstern), Bowyer, R. (Ekstern), Kaiser, M. J. (Ekstern), Sköld, M. (Ekstern), Jonsson, P. (Ekstern), Bastardie, F. (Intern), Hinz, H. (Ekstern)
Pages: 1500-1510
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Journal: Journal of Applied Ecology
Volume: 53
Brain serotonergic activation in growth-stunted farmed salmon: adaption versus pathology

Signalling systems activated under stress are highly conserved, suggesting adaptive effects of their function. Pathologies arising from continued activation of such systems may represent a mismatch between evolutionary programming and
current environments. Here, we use Atlantic salmon (Salmo salar) in aquaculture as a model to explore this stance of evolutionary-based medicine, for which empirical evidence has been lacking. Growth-stunted (GS) farmed fish were characterized by elevated brain serotonergic activation, increased cortisol production and behavioural inhibition. We make the novel observation that the serotonergic system in GS fish is unresponsive to additional stressors, yet a cortisol response is maintained. The inability of the serotonergic system to respond to additional stress, while a cortisol response is present, probably leads to both imbalance in energy metabolism and attenuated neural plasticity. Hence, we propose that serotonin-mediated behavioural inhibition may have evolved in vertebrates to minimize stress exposure in vulnerable individuals.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Oslo, Uni Research AS, Institute of Marine Research, Radboud University Nijmegen, Norwegian University of Life Sciences
Authors: Vindas, M. A. (Ekstern), Johansen, I. B. (Ekstern), Folkedal, O. (Ekstern), Höglund, E. (Intern), Gorissen, M. (Ekstern), Flik, G. (Ekstern), Kristiansen, T. S. (Ekstern), Øverli, Ø. (Ekstern)
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Source: FindIt
Source-ID: 277650889
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Brakvandscup efter gedder og aborre indgår i DTU Aqua’s forskning

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jacobsen, L. (Intern)
Publication date: 2016

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Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences

Links:
http://www.fiskepleje.dk/nyheder/2016/11/brakvandscup-efter-gedder-og-aborre?id=64988595-8a9f-482e-8714-e6244803d590&utm_source=newsletter&utm_media@mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2016

Calanus finmarchicus egg production at its northern border

How the distribution of Calanus finmarchicus and its potential northward expansion will be affected by climate changes depends on the mechanisms and processes constraining their reproduction, recruitment and survival. Here we present measurements of C. finmarchicus egg production rates during the spring bloom in 2008, 2010 and 2011 in Disko Bay, West Greenland and validate four independently derived metabolic models to predict egg production rates. The spring
bloom in 2008 was short and intense and supported lower cumulated specific egg production of C. finmarchicus than the longer blooms with lower peak biomass in 2011 and 2012. The models predicted different timing of initialization and development of egg production rates based on phytoplankton biomass and temperature and model performance varied from ‘poor’ to ‘very good’. Phytoplankton biomass controlled the changes in egg production rates during the spring in Disko Bay, while the low temperature in the Bay explained why the egg production rate here is much lower than at more southerly localities despite high food concentrations. This study suggests that an increase in magnitude of the Arctic phytoplankton spring bloom will not result in increased copepod egg production, whereas a longer bloom and increasing temperatures will

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Southern Denmark, Greenland Climate Research Centre, Aarhus University
Authors: Møller, E. F. (Ekstern), Bohr, M. (Ekstern), Kjellerup, S. (Intern), Maar, M. (Ekstern), Møhl, M. (Intern), Swalethorp, R. (Intern), Nielsen, T. G. (Intern)
Pages: 1206-1214
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Main Research Area: Technical/natural sciences

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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.92 SJR 1.098 SNIP 0.848
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.025 SNIP 0.796 CiteScore 1.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.095 SNIP 1.255 CiteScore 2.24
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.289 SNIP 1.109 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.557 SNIP 1.101 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.158 SNIP 1.045 CiteScore 1.99
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.186 SNIP 0.98
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.922 SNIP 1.046
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.174 SNIP 1.037
Can rectangular mesh codends improve size selectivity in Mediterranean multispecies trawl fisheries?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF, Çukurova University Fisheries Faculty, Ege University
Authors: Gökçe, G. (Ekstern), Herrmann, B. (Ekstern), Ozbilgin, H. (Ekstern), Saygu, I. (Ekstern), Kalecik, E. (Ekstern), Demir, O. (Ekstern), Tokaç, A. (Ekstern), Krag, L. A. (Intern)
Publication date: 2016
Event: Abstract from World Fisheries Congress, Busan, Korea, Republic of.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

Carbon export by vertically migrating zooplankton: Optimal vertical migration and carbon export

Through diel vertical migration (DVM), zooplankton add an active transport to the otherwise passive sinking of detrital material that constitutes the biological pump. This active transport has proven difficult to quantify. We present a model that estimates both the temporal and depth characteristic of optimal DVM behavior based on a trade-off between feeding opportunity and predation risk; factors that vary with latitude, time of year, and the size of the migrating animal. This behavioral component, coupled to a nutrient-phytoplankton-zooplankton (NPZ) productivity model provides estimates of the active transport of carbon by different size fractions of the migrating zooplankton population as function of time and space. The approach is motivated by the difficulty in incorporating behavioral aspects of carbon transport into large scale carbon budgets of the world's oceans. The results show that despite their lower abundance, large zooplankton (length circa 1–2 mm) migrate deeper and transport approximately twice as much carbon as do the smaller zooplankton (length circa 0.2–0.3 mm). In mid- latitudes (~30°N to ~45°N), where pronounced spring blooms are observed, up to 20% more carbon is transported than at either equatorial or boreal latitudes. We estimate that the amount of carbon transported below the mixed layer by migrating zooplankton in the North Atlantic Ocean constitutes 27% (16–30%) of the total export flux associated with the biological pump in that region.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Authors: Hansen, A. N. (Intern), Visser, A. W. (Intern)
Pages: 701-710
Publication date: 2016
Main Research Area: Technical/natural sciences
Challenging ICES age estimation protocols: lessons learned from the eastern Baltic cod stock

Over the recent decades, the International Council for the Exploration of the Sea (ICES) has set guidelines for best practise quality control of age estimation procedures. The applicability of these guidelines is assessed by reviewing the ageing issues of eastern Baltic cod (EBC) as a case study. Since the implementation of an age-based assessment of EBC in the beginning of the 1970s, the assessment has been hampered by the quality of the age composition data, in recent years to a degree that age-based assessment is no longer used. The reason for the age reading problems is the low visual contrast between growth zones in the otoliths which seems to be the result of complex interactions of the hydrography in the Baltic Sea with the cod’s biology and behaviour. Over the last 40 years, various expert groups have struggled to document and improve the agreement of age estimation between national otolith readers, standardize methods and age estimations through repeated exchanges and reference collections as well as an internationally agreed manual. Despite these initiatives the precision of the age estimations based on traditional ageing did not improve, with significant bias persisting between and within readers. Additionally, a wide range of alternative methods for deriving the age information necessary for stock assessment and for validation of the true age have been tested. However, these methods did not produce unbiased age estimates over the entire size and age range of the EBC stock. An age-validation is urgently needed. Deviations from the ICES guidelines identified are as follows: (i) the lack of rigorous quality control, particularly the auditing of national trends in age precision over the years using a reference collection and (ii) the implementation of an age error matrix in the stock assessment.
Characteristic sizes of life in the oceans - from bacteria to whales

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life, Section for Ecosystem based Marine Management
Pages: 217-241
Publication date: 2016
Conference: International Workshop on Trait-based approaches to Ocean Life, Copenhagen, Denmark, 26/08/2013 - 26/08/2013
Main Research Area: Technical/natural sciences

Publication information
Journal: Annual Review of Marine Science
Volume: 8
Issue number: 3
ISSN (Print): 1941-1405
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 12.76 SJR 6.382 SNIP 4.101
Web of Science (2016): Indexed yes
Characterization and fate of dissolved organic matter in the Lena Delta Region, Siberia

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Alfred-Wegener-Institute für Polar und Meeresforschung, Russian Academy of Sciences
Authors: Goncalves-Araujo, R. (Ekstern), Stedmon, C. (Intern), Heim, B. (Ekstern), Dubinenkov, I. (Ekstern), Kraberg, A. (Ekstern), Moiseev, D. (Ekstern), Bracher, A. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Characterization of melatonin synthesis in the gastrointestinal tract of rainbow trout (Oncorhynchus mykiss): distribution, relation with serotonin, daily rhythms and photoperiod regulation

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Universidade de Vigo
Authors: Muñoz-Pérez, J. L. (Ekstern), López-Patiño, M. A. (Ekstern), Álvarez-Otero, R. (Ekstern), Álvarez-Otero, R. (Ekstern), Gesto, M. (Intern), Soengas, J. L. (Ekstern), Míguez, J. M. (Ekstern)
Pages: 471-484
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Journal: Journal of Comparative Physiology B: Biochemical, Systems, and Environmental Physiology
Volume: 186
Issue number: 4
ISSN (Print): 0174-1578
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): SJR 0.867 SNIP 0.887 CiteScore 2.02
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.126 SNIP 0.991 CiteScore 2.21
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.16 SNIP 1.018 CiteScore 2.35
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.987 SNIP 0.97 CiteScore 2.39
ISI indexed (2013): ISI indexed yes
Clupeid consumption of cod eggs: Does it affect recent recruitment of Baltic cod?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Institute Management
Authors: Neumann, V. (Intern), Schaber, M. (Ekstern), Böttcher, U. (Ekstern), Eero, M. (Intern), Köster, F. (Intern)
Publication date: 2016
Event: Abstract from 40th Annual Larval Fish Conference, Solomons, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Coccolithophores in Polar Waters: Papposphaera arctica HET and HOL revisited
It has been generally accepted based on the finding of combination coccospheres in field samples that Turrisphaera arctica and Papposphaera sarion are alternate life-cycle phases of a single species. However, while recently revisiting P. sarion it became evident that the Turrisphaera phase of this species is not identical with T. arctica but rather is an undescribed species of Turrisphaera. The most conspicuous diagnostic feature of T. arctica, an asymmetrical and tilted hypertrophy of the distal tube opening in circum-flagellar coccoliths, was hinted at in the first description of the taxon. However, focus was here on the overall similarity between T. borealis and T. arctica to the extent that the rather conspicuous difference between the two taxa was not clearly recognized by the authors of the taxon, nor by any researcher who has worked on these species since then. We present here material of T. arctica from various Arctic locations (West Greenland, NE Greenland, Svalbard) that completely matches the type material from Resolute Bay, Cornwallis Island. This material additionally comprised (NE Greenland) large numbers of combination coccospheres that clearly indicate that T. arctica shares a life history with an as yet undescribed species of Papposphaera. This allows us to emend the description of T. arctica including also its heterococcolithophore phase, and in this context making use of the combination P. arctica which was established
decades ago, yet here with the specific comment that P. sarion is no longer a valid synonym of P. arctica

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, University of Bergen
Authors: Thomsen, H. A. (Intern), Heldal, M. (Ekstern), Østergaard, J. B. (Ekstern)
Pages: 419-427
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Micropaleontology
Volume: 61
Issue number: 6
ISSN (Print): 0026-2803
Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.371 SNIP 0.686 CiteScore 0.76
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.299 SNIP 0.503 CiteScore 0.6
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.38 SNIP 0.436 CiteScore 0.66
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.38 SNIP 0.548 CiteScore 0.85
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.402 SNIP 0.476 CiteScore 0.62
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.381 SNIP 0.66 CiteScore 0.71
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.362 SNIP 0.403
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.685 SNIP 0.706
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.432 SNIP 0.531
Scopus rating (2007): SJR 0.552 SNIP 0.755
Scopus rating (2006): SJR 0.633 SNIP 0.721
Scopus rating (2005): SJR 0.605 SNIP 0.774
Scopus rating (2004): SJR 0.377 SNIP 0.694
Scopus rating (2003): SJR 0.558 SNIP 0.899
Scopus rating (2002): SJR 0.968 SNIP 1.227
Scopus rating (2001): SJR 0.623 SNIP 0.7
Scopus rating (2000): SJR 0.664 SNIP 0.965
Scopus rating (1999): SJR 0.684 SNIP 1.095
Original language: English
Electronic versions:
Publishers version
Links:
http://www.micropress.org/microaccess/micropaleontology
Publication: Research - peer-review › Journal article – Annual report year: 2016
Coccolithophores in Polar Waters: Papposphaera sagittifera HET and HOL revisited

The re-examination of the lightly calcified Arctic coccolithophore species, Papposphaera sagittifera, has some inherent challenges due to the research history on this taxon. It is thus obvious in retrospect that the species description based on just a single specimen does not adequately account for the true identity of this taxon. Today we are aware of the existence of at least three species of Papposphaera that have basically the same calyx design while being differentiated based on patterns of central area calcification. In order to remedy this we emend here the description of P. sagittifera and provide an epitype for the species. When realizing that species pairs of Papposphaera and Turrisphaera share a life history, the new combination, P. borealis, was established to accommodate P. sagittifera and T. borealis. However, it turns out that 'sagittifera' is in fact the senior epithet by a few months, which means that the correct name for the species is P. sagittifera with T. borealis added as a synonym. While the P. sagittifera HET and HOL morphological variability across Arctic sites clearly leaves the impression of a single, fairly well defined species, the situation is different with respect to the occurrence of P. sagittifera in Antarctic waters. While there are obvious similarities between P. sagittifera HET across the Polar Regions there are also subtle differences, and most importantly it has been found that the Antarctic P. sagittifera shares a life history with a species of Turrisphaera that is markedly different from T. borealis. While awaiting molecular evidence the Antarctic material is tentatively referred to as P. sagittifera cfr.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, University of Bergen
Authors: Thomsen, H. A. (Intern), Østergaard, J. B. (Ekstern), Heldal, M. (Ekstern)
Pages: 33-50
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication Information
Journal: Acta Protozoologica
Volume: 55
Issue number: 1
ISSN (Print): 0065-1583
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.51 SJR 0.513 SNIP 0.81
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.754 SNIP 0.959 CiteScore 1.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.498 SNIP 0.526 CiteScore 0.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.458 SNIP 0.507 CiteScore 1.17
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.294 SNIP 0.44 CiteScore 0.82
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.721 SNIP 0.745 CiteScore 1.41
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.533 SNIP 0.577
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.506 SNIP 0.786
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.489 SNIP 0.569
**Coccolithophores in Polar Waters: Papposphaera sarion HET and HOL revisited**

Papposphaera sarion was first described from West Greenland waters and has not since then been reported from other sites. We present here additional material of P. sarion from the type locality, transmission electron images of P. sarion from the NEW polynya (NE Greenland) and scanning electron images from Svalbard. Study of a vastly extended source of images provides new morphological data, particularly on the variability of coccolith central area calcification in this species. Combination coccospheres involving a Turrisphaera sp. were frequently observed in samples from the NEW polynya as was also the holococcolithophore Turrisphaera phase of this species. Papposphaera sarion has in its life-cycle previously been associated with Turrisphaera arctica. However, a careful re-examination of the micrographs accompanying the description of T. arctica and unpublished material available to us clearly reveals that T. arctica combines with a different, but as yet undescribed species of Papposphaera. A striking similarity is pointed out between P. sarion HET and species of Stradnerlithus, e.g. Stradnerlithus fragilis from the middle Jurassic.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, University of Bergen
Authors: Thomsen, H. A. (Intern), Heldal, M. (Ekstern), Østergaard, J. B. (Ekstern)
Pages: 429-438
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Micropaleontology
Volume: 61
Issue number: 6
ISSN (Print): 0026-2803
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.371 SNIP 0.686 CiteScore 0.76
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.299 SNIP 0.503 CiteScore 0.6
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.38 SNIP 0.436 CiteScore 0.66
BFI (2013): BFI-level 1
Coexistence of Pacific oyster Crassostrea gigas (Thunberg, 1793) and blue mussels Mytilus edulis Linnaeus, 1758 on a sheltered intertidal bivalve bed?

The invasive Pacific oyster, Crassostrea gigas Thunberg, 1793 was introduced in Denmark for aquaculture in the 1970s. Presently, feral populations are found in many parts of the country, with the largest populations established on existing beds of blue mussel, Mytilus edulis Linnaeus, 1758. This study was conducted in the Limfjord estuary, at Agger Tange, where C. gigas was introduced in 1972. The study site is a large cluster of raised intertidal bivalve beds inhabited by C. gigas and M. edulis in a sheltered part of the estuary. The two bivalves have some of the same living requirements, and as C. gigas have been present in the ecosystem for more than 40 years, we hypothesize that the presence of C. gigas has altered the spatial and temporal distribution of M. edulis by inducing a niche separation. The spatiotemporal development of the bivalve bed was determined using orthophotos. C. gigas and M. edulis were collected from the bivalve bed, shell lengths were converted into biomass, which were interpolated to create biomass contours and combined with modelled topography of the bivalve bed to study niche separation. The bivalve bed slowly extended northwards over a period of 11 years, where it also became more fragmented. The northern part of the bed was composed of mussel mats on top of soft sediment. This area was dominated by M. edulis, while areas in the south were dominated by C. gigas. In the southern part, the bivalve bed was composed of thick and compact sediment suggesting it represent the oldest part of the bivalve bed. There were no differences in the conditions of C. gigas and M. edulis from old or newly established areas, and there were no difference in the vertical distributions of the bivalve species. Thus, spatial and temporal separation of the two species is not pronounced at present, and thus unable to explain why they seemingly coexist.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Roskilde University, Orbicon, University of Copenhagen
Authors: Holm, M. (Ekstern), Davids, J. (Ekstern), Dolmer, P. (Intern), Holmes, E. (Forskerdatabase), Nielsen, T. (Ekstern), Vismann, B. (Ekstern), Hansen, B. (Ekstern)
Pages: 155-165
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquatic Invasions
Volume: 11
Issue number: 2
Cognitive appraisal of aversive stimulus differs between individuals with contrasting stress coping styles; evidences from selected rainbow trout (Oncorhynchus mykiss) strains

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Copenhagen, Uni Research AS, Norwegian Institute for Water Research, Norwegian University of Life Sciences, Uppsala University, UAEMéx, Mexico, Facultad de Ciencias
Authors: Moltesen, M. (Intern), Vindas, M. A. (Ekstern), Winberg, S. (Ekstern), Ebbesson, L. (Ekstern), Ruiz-Gomez, M. L. (Ekstern), Skov, P. V. (Intern), Dabelsteen, T. (Forskerdatabase), Øverli, Ø. (Ekstern), Höglund, E. (Intern)
Pages: 1567-1587
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Behaviour
Volume: 153
Co-location of passive gear fisheries in offshore wind farms in the German EEZ of the North Sea: A first socio-economic scoping

Monotonous size selection curves have traditionally been sufficient to describe the size selection in the aft end of a bottom trawl. Such modelling is a good approximation when the size selective system consists of a single selective device. However, in some fisheries the demands for species and size selectivity have motivated the development of selective systems in trawl fisheries that utilize more than one selective device simultaneously. An example can be found in the Swedish demersal trawl fishery targeting Norway lobster (Nephrops norvegicus), which simultaneously aims at avoiding catches of Atlantic cod (Gadhus morhua). In this fishery, the selective system consists of a Nordmøre type sorting grid followed by a size selective square mesh codend. The size selection curve for this system has a characteristic bell-shaped curvature, which cannot be sufficiently described by a monotonous selection curve. An approach that can handle a bell-shaped curvature is to use a more flexible empirical size selection model. However, such models primarily use a curve fitting procedure, and do not allow the possibility to investigate the contribution of the individual parts of the selection system. Therefore, we choose to use a structural-based model that directly models the contributions of the individual selectivity devices to the overall performance of the system. We demonstrate that this approach can appropriately describe the experimental size selection data for both Nephrops and cod in a system composed of a sorting grid followed by a size selective codend. Furthermore, this approach provides a direct quantification of the selective processes of the individual
parts of the system to the overall size selection in the fishing gear. In addition, we demonstrate how this approach can provide fisheries managers with a new tool when trying to develop more sustainable fisheries through improving fishing gear size and species selectivity.

**General information**

**State:** Published

**Organisations:** National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Thünen Institute of Sea Fisheries, Thünen Institute of Fisheries Ecology, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI), Alfred Wegener Institute

**Authors:** Stelzenmüller, V. (Ekstern), Diekmann, R. (Ekstern), Bastardie, F. (Intern), Schulze, T. (Ekstern), Berkenhagen, J. (Ekstern), Kloppmann, M. (Ekstern), Krause, G. (Ekstern), Pogoda, B. (Ekstern), Buck, B. (Ekstern), Kraus, G. (Ekstern)

**Pages:** 794-805

**Publication date:** 2016

**Main Research Area:** Technical/natural sciences

**Publication information**

**Journal:** Journal of Environmental Management

**Volume:** 183

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**Ratings:**

- **BFI (2018):** BFI-level 2
- **Web of Science (2018):** Indexed yes
- **BFI (2017):** BFI-level 2
- **Web of Science (2017):** Indexed Yes
- **BFI (2016):** BFI-level 2
- **Scopus rating (2016):** CiteScore 4.28 SJR 1.141 SNIP 1.779
- **Web of Science (2016):** Indexed yes
- **BFI (2015):** BFI-level 2
- **Scopus rating (2015):** SJR 1.19 SNIP 1.717 CiteScore 3.86
- **Web of Science (2015):** Indexed yes
- **BFI (2014):** BFI-level 2
- **Scopus rating (2014):** SJR 1.228 SNIP 1.921 CiteScore 3.62
- **Web of Science (2014):** Indexed yes
- **BFI (2013):** BFI-level 2
- **Scopus rating (2013):** SJR 1.203 SNIP 2.014 CiteScore 3.84
- **ISI indexed (2013):** ISI indexed yes
- **Web of Science (2013):** Indexed yes
- **BFI (2012):** BFI-level 2
- **Scopus rating (2012):** SJR 1.377 SNIP 2.513 CiteScore 4.01
- **ISI indexed (2012):** ISI indexed yes
- **Web of Science (2012):** Indexed yes
- **BFI (2011):** BFI-level 2
- **Scopus rating (2011):** SJR 1.206 SNIP 2.181 CiteScore 3.66
- **ISI indexed (2011):** ISI indexed yes
- **Web of Science (2011):** Indexed yes
- **BFI (2010):** BFI-level 2
- **Scopus rating (2010):** SJR 1.13 SNIP 1.704
- **Web of Science (2010):** Indexed yes
- **BFI (2009):** BFI-level 2
- **Scopus rating (2009):** SJR 0.951 SNIP 1.718
- **Web of Science (2009):** Indexed yes
- **BFI (2008):** BFI-level 2
- **Scopus rating (2008):** SJR 0.75 SNIP 1.317
- **Web of Science (2008):** Indexed yes
- **Scopus rating (2007):** SJR 0.909 SNIP 1.46
- **Web of Science (2007):** Indexed yes
- **Scopus rating (2006):** SJR 0.813 SNIP 1.381
Comparing model predictions for ecosystem-based management

Ecosystem modeling is becoming an integral part of fisheries management, but there is a need to identify differences between predictions derived from models employed for scientific and management purposes. Here, we compared two models: a biomass-based food-web model (Ecopath with Ecosim (EwE)) and a size-structured fish community model. The models were compared with respect to predicted ecological consequences of fishing to identify commonalities and differences in model predictions for the California Current fish community. We compared the models regarding direct and indirect responses to fishing on one or more species. The size-based model predicted a higher fishing mortality needed to reach maximum sustainable yield than EwE for most species. The size-based model also predicted stronger top-down effects of predator removals than EwE.

In contrast, EwE predicted stronger bottom-up effects of forage fisheries removal. In both cases, the differences are due to the presumed degree of trophic overlap between juveniles of large-bodied fish and adult stages of forage fish. These differences highlight how each model’s emphasis on distinct details of ecological processes affects its predictions, underscoring the importance of incorporating knowledge of model assumptions and limitation, possibly through using model ensembles, when providing model-based scientific advice to policy makers.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of Washington
Authors: Jacobsen, N. S. (Intern), Essington, T. E. (Ekstern), Andersen, K. H. (Intern)
Pages: 666-676
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 73
Issue number: 4
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Composition of seminal plasma and ovarian fluid in Ide Leuciscus idus and Northern pike Esox lucius

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of South Bohemia, University of Warmia and Mazury in Olsztyn
Authors: Siddique, M. (Ekstern), Linhart, O. (Ekstern), Kujawa, R. (Ekstern), Krejszeff, S. (Ekstern), Butts, I. (Intern)
Pages: 960-969
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Reproduction in Domestic Animals
Connectivity of larval cod in the transition area between North Sea and Baltic Sea and potential implications for fisheries management

Connectivity of pelagic, early life stages via transport by ocean currents may affect survival chances of offspring, recruitment success, and mixing of stocks across management units. Based on drift model studies, transport patterns of particles representing exogenously feeding cod larvae in the transition area between North Sea and Baltic were investigated to (i) determine long-term trends and variability in advective transport of larvae from spawning grounds to juvenile nursery areas, (ii) estimate the degree of exchange between different management areas, and (iii) compare the results with spatial distributions of juvenile cod. The transport of particles showed considerable intra- and interannual variability, but also some general patterns of retention within and dispersion to different management areas. Good spatial overlap of particle end positions, representing potential juvenile settlement areas, with observed distributions of juveniles...
in bottom trawl surveys suggests that the drift simulations provide reasonable estimates of early life stage connectivity between cod populations in the investigated areas. High exchange rates of particles between management areas of up to ca. 70% suggest that cod populations in the investigated areas are demographically correlated. Results are discussed in relation to their relevance for stock structure, fish stock assessment, and management.
Conservation physiology of marine fishes: state of the art and prospects for policy

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Centre for Marine Biodiversity Exploitation and Conservation, University of Gothenburg, Universite de Bretagne Occidentale, Carleton University, Longline Environment Ltd., University of Antwerp, University of Algarve, Ruder Boskovic Institute, Glasgow Caledonian University, University of Oslo, Consiglio Nazionale delle Ricerche, Aristotle University of Thessaloniki, University of Manchester, Royal Netherlands Institute for Sea Research - NIOZ, University of Exeter, University of Bergen, Ministere des Peches et des Oceans, Université Montpellier II, University of Hamburg, University of Murcia, Wageningen IMARES, University of Copenhagen, Aarhus University, University of Porto, Cefas
Pages: 1-20
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Main Research Area: Technical/natural sciences

Publication information
Journal: Conservation Physiology
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Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 1.66 SJR 0.648 SNIP 0.501
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.123 SNIP 0.01
Scopus rating (2014): SJR 0.109 SNIP 0
Original language: English
Electronic versions:
Publishers version
DOIs:
10.1093/conphys/cow046
Publication: Research - peer-review › Journal article – Annual report year: 2016

Conserved structure and expression of hsp70 paralogs in teleost fishes
The cytosolic 70 KDa heat shock proteins (Hsp70s) are widely used as biomarkers of environmental stress in ecological and toxicological studies in fish. Here we analyze teleost genome sequences to show that two genes encoding inducible hsp70s (hsp70-1 and hsp70-2) are likely present in all teleost fish. Phylogenetic and synteny analyses indicate that hsp70-1 and hsp70-2 are distinct paralogs that originated prior to the diversification of the teleosts. The promoters of both genes contain a TATA box and conserved heat shock elements (HSEs), but unlike mammalian HSP70s, both genes contain an intron in the 5' UTR. The hsp70-2 gene has undergone tandem duplication in several species. In addition, many other teleost genome assemblies have multiple copies of hsp70-2 present on separate, small, genomic scaffolds. To verify that these represent poorly assembled tandem duplicates, we cloned the genomic region surrounding hsp70-2 in Fundulus heteroclitus and showed that the hsp70-2 gene copies that are on separate scaffolds in the genome assembly are arranged as tandem duplicates. Real-time quantitative PCR of F. heteroclitus genomic DNA indicates that four copies of
the hsp70-2 gene are likely present in the F. heteroclitus genome. Comparison of expression patterns in F. heteroclitus and Gasterosteus aculeatus demonstrates that hsp70-2 has a higher fold increase than hsp70-1 following heat shock in gill but not in muscle tissue, revealing a conserved difference in expression patterns between isoforms and tissues. These data indicate that ecological and toxicological studies using hsp70 as a biomarker in teleosts should take this complexity into account.

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Marine Living Resources, University of British Columbia  
**Authors:** Metzger, D. C. (Ekstern), Hansen, J. H. (Intern), Schulte, P. M. (Ekstern)  
**Pages:** 10-20  
**Publication date:** 2016  
**Main Research Area:** Technical/natural sciences

**Publication information**

**Journal:** Comparative Biochemistry and Physiology. Part D: Genomics and Proteomics  
**Volume:** 18  
**ISSN (Print):** 1744-117X  
**Ratings:**  
BFI (2018): BFI-level 1  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Web of Science (2017): Indexed Yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): SJR 0.921 SNIP 0.834 CiteScore 2.73  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 1  
Scopus rating (2015): SJR 1.023 SNIP 0.83 CiteScore 2.44  
BFI (2014): BFI-level 1  
Scopus rating (2014): SJR 0.931 SNIP 0.841 CiteScore 2.4  
BFI (2013): BFI-level 1  
Scopus rating (2013): SJR 0.814 SNIP 0.737 CiteScore 2.32  
ISI indexed (2013): ISI indexed yes  
BFI (2012): BFI-level 1  
Scopus rating (2012): SJR 0.756 SNIP 0.88 CiteScore 2.52  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 1  
Scopus rating (2011): SJR 0.577 SNIP 0.536 CiteScore 1.79  
ISI indexed (2011): ISI indexed yes  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 0.673 SNIP 0.599  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 0.606 SNIP 0.485  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.432 SNIP 0.305  
Scopus rating (2007): SJR 0.321 SNIP 0.28  
Scopus rating (2006): SJR 0.108 SNIP 0.015  
Original language: English  
DOIs:  
10.1016/j.cbd.2016.01.007  
Source: FindIt  
Source-ID: 2291668697  
Publication: Research - peer-review › Journal article – Annual report year: 2016

**Contribution to the Themed Section:** Scaling from individual plankton to marine ecosystems HORIZONS Small bugs with a big impact: linking plankton ecology with ecosystem processes
As an introduction to the following Themed Section on the significance of planktonic organisms to the functioning of marine ecosystems and global biogeochemical cycles we discuss the ramifications size imparts on the biology of plankton. We provide examples of how the characteristics of these microscopic organisms shape plankton population dynamics, distributions, and ecosystem functions. Key features of the marine environment place constraints on the ecology and evolution of plankton. Understanding these constraints is critical in developing a mechanistic understanding and predictive capacity of how planktonic ecosystems function, render their capacities in terms of biogeochemical cycling and trophic transfer, and how planktonic communities might respond to changing climate conditions.
Copepod life strategy and population viability in response to prey timing and temperature: Testing a new model across latitude, time, and the size spectrum

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Strathclyde University, NOAA, Aarhus University
Authors: Banas, N. S. (Ekster), Møller, E. F. (Ekster), Nielsen, T. G. (Intern), Eisner, L. B. (Ekster)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Marine Science
Volume: 3
Article number: 225
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.53 SJR 0.173 SNIP 0.109
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.145 SNIP 0.05
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
Original language: English
Electronic versions:
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DOIs:
doi: 10.3389/fmars.2016.00225
Publication: Research - peer-review › Journal article – Annual report year: 2016
Coping with a changing environment: The effects of early life stress

Ongoing rapid domestication of Atlantic salmon implies that individuals are subjected to evolutionarily novel stressors encountered under conditions of artificial rearing, requiring new levels and directions of flexibility in physiological and behavioural coping mechanisms. Phenotypic plasticity to environmental changes is particularly evident at early life stages. We investigated the performance of salmon, previously subjected to an unpredictable chronic stress (UCS) treatment at an early age (10 month old parr), over several months and life stages. The UCS fish showed overall higher specific growth rates compared with unstressed controls after smoltification, a particularly challenging life stage, and after seawater transfer. Furthermore, subjecting fish to acute stress at the end of the experiment, we found that UCS groups had an overall lower hypothalamic catecholaminergic and brain stem serotonergic response to stress compared with control groups. In addition, serotonergic activity was negatively correlated with final growth rates, which implies that serotonin responsive individuals have growth disadvantages. Altogether, our results may imply that a subdued monoaminergic response in stressful farming environments may be beneficial, because in such situations individuals may be able to reallocate energy from stress responses into other life processes, such as growth.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Uni Research AS, Institute of Marine Research, Norwegian University of Life Sciences, Norwegian Institute for Water Research, Norwegian University of Science and Technology
Authors: Vindas, M. A. (Ekstern), Madaro, A. (Ekstern), Fraser, T. W. (Ekstern), Höglund, E. (Intern), Olsen, R. E. (Ekstern), Øverli, Ø. (Ekstern), Kristiansen, T. S. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Royal Society Open Science
Volume: 3
Issue number: 10
Article number: 160382
ISSN (Print): 2054-5703
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 2.27 SJR 0.957 SNIP 1.017
Web of Science (2016): Indexed yes
Scopus rating (2015): SNIP 0.957 SJR 0.636 CiteScore 1.92
Original language: English
Multidisciplinary, Atlantic salmon, Catecholamines, Neurochemistry, Phenotypic plasticity, Serotonin
Electronic versions:
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DOIs:
10.1098/rsos.160382
Source: FindIt
Source-ID: 2346699968
Publication: Research - peer-review › Journal article – Annual report year: 2016

Cormorant predation of the highly endangered North Sea houting in river Vidaa, Denmark

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Ecosystem based Marine Management, Institut National des Sciences Appliquées de Lyon, Aalborg University, Fisheries and Maritime Museum
Authors: Jensen, L. F. (Ekstern), Rognon, P. C. B. (Ekstern), Aarestrup, K. (Intern), Thomsen, S. N. (Ekstern), Hertz, M. (Ekstern), Svendsen, J. C. (Intern)
Publication date: 2016
Event: Poster session presented at Den nationale temadag om dansk vidtforskning med emnet: Forskningsbaseret forvaltning af fugle og pattedyr – med fokus på ”konfliktarter”, Århus, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Snæbel poster
Coupling bacterioplankton populations and environment to community function in coastal temperate waters

Bacterioplankton play a key role in marine waters facilitating processes important for carbon cycling. However, the influence of specific bacterial populations and environmental conditions on bacterioplankton community performance remains unclear. The aim of the present study was to identify drivers of bacterioplankton community functions, taking into account the variability in community composition and environmental conditions over seasons, in two contrasting coastal systems. A Least Absolute Shrinkage and Selection Operator (LASSO) analysis of the biological and chemical data obtained from surface waters over a full year indicated that specific bacterial populations were linked to measured functions. Namely, Synechococcus (Cyanobacteria) was strongly correlated with protease activity. Both function and community composition showed seasonal variation. However, the pattern of substrate utilization capacity could not be directly linked to the community dynamics. The overall importance of dissolved organic matter (DOM) parameters in the LASSO models indicate that bacterioplankton respond to the present substrate landscape, with a particular importance of nitrogenous DOM. The identification of common drivers of bacterioplankton community functions in two different systems indicates that the drivers may be of broader relevance in coastal temperate waters.
Deciphering the structure of the West Greenland marine food web using stable isotopes (δ13C, δ15N)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Monitoring and Data, Environment Canada, Aarhus University, Greenland Climate Research Centre, Kalundborg Municipality, Greenland Institute of Natural Resources
Authors: Linnebjerg, J. F. (Forskerdatabase), Hobson, K. A. (Ekstern), Fort, J. (Ekstern), Nielsen, T. G. (Intern), Møller, P. (Ekstern), Wieland, K. (Intern), Born, E. W. (Ekstern), Rigét, F. F. (Ekstern), Mosbech, A. (Forskerdatabase)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biology
Volume: 163
Issue number: 11
Article number: 230
ISSN (Print): 0025-3162
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.41 SJR 1.198 SNIP 0.993
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.315 SNIP 0.932 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.204 SNIP 1.041 CiteScore 2.32
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.272 SNIP 1.064 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.306 SNIP 1.107 CiteScore 2.43
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.145 SNIP 1.073 CiteScore 2.22
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.235 SNIP 1.069
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.178 SNIP 1.052
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.236 SNIP 1.022
Deliverable CS1 Pelagic fisheries sampling designs: WP2 – Regional sampling design for commercial fisheries. WP2.3 – Case Study fisheries

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, IMARES
Authors: Håkansson, K. B. (Intern), Storr-Paulsen, M. (Intern), Chen, C. (Ekstern), Verver, S. (Ekstern), van Helmond, E. (Ekstern), Pout, A. (Ekstern), Clarke, L. (Ekstern)
Pages: 161-216
Publication date: 2016

Host publication information
Title of host publication: Strengthening regional cooperation in fisheries data collection
Chapter: 11
Main Research Area: Technical/natural sciences
Publication: Research › Report chapter – Annual report year: 2016

Deltag i en undersøgelse af ørredfiskeri i Isefjorden

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Geertz-Hansen, P. (Intern), Aarestrup, K. (Intern), Sivebæk, F. (Intern)
Publication date: 2016

Publication information
Type: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2016/10/isefjorden-oerredfiskeri?id=7ec36f5d-41c9-443f-96ab-85ec202a55c9&utm_source=newsletter&utm_medium=mail&utm_campaign=2016-10-05
Publication: Communication › Internet publication – Annual report year: 2016

De naturlige bestande af ørreder i danske ørredvandløb målt i forhold til ørredindekset DFFVs

General information
Density and climate influence seasonal population dynamics in an Arctic ungulate

The locally migratory behavior of the high arctic muskox (Ovibos muscatus) is a central component of the breeding and winter survival strategies applied to cope with the highly seasonal arctic climate. However, altered climate regimes affecting plant growth are likely to affect local migration dynamics of the muskox. In this study, we apply longterm local-scale data on the seasonal distribution of muskoxen in the Zackenberg Valley, Northeast Greenland, to assess the degree of climatic influence on local seasonal muskox dynamics. Specifically, we analyze how seasonal climate (temperature, snow cover), forage availability (length of growth season), and the number of adult females available per male (operational sex ratio) influence changes in the seasonal density dependence, abundance, and immigration rate of muskoxen into the valley.

The results suggested summer temperature as the major controlling factor in the seasonal, local-scale migration of muskoxen at Zackenberg. Specifically, higher summer temperatures, defined as the cumulative average daily positive degrees in June, July, and August, resulted in decreased density dependence and, consequently, increase in the seasonal abundance of muskox in the valley. Additionally, a longer growth season was found to increase the seasonal abundance of muskox in the Zackenberg Valley. In contrast, changes in spring snow cover displayed no direct relation to the seasonal immigration rate. Our study suggests that access to high-quality forage is important for the shortterm, local scale population dynamics of muskoxen in Northeast Greenland.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Roskilde University, Pennsylvania State University
Authors: Mortensen, L. O. (Intern), Moshøj, C. (Ekstern), Forchhammer, M. C. (Ekstern)
Pages: 523-530
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Main Research Area: Technical/natural sciences

Publication information
Journal: Arctic, Antarctic, and Alpine Research
Volume: 48
Issue number: 3
ISSN (Print): 1523-0430
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
Density-dependent changes in effective area occupied for sea-bottom-associated marine fishes

The spatial distribution of marine fishes can change for many reasons, including density-dependent distributional shifts. Previous studies show mixed support for either the proportional-density model (PDM; no relationship between abundance and area occupied, supported by ideal-free distribution theory) or the basin model (BM; positive abundance–area relationship, supported by density-dependent habitat selection theory). The BM implies that fishes move towards preferred habitat as the population declines. We estimate the average relationship using bottom trawl data for 92 fish species from six marine regions, to determine whether the BM or PDM provides a better description for sea-bottom-associated fishes. We fit a spatio-temporal model and estimate changes in effective area occupied and abundance, and combine results to estimate the average abundance–area relationship as well
as variability among taxa and regions. The average relationship is weak but significant (0.6% increase in area for a 10% increase in abundance), whereas only a small proportion of species–region combinations show a negative relationship (i.e. shrinking area when abundance increases). Approximately one-third of combinations (34.6%) are predicted to increase in area more than 1% for every 10% increase in abundance. We therefore infer that population density generally changes faster than effective area occupied during abundance changes. Gadiformes have the strongest estimated relationship (average 1.0% area increase for every 10% abundance increase) followed by Pleuronectiformes and Scorpaeniformes, and the Eastern Bering Sea shows a strong relationship between abundance and area occupied relative to other regions. We conclude that the BM explains a small but important portion of spatial dynamics for sea-bottom-associated fishes, and that many individual populations merit cautious management during population declines, because a compressed range may increase the efficiency of harvest.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, National Oceanographic and Atmospheric Administration, South African National Biodiversity Institute
Authors: Thorson, J. T. (Ekstern), Rindorf, A. (Intern), Gao, J. (Ekstern), Hanselman, D. H. (Ekstern), Winker, H. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication Information**
Journal: Proceedings of the Royal Society B: Biological Sciences
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Article number: 20161853
ISSN (Print): 0962-8452
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 2.541 SNIP 1.474
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.948 SNIP 1.535 CiteScore 4.08
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.916 SNIP 1.673 CiteScore 4.18
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.091 SNIP 1.762 CiteScore 5.08
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.947 SNIP 1.881 CiteScore 4.99
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.234 SNIP 1.789 CiteScore 5.02
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.894 SNIP 1.61
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Development of a broodstock diet to improve developmental competence of embryos in European eel, Anguilla anguilla
We examined the effect of dietary arachidonic acid (ARA) and eicosapentaenoic acid (EPA) on the production of embryos and hatched larvae in the European eel, Anguilla anguilla. Two diets with high and intermediate levels of ARA and low and intermediate levels of EPA (Feed 1: ARA 1.9%, EPA 4.2%; Feed 2: ARA 1.2%, EPA 5.1% of total fatty acids) were tested against a commercial diet (DE: ARA: 0.5%, EPA: 8.2% of total fatty acids). After 24 weeks of feeding, ARA levels in the muscles and ovaries increased to 0.9% and 1.3% of total fatty acids, respectively, in Feed 1 and were significantly higher than in Feed 2 and DE. Female broodstock was not fed during hormonal treatment to induce vitellogenesis and ovulation. EPA levels in females fed the test diets decreased in the both muscle and ovary and were significantly lower in eggs from females fed Feed 1. The highest percentage of stripped females, producing viable eggs and larvae, were those females fed the highest dietary ARA levels (Feed 1). The level of lipid peroxidation products in eggs was similar among treatment, indicating that the lowest dietary levels of vitamin C and vitamin E were sufficient. In the unfertilized eggs, ARA levels were also highest (1.1% of total fatty acids) in the diet with highest ARA levels (Feed 1).
Dietary evidence of mesopelagic and pelagic foraging by Atlantic bluefin tuna (Thunnus thynnus L.) during autumn migrations to the Iceland Basin

Atlantic bluefin tuna (ABFT; Thunnus thynnus) is a large highly mobile predator fish species in the North Atlantic Ocean and Mediterranean Sea. Knowledge of its trophic role in marine food webs in summer feeding areas is presently based on recent (1980–2010s) sampling in the Bay of Biscay, Gulfs of Maine and St. Lawrence, and from historical (1950–1960s) sampling in the Norwegian-North Sea-Kattegat. No study has yet investigated the diets of ABFT in Icelandic waters, where it supported an experimental fishery during 1996–2005, nor in any region north of the Bay of Biscay since the 1960s. However, north Atlantic temperatures and fish species distributions, including some ABFT prey species (e.g., mackerel)
have been changing in the 2000s. New knowledge of ABFT diets in previously understudied parts of the species range will be useful for understanding factors affecting the trophic role, migration behavior, and bioenergetics of ABFT. Here, we report the dietary composition of ABFT during autumn migrations to the Iceland Basin south of the continental shelf of Iceland. A total of 36 prey species or higher taxa were observed in 421 stomach samples: 17 teleost fishes, 4 squid, 1 octopus, 12 crustaceans, and 2 other invertebrate species. The most important prey species were European flying squid (Todarodes sagittatus) (%N = 16.70, %W = 48.89; %FO = 87.65), barracudinas (Paralepididae) (%N = 14.05, %W = 28.59, %FO = 76.48), and gonate squid (Gonatus sp.) (%N = 9.17, %W = 7.85, %FO = 75.06). Prey sizes were highly variable relative to ABFT sizes indicating highly opportunistic feeding on diverse sizes. The presence of a large proportion of mesopelagic species in the diet indicates feeding in the mesopelagic layer and extensive dive behavior. These results give new baseline knowledge for future comparison with anticipated oceanographic-biological changes in the region in the coming decades and can be used to help parameterize new models of ABFT migration behavior and trophic role.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Marine Research Institute
Authors: Olafsdottir, D. (Ekstern), MacKenzie, B. (Intern), Chosson-P, V. (Ekstern), Ingimundardottir, T. (Ekstern)
Number of pages: 23
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Frontiers in Marine Science
Volume: 3
Article number: 108
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.53 SJR 0.173 SNIP 0.109
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.145 SNIP 0.05
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
Original language: English
Atlantic Bluefin Tuna, Diet, Mesopelagic, Iceland, Squid, Barracudina, Trophic Role, Food Web
Electronic versions:
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DOIs:
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Source: FindIt
Source-ID: 2306169023
Publication: Research - peer-review › Journal article – Annual report year: 2016

Dietary phytoimmunostimulant Persian hogweed (Heracleum persicum) has more remarkable impacts on skin mucus than on serum in common carp (Cyprinus carpio)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Gorgan University of Agricultural Sciences and Natural Resources
Authors: Hoseinifar, S. H. (Ekstern), Zoheiri, F. (Ekstern), Lazado, C. C. (Intern)
Pages: 77-82
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Fish and Shellfish Immunology
Volume: 59
ISSN (Print): 1050-4648
Ratings:
BFI (2018): BFI-level 1
Diets supplemented with seaweed affect metabolic rate, innate immune, and antioxidant responses, but not individual growth rate in European seabass (Dicentrarchus labrax)

This study investigated the effects of seaweed dietary supplementation on measures of fish performance including aerobic metabolism, digestive enzymes activity, innate immune status, oxidative damage, and growth rate using European seabass (Dicentrarchus labrax). Fish were fed for 49 days with three different diets: a control diet (CTRL), a Gracilaria-supplemented diet (GR7.5), and a mixed diet (Mix) composed of Gracilaria, Fucus, and Ulva genera representatives. All diets were isoenergetic (22 kJ g⁻¹ adjusted for dry matter (DM)), isoproteic (47 %DM), and isolipidic (18 %DM) and tested in triplicate groups of 20 fish (initial body weight 25.5 ± 4.1 g). Final results showed similar growth rates and digestive activities between diets. Maximum and standard metabolic rates and aerobic metabolic scope revealed comparable results for the three diets. In contrast, fish fed with GR7.5 exhibited elevated routine metabolic rate (190.7 mg O₂ kg⁻¹ h⁻¹). Fish fed with the GR7.5 and Mix diets had lower alternative complement pathway (ACH50) (62.5 and 63 units mL⁻¹ respectively) than CTRL (84 units mL⁻¹) GR7.5 increased lipid peroxidation and cholinesterase levels, as well as glutathione s-transferase activity. Mix diet increased glutathione reductase activity when compared to CTRL. Collectively, our findings suggest that dietary seaweed supplementation may alter seabass metabolic rate, innate immune, and antioxidant responses without compromising growth parameters.
Differences in density-dependence drive dual offspring size strategies in fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Centre for Ocean Life
Authors: Olsson, K. H. (Intern), Gislason, H. (Intern), Andersen, K. H. (Intern)
Pages: 118-127
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Theoretical Biology
Volume: 407
ISSN (Print): 0022-5193
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.918 SNIP 0.932 CiteScore 2.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.084 SNIP 1.017 CiteScore 2.21
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.07 SNIP 1.048 CiteScore 2.25
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.04 SNIP 1.044 CiteScore 2.44
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.939 SNIP 1.04 CiteScore 2.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.802 SNIP 1.031 CiteScore 2.44
Discontinuation of anti-VEGF cancer therapy promotes metastasis through a liver revascularization mechanism

The impact of discontinuation of anti-VEGF cancer therapy in promoting cancer metastasis is unknown. Here we show discontinuation of anti-VEGF treatment creates a time-window of profound structural changes of liver sinusoidal vasculatures, exhibiting hyper-permeability and enlarged open-pore sizes of the fenestrated endothelium and loss of VE-cadherin. The drug cessation caused highly leaky hepatic vasculatures permit tumour cell intravasation and extravasation. Discontinuation of an anti-VEGF antibody-based drug and sunitinib markedly promotes liver metastasis. Mechanistically, host hepatocyte, but not tumour cell-derived vascular endothelial growth factor (VEGF), is responsible for cancer metastasis. Deletion of hepatocyte VEGF markedly ablates the 'off-drug' -induced metastasis. These findings provide mechanistic insights on anti-VEGF cessation-induced metastasis and raise a new challenge for uninterrupted and sustained antiangiogenic therapy for treatment of human cancers.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Karolinska Institutet, National Sun Yat-sen University, The First Affiliated Hospital of Shenzhen University, Zhejiang University
Authors: Yang, Y. (Ekstern), Zhang, Y. (Ekstern), Iwamoto, H. (Ekstern), Hosaka, K. (Ekstern), Seki, T. (Ekstern), Andersson, P. (Ekstern), Lim, S. (Ekstern), Fischer, C. (Ekstern), Nakamura, M. (Ekstern), Abe, M. (Ekstern), Skov, P. V. (Intern), Feng, C. (Ekstern), Chen, X. (Ekstern), Lu, Y. (Ekstern), Nie, G. (Ekstern), Cao, Y. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Nature Communications
Volume: 7
Article number: 12680
ISSN (Print): 2041-1723
Ratings:
BFI (2018): BFI-level 2
Disinfection with peracetic acid (PAA), an alternative against fish pathogens

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Agricultural Research Service
Authors: Meinelt, T. (Ekstern), Pedersen, L. (Intern), Straus, D. L. (Ekstern), Liu, D. (Ekstern)
Publication date: 2016
Event: Abstract from International Conference on Recirculating Aquaculture, Roanoke, VA, United States.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

Documentation on key drivers and physiological tolerance limits for resident and invasive species: Report: BIO-C3 Deliverable, D1.2

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Marine Living Resources, Centre for Ocean Life, University of Tartu, University of Hamburg
Number of pages: 100
Does one glove fit all? A review of Remote Electronic Monitoring as a documentation tool

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Cefas
Authors: Mortensen, L. O. (Intern), Schreiber Plet-Hansen, K. (Intern), Bailey, N. (Ekstern), Catchpole, T. (Ekstern), Dolder, P. J. (Ekstern), van Helmond, E. (Ekstern), Kempf, A. (Ekstern), Needle, C. L. (Ekstern), Oesterwind, D. (Ekstern), Poos, J. J. (Ekstern), Zimmermann, C. (Ekstern), Ulrich, C. (Intern)
Publication date: 2016
Event: Abstract from IIFET 2016, Aberdeen, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Drivers of fluorescent dissolved organic matter in the global epipelagic ocean
Fluorescent dissolved organic matter (FDOM) in open surface waters (< 200 m) of the Atlantic, Pacific, and Indian oceans was analysed by excitation-emission matrix (EEM) spectroscopy and parallel factor analysis (PARAFAC). A four-component PARAFAC model was fit to the EEMs, which included two humic- (C1 and C2) and two amino acid-like (C3 and C4) components previously identified in ocean waters. Generalized additive models (GAMs) were used to explore the environmental factors that drive the global distribution of these PARAFAC components. The explained variance for the humic-like components was substantially larger (> 70%) than for the amino acid-like components (< 35%). The environmental variables exhibiting the largest effect on the global distribution of C1 and C2 were apparent oxygen utilisation followed by chlorophyll a. Positive non-linear relationships between both predictor variables and the two humic-like PARAFAC components suggest that their distribution are biologically controlled. Compared with the dark ocean (> 200 m), the relationships of C1 and C2 with AOU indicate a higher C1/AOU and C2/AOU ratios of the humic-like substances in the dark ocean than in the surface ocean where a net effect of photobleaching is also detected. C3 (tryptophan-like) and C4 (tyrosine-like) variability was mostly dictated by salinity (S), by means of positive non-linear relationships, suggesting a primary physical control of their distributions at the global surface ocean scale that could be related to the changing evaporation-precipitation regime. Remarkably, bacterial biomass (BB) only contributed to explain a minor part of the variability of C1 and C4

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Universidad De Granada, CSIC Instituto de Investigaciones Marinas, Consejo Superior de Investigaciones Científicas, Charles University, Instituto Mediterráneo de Estudios Avanzados, Instituto Español de Oceanografía
Pages: 1101-1119
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Publication information
Journal: Limnology and Oceanography
Volume: 61
Issue number: 3
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
Dynamic optimal foraging theory explains vertical migrations of bigeye tuna

Bigeye tuna are known for remarkable daytime vertical migrations between deep water, where food is abundant but the water is cold, and the surface, where water is warm but food is relatively scarce. Here we investigate if these dive patterns can be explained by dynamic optimal foraging theory, where the tuna maximizes its energy harvest rate. We assume that foraging efficiency increases with body temperature, so that the vertical migrations are thermoregulatory. The tuna’s state is characterized by its mean body temperature and depth, and we solve the optimization problem numerically using dynamic programming. With little calibration of model parameters, our results are consistent with observed data on vertical movement: we find that small tuna should display constant-depth strategies while large tuna should display vertical migrations. The analysis supports the hypothesis that the tuna behaves such as to maximize its energy gains. The model therefore provides insight into the processes underlying observed behavioral patterns and allows generating predictions of foraging behavior in unobserved environments.
Dynamics of a physiologically structured population in a time-varying environment

Physiologically structured population models have become a valuable tool to model the dynamics of populations. In a stationary environment such models can exhibit equilibrium solutions as well as periodic solutions. However, for many organisms the environment is not stationary, but varies more or less regularly. In order to understand the interaction between an external environmental forcing and the internal dynamics in a population, we examine the response of a physiologically structured population model to a periodic variation in the food resource. We explore the addition of forcing in two cases: (A) where the population dynamics is in equilibrium in a stationary environment, and (B) where the population dynamics exhibits a periodic solution in a stationary environment. When forcing is applied in case A, the solutions are mainly periodic. In case B the forcing signal interacts with the oscillations of the unforced system, and both periodic and irregular (quasi-periodic or chaotic) solutions occur. In both cases the periodic solutions include one and multiple period cycles, and each cycle can have several reproduction pulses.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Dynamical Systems, National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Living Resources
Authors: Heilmann, I. L. T. (Intern), Starke, J. (Intern), Andersen, K. H. (Intern), Thygesen, U. H. (Intern), Sørensen, M. P. (Intern)
Pages: 54-61
Publication date: 2016
Main Research Area: Technical/natural sciences
Early life of an inshore population of West Greenlandic cod Gadus morhua: spatial and temporal aspects of growth and survival

Understanding the processes that affect fish larval survival and recruitment is a fundamental tenant of fisheries science. Small, isolated fjords are ideal study systems for elucidating early life history processes, as population dynamics are well traced in these partially closed systems. We examined the distribution, growth and mortality of eggs and larvae of a fjord population of cod during a 5 mo field campaign in the fjord Kapisigdlit, West Greenland. Cod mainly spawned early in the season in the innermost shallow region of the fjord. Egg survival was generally high in the fjord. The high survival may have been driven by relatively high temperature and/or low predation in the inner region. Early in the season, the distribution of eggs and young larvae was mostly restricted to the spawning area. Later in the season, larger larvae had become more evenly distributed in the fjord. This shift in distribution was observed after the seasonal pulse in freshwater outflow following the ice break-up in Kapisigdlit River. There was a positive correlation between the amount of food in a larval stomach and growth, and larval growth was greater in the outer fjord where prey availability was higher. The timing between spawning and freshwater input may be essential for survival and recruitment, this ensuring low dispersal of eggs and younger stages and high dispersal of older, actively feeding stages. Therefore, cod in this area could be vulnerable to future climate change affecting the timing and magnitude of freshwater outflow, by changes in precipitation, temperature or prey availability.
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of California, NOAA
Authors: Swalethorp, R. (Intern), Nielsen, T. G. (Intern), Thompson, A. R. (Ekstern), Møhl, M. (Intern), Munk, P. (Intern)
Pages: 185-202
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 555
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2001): Indexed yes
Web of Science (2000): Indexed yes
Original language: English
DOIs:
10.3354/meps11816
Early life of key fish species, capelin Mallotus villosus and Atlantic cod Gadus morhua, in West Greenland

Research involving the processes governing early life of fishes is important for understanding recruitment to the adult population. The forcing factors, like oceanographic processes and the associated plankton communities, impact the distribution and transport of fish larvae and determine their growth conditions, survival and recruitment to the adult stock. The temporal and spatial overlap of fish larvae and their prey is essential for their feeding, growth and survival. Investigations of the prey size spectra in fish larvae made possible to observe inter-specific prey competition and gain knowledge on the role in the food web. The changes in environmental factors between subarctic and Arctic areas along the west coast of Greenland provide a unique study frame. Here, the period of high primary productivity is short and limited by seasonal changes in light, consequently prey availability for the fish larvae during the summer. The duration of the productive season is of great importance for the early life of fish. The present thesis investigates the diets of capelin and cod in the subarctic Kapisigdlit, as well as the feeding of non-commercial larval fish in the entire Godthåbsfjord system. Furthermore, growth and feeding of capelin were compared between the two distant localities, Kapisigdlit Fjord and Disko Bay.

In Kapisigdlit Fjord, the zooplankton community structure was dominated by rotifers and harpacticoid copepods. These organisms appeared too small as prey for cod larvae, where they were feeding on prey sizes of about 5% of their own size (Paper I) and consequently the prey preference spectra covered calanoid nauplii, cladocerans and calanoid copepodes with increasing larval size.

In the Godthåbsfjord system and Fyllas Bank area, 4 hydrographic zones were defined; in each zone distinct zooplankton and ichthyoplankton assemblages were observed (Paper II). Calanus spp are mainly found off Godthåbsfjord, while the smaller copepods are found in the inner fjord. Cladocerans and rotifers were mainly found in Kapisigdlit Fjord, where the key fish species capelin and cod spawn. Sixteen larval fish species were found in the area, and 3 main assemblages were identified according to their similarities, which are related to the hydrographic zones. Fish larvae may benefit from the estuarine circulation to distribute themselves from the spawning areas through the Godthåbsfjord. The diet of the larval fish species varied markedly along the fjord. Prey size preferences of fish larvae were positively correlated to their mouth sizes. American plaice and sandeel were probably do not compete for food with other fish species since these, contrary to other species, had high preference for microplankton. Capelin larvae from Kapisigdlit Fjord and Disko Bay emerged from the spawning sites when the sea surface temperature reached 6°C, this temperature was reached 1 month later in the northern locality though (Paper III). Their highest pelagic abundances were found when the sea surface temperature reached 8°C. Larval growth rate differed between the two localities, larvae growing faster in the northern Disko Bay than in Kapisigdlit Fjord.

Apparently, the later emergence of larvae in the northern locality was compensated by a higher growth rate, so the capelin larvae could reach the appropriate larval stage and size for overwintering. With respect to diet of capelin larvae, the feeding incidence was found to be greater than 50% and we found a broader spectra of prey taxa than seen in other investigations (Paper IV). The dominating prey items in both localities are: numerically, the rotifers and cyclopoid copepodes, and harpacticoid nauplii in Kapisigdlit only; while in terms of biomass, calanoid nauplii and cyclopoid copepodes dominated in both localities. The prey size spectra calculations show some feeding on microplankton, invertebrate eggs and rotifers for the smaller larvae, but the main organisms of preference – and of importance as biomass consumed – were calanoid nauplii and cyclopoid copepodes.

The findings indicate that capelin and cod larvae were not competing for food as their prey size spectra do not overlap. While cod is preying on larger organisms as they develop, the increase in maximally preferred prey size showed a slower increase during growth of the capelin larvae. Cyclopoid copepodes are food source for both capelin and cod, and there might be some competition for this item, however this plankton group is very abundant in the west coast of Greenland. However, the competition for food seems to be greater between cod and other fish larvae. With capelin, competition with other fish larvae seems to be minor. The increase in water temperatures in west of Greenland may impact the capelin stocks. When larval emergence is linked to temperature, and the initiation of productive cycles is linked to the break-up of ice cover and the subsequent irradiance increase in the water column, climatic changes in Arctic regions could lead to a mismatch between larval emergence and optimal conditions for their feeding and growth. Thus it would be feasible to investigate the capelin stock genetic characteristics in these areas, to evaluate the potential impact generated by the global warming because of the importance of the capelin for the food web in the west coast of Greenland.
Ecosystem goods and services of blue mussel mitigation cultures

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Nielsen, P. (Intern)
Publication date: 2016
Event: Abstract from YOUMARES 17, Hamburg, Germany.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Ecosystem indicators in the context of fisheries management: example of cod in the Baltic Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Institute Management
Authors: Eero, M. (Intern), Casini, M. (Ekstern), Hüsey, K. (Intern), Köster, F. (Intern), MacKenzie, B. (Intern), Neuenfeldt, S. (Intern), Tomkiewicz, J. (Intern)
Publication date: 2016
Event: Abstract from World Fisheries Congress, Busan, Korea, Republic of.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Effect of arctic sea-ice melt on inherent optical properties and vertical distribution of solar radiant heating - possible feedbacks on ice melt

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute
Authors: Granskog, M. A. (Ekstern), Pavlov, A. K. (Ekstern), Sagan, S. (Ekstern), Kowalczuk, P. (Ekstern), Raczkowska, A. (Ekstern), Stedmon, C. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Effects of acute and chronic stress on telencephalic neurochemistry and gene expression in rainbow trout (Oncorhynchus mykiss)

By filtering relevant sensory inputs and initiating stress responses, the brain is an essential organ in stress coping and adaptation. However, exposure to chronic or repeated stress can lead to allostatic overload, where neuroendocrinal and behavioral reactions to stress become maladaptive. This work examines forebrain mechanisms involved in allostatic processes in teleost fishes. Plasma cortisol, forebrain serotonergic (5-HTergic) neurochemistry, and mRNA levels of corticotropin-releasing factor (CRF), CRF-binding protein (CRFBP), CRF receptors (CRFR1 and CRFR2), mineralocorticoid receptor (MR), glucocorticoid receptors (GR1 and GR2) and serotonin type 1A (5-HT1A) receptors (5-HT1Aα and 5-HT1Aβ) were investigated at 1 h before and 0, 1 and 4 h after acute stress, in two groups of rainbow trout held in densities of 25 and 140 kg m⁻³ for 28 days. Generally, being held at 140 kg m⁻³ resulted in a less pronounced cortisol response. This effect was also reflected in lower forebrain 5-HTergic turnover, but not in mRNA levels in any of the investigated genes. This lends further support to reports that allostatic load causes fish to be incapable of mounting a proper cortisol response to an acute stressor, and suggests that changes in forebrain 5-HT metabolism are involved in allostatic processes in fish. Independent of rearing densities, mRNA levels of 5-HT1Aα and MR were downregulated 4 h post-stress compared with values 1 h post-stress, suggesting that these receptors are under feedback control and take part in the downregulation of the hypothalamic-pituitary-interrenal (HPI) axis after exposure to an acute stressor.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, University of Copenhagen, Uppsala University, Lund University, Norwegian Institute for Water Research
Authors: Moltesen, M. (Intern), Laursen, D. C. (Intern), Thörnqvist, P. O. (Ekstern), Åberg Andersson, M. (Intern), Winberg, S. (Ekstern), Höglund, E. (Intern)
Effects of an Arctic under-ice phytoplankton bloom on bio-optical properties of surface waters during the Norwegian Young Sea Ice Cruise (N-ICE2015)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Bergen, Norwegian Polar Institute, University of Manitoba, Alfred Wegener Institute for Polar and Marine Research
Publication date: 2016
Main Research Area: Technical/natural sciences

Effects of dietary microplastic exposure on the organ toxicity of a mixture of chemical contaminants in zebrafish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, National Food Institute, Research Group for Analytical Food Chemistry, Parque Tecnologico de Bizkaia
Authors: Rainieri, S. (Ekstern), Conlledo, N. (Ekstern), Larsen, B. K. (Intern), Granby, K. (Intern), Barranco, A. (Ekstern)
Number of pages: 1
Publication date: 2016
Event: Poster session presented at 52nd European Congress of the European Societies of Toxicology (EUROTOX2016), Seville, Spain.
Main Research Area: Technical/natural sciences

Effects of dietary microplastic exposure on the organ toxicity of a mixture of chemical contaminants in zebrafish (Danio rerio)

General information
State: Published
Organisations: National Food Institute, Research Group for Analytical Food Chemistry, National Institute of Aquatic Resources, Section for Aquaculture
Authors: Rainieri, S. (Ekstern), Conlledo, N. (Ekstern), Larsen, B. K. (Intern), Granby, K. (Intern), Barranco, A. (Ekstern)
Pages: 285-286
Publication date: 2016
Main Research Area: Technical/natural sciences
Effects of dietary prebiotic GroBiotic®-A on growth performance, plasma thyroid hormones and mucosal immunity of great sturgeon, Huso huso (Linnaeus, 1758)

The present study was conducted to evaluate the effects of Grobiotic®-A, a commercial prebiotics, when administered in feed on the growth performance, plasma thyroid hormones and mucosal immunity of great sturgeon (Huso huso). The commercial prebiotic mixture was supplemented in the diets at four different levels (i.e. 0.0% as control, 0.5%, 1% and 2%, in three replicates, 20 fish per replicate) and fed to the fish for an 8-week period wherein 240 fish were cultured in 1,800-L fiberglass tanks that formed part of a flow-through system. Water temperature was maintained at 20.4 ± 1.5°C. Significant changes in growth performance parameters were observed, but only in those groups fed with 1% and 2% prebiotics. Specifically, marked improvements relative to the control group were observed in percentage weight gain, body weight gain, feed conversion ratio and specific growth rate in prebiotic-fed fish. The levels of plasma thyroid hormones, specifically thyroxine and thyroid stimulating hormones were significantly elevated in the group receiving 2% prebiotics. Activities of lysozyme and alkaline phosphatase in skin mucus were significantly enhanced in prebiotics-fed groups, particularly at an inclusion level of 1% and higher (2% group compared to the control). Inhibitory activity of the skin mucus against pathogens, particularly Streptococcus iniae and Yersinia ruckeri, was significantly improved following prebiotic feeding. Taken together, dietary inclusion of GroBiotic®-A promoted growth, modulated thyroid hormones, and enhanced mucosal immunity of H. huso. This prebiotic mixture has the potential for use in improving the growth performance and health status of farmed great sturgeon.

General Information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Iranian Fisheries Science Research Institute (IFSRI), North Orissa University, Sari University of Agricultural Sciences and Natural Resources
Authors: Adel, M. (Ekstern), Nayak, S. (Ekstern), Lazado, C. C. (Intern), Yeganeh, S. (Ekstern)
Pages: 825-831
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication Information
Journal: Journal of Applied Ichthyology
Volume: 32
Issue number: 5
ISSN (Print): 0175-8659
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.94
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 0.84
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.06
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.99
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.99
Effects of feed loading on microbial water quality in RAS

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Rojas-Tirado, P. A. (Intern), Pedersen, P. B. (Intern), Vadstein, O. (Ekstern), Pedersen, L. (Intern)
Publication date: 2016
Event: Abstract from International Conference on Recirculating Aquaculture, Roanoke, VA, United States.
Main Research Area: Technical/natural sciences
Links:
http://media.wix.com/ugd/9c091d_bda94a40dd8a48f8af6a55712b95f4ab.pdf
Publication: Research › Conference abstract for conference – Annual report year: 2016

Effects of in situ turbulence on the feeding behavior of Mnemiopsis leidyi

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Marine Biological Laboratory
Authors: Colin, S. P. (Ekstern), Bezio, N. (Ekstern), Costello, J. (Ekstern), Jaspers, C. (Intern), Gemmell, B. (Ekstern), Sutherland, K. (Ekstern)
Publication date: 2016
Event: Abstract from ASLO Ocean Sciences Meeting, New Orleans, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Effects of oil spill responses on key Arctic zooplankton species
The copepod Calanus glacialis is a key species in the Arctic ecosystem. Increased shipping and oil and gas activities in the Arctic increase the risk of an oil spill. It is therefore important to study the potential consequences of an oil spill on this key species in the Arctic marine ecosystems. As a part of a large joint industry initiative (www.arcticresponsetechnology.org) a first of its kind mesocosm experiment was executed in an Arctic fjord of the Island of Svalbard. Effects of natural attenuation of the oil, in-situ burning and chemical dispersion were studied on grazing, egg production and hatching of the Arctic copepod Calanus glacialis. Eight mesocosms with open top and bottom were deployed in the sea ice in Van Mijenfjorden, Svalbard, in February 2015. Two replicates were used for all treatments. After application, surface ice was allowed to re-establish. Water was collected from the top 2 cm water column in March and just before sea ice break up in May, and was used in two 14-day incubation experiments with C. glacialis collected in Isfjorden. Copepods were fed during the experiment and eggs and pellets were quantified daily. Egg hatching was determined in the beginning and end of the experiment. There was no significant effect of the oil spill treatments on average cumulated specific pellet production or egg hatching success. However in May, the average cumulated specific egg production was significantly higher in the dispensed oil treatment compared to the control from day 2 (+ 169 %) until the end of the
Effects of oil spill responses on key Arctic zooplankton species

Increased shipping and oil and gas activities in the Arctic increase the risk of an oil spill. Oil compounds can have toxic impact on Arctic marine ecosystems, but impacts from response technologies on ice associated ecology have not been studied extensively. The copepod Calanus glacialis is a key species in the Arctic marine ecosystem. It plays a central role in energy transfer between primary producers and higher trophic levels of the Arctic food chain. It is therefore relevant to study potential consequences of an oil spill on this ecological important species. As a part of a large joint industry initiative (www.arcticresponsetechnology.org) a first of its kind mesocosm experiment was executed in an Arctic fjord of the Island of Svalbard. Effects of natural attenuation of the oil, in-situ burning and chemical dispersion were studied on grazing, egg production and hatching of the Arctic copepod Calanus glacialis. Eight mesocosms with open top and bottom were deployed in the sea ice in Van Mijenfjorden, Svalbard, in February 2015. Two replicates were used for all treatments. After application, surface ice was allowed to re-establish. Water was collected from the top 2 cm water column in March and just before sea ice break up in May, and was used in two 14-day incubation experiments with C. glacialis collected in Isfjorden. Copepods were fed during the experiment and eggs and pellets were quantified daily. Egg hatching was determined in the beginning and end of the experiment. There was no significant effect of the oil spill treatments on average cumulated specific pellet production or egg hatching success. However in May, the average cumulated specific egg production was significantly higher in the oil-dispersant mixture treatment compared to the control from day 2 (+169 %) until the end of the experiment (+41 %). To correlate observed effects and toxicity, and to examine potential pollutant transfer, the chemical content of incubation water, exposed females and produced eggs was further analysed for chemical residue. These results will be presented on the SETAC 2016 conference.
Effects of wastewater treatment plant effluent inputs on planktonic metabolic rates and microbial community composition in the Baltic Sea

The Baltic Sea is the world's largest area suffering from eutrophication-driven hypoxia. Low oxygen levels are threatening its biodiversity and ecosystem functioning. The main causes for eutrophication-driven hypoxia are high nutrient loadings and global warming. Wastewater treatment plants (WWTP) contribute to eutrophication as they are important sources of nitrogen to coastal areas. Here, we evaluated the effects of wastewater treatment plant effluent inputs on Baltic Sea planktonic communities in four experiments. We tested for effects of effluent inputs on chlorophyll a content, bacterial community composition, and metabolic rates: gross primary production (GPP), net community production (NCP), community respiration (CR) and bacterial production (BP). Nitrogen-rich dissolved organic matter (DOM) inputs from
effluents increased bacterial production and decreased primary production and community respiration. Nutrient amendments and seasonally variable environmental conditions lead to lower alpha-diversity and shifts in bacterial community composition (e.g. increased abundance of a few cyanobacterial populations in the summer experiment), concomitant with changes in metabolic rates. An increase in BP and decrease in CR could be caused by high lability of the DOM that can support secondary bacterial production, without an increase in respiration. Increases in bacterial production and simultaneous decreases of primary production lead to more carbon being consumed in the microbial loop, and may shift the ecosystem towards heterotrophy.
Emergence of a new predator in the North Sea: evaluation of potential trophic impacts focused on hake, saithe, and Norway pout

During the last 15 years, northern European hake (Merluccius merluccius) has increased in abundance, and its spatial distribution has expanded in the North Sea region in correlation with temperature. In a context of global warming, this spatial shift could impact local trophic interactions: direct impacts may affect forage fish through modified predator-prey interactions, and indirect impacts may materialize through competition with other resident predators. For instance, North Sea saithe (Pollachius virens) spatial overlap with hake has increased while saithe spawning-stock biomass has decreased recently notwithstanding a sustainable exploitation. In this context, we investigated the range of potential impacts resulting from most recent hake emergence in the North Sea, with a particular focus on saithe. We carried out a multispecies assessment of North Sea saithe, using the Stochastic MultiSpecies (SMS) model. In addition to top-down processes already implemented in SMS, we built in the model bottom-up processes, relating Norway pout (Trisopterus esmarkii) abundance and saithe weight-at-age. We simulated the effects, on all North Sea species being considered but focusing on Norway pout and saithe, of combining different hake abundance trends scenarios with the inclusion of bottom-up processes in SMS. North Sea saithe F-MSY was then evaluated in a multispecies context and contrasted with single-species value. The different scenarios tested revealed a negative impact of hake emergence on saithe biomass, resulting from an increase of predation pressure on Norway pout. These results confirm the competition assumption between saithe and hake in the North Sea and might partially explain the most recent decrease of saithe biomass. This study also highlighted that taking into account bottom-up processes in the stock assessment had a limited effect on the estimation of saithe FMSY which was consistent with single-species value.
Empirical observations of the spawning migration of European eels: The long and dangerous road to the Sargasso Sea

Fresh data on the timing and speed of the oceanic spawning migration of European eels suggest a new paradigm for spawning ecology.

General information

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Publication date: 2016
Employing a trawl independent multi-compartment towing rig to study selectivity of crustaceans in trawls

En barsk udfordring kræver store løsninger

Enhancing organic matter removal in desalination pretreatment systems by application of dissolved air flotation
4-12 at pH7.5. At pH5.5, the optimum coagulant dose increased with increasing humic character of the feed water. Overall, the OM removal efficiency by DAF observed in this study was higher than reported for other membrane-based processes; a combination of DAF and biofiltration is likely to be complementary.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of New South Wales
Authors: Shutova, Y. (Ekstern), Karna, B. L. (Ekstern), Hambly, A. C. (Intern), Lau, B. (Ekstern), Henderson, R. K. (Ekstern), Le-Clech, P. (Ekstern)
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Scopus rating (2016): CiteScore 5.82 SJR 1.808 SNIP 1.911
Web of Science (2016): Indexed yes
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BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.733 SNIP 2.17 CiteScore 4.28
ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 1
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Scopus rating (2011): SJR 1.109 SNIP 1.276 CiteScore 2.93
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.897 SNIP 1.076
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.883 SNIP 1.043
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.817 SNIP 1.023
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.727 SNIP 0.954
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.635 SNIP 0.962
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.067 SNIP 1.231
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.057 SNIP 1.09
Environmental DNA from seawater samples correlate with trawl catches of Subarctic, deepwater fishes

Remote polar and deepwater fish faunas are under pressure from ongoing climate change and increasing fishing effort. However, these fish communities are difficult to monitor for logistic and financial reasons. Currently, monitoring of marine fishes largely relies on invasive techniques such as bottom trawling, and on official reporting of global catches, which can be unreliable. Thus, there is need for alternative and non-invasive techniques for qualitative and quantitative oceanic fish surveys. Here we report environmental DNA (eDNA) metabarcoding of seawater samples from continental slope depths in Southwest Greenland. We collected seawater samples at depths of 188-918 m and compared seawater eDNA to catch data from trawling. We used Illumina sequencing of PCR products to demonstrate that eDNA reads show equivalence to fishing catch data obtained from trawling. Twenty-six families were found with both trawling and eDNA, while three families were found only with eDNA and two families were found only with trawling. Key commercial fish species for Greenland were the most abundant species in both eDNA reads and biomass catch, and interpolation of eDNA abundances between sampling sites showed good correspondence with catch sizes. Environmental DNA sequence reads from the fish assemblages correlated with biomass and abundance data obtained from trawling. Interestingly, the Greenland shark (Somniosus microcephalus) showed high abundance of eDNA reads despite only a single specimen being caught, demonstrating the relevance of the eDNA approach for large species that can probably avoid bottom trawls in most cases. Quantitative detection of marine fish using eDNA remains to be tested further to ascertain whether this technique is able to yield credible results for routine application in fisheries. Nevertheless, our study demonstrates that eDNA reads can be used as a qualitative and quantitative proxy for marine fish assemblages in deepwater oceanic habitats. This relates directly to applied fisheries as well as to monitoring effects of ongoing climate change on marine biodiversity-especially in polar ecosystems.
Environmental Impacts—Marine Ecosystems

This chapter presents a review of what is known about the impacts of climate change on the biota (plankton, benthos, fish, seabirds and marine mammals) of the North Sea. Examples show how the changing North Sea environment is affecting biological processes and organisation at all scales, including the physiology, reproduction, growth, survival, behaviour and transport of individuals; the distribution, dynamics and evolution of populations; and the trophic structure and coupling of ecosystems. These complex responses can be detected because there are detailed long-term biological and environmental records for the North Sea; written records go back 500 years and archaeological records many thousands of years. The information presented here shows that the composition and productivity of the North Sea marine ecosystem is clearly affected by climate change and that this will have consequences for sustainable levels of harvesting and other ecosystem services in the future. Multi-variate ocean climate indicators that can be used to monitor and warn of changes in composition and productivity are now being developed for the North Sea.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Institute of Marine Research, University of Groningen, CNRS, University of Veterinary Medicine Hannover, University of Kiel, Cefas, Wageningen IMARES
Authors: Brander, K. (Intern), Ottersen, G. (Ekstern), Bakker, J. (Ekstern), Beaugrand, G. (Ekstern), Herr, H. (Ekstern), Garthe, S. (Ekstern), Gilles, A. (Ekstern), Kenny, A. (Ekstern), Siebert, U. (Ekstern), Skjoldal, H. R. (Ekstern), Tulp, I. (Ekstern)

BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.414 SNIP 1.131 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.74 SNIP 1.147 CiteScore 3.94
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
ISI indexed (2012): ISI indexed yes
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ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.631 SNIP 1.161
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.473 SNIP 0.985
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
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Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.289 SNIP 0.525
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Er det genetik der bestemmer, hvor længe laks opholder sig i havet?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Freshwater Fisheries Ecology
Authors: Bekkevold, D. (Intern), Eg Nielsen, E. (Intern), Sivebæk, F. (Intern)
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Er du interesseret i fisk og fiskeri?

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Authors: Christoffersen, M. (Intern)
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Er du interesseret i fisk og fiskeri?

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Authors: Christoffersen, M. (Intern)
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Publication: Research › Poster – Annual report year: 2016

Erhvervsmæssig fangst af ferskvandsfisk i Danmark

General information
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Escape panels in trawls – a consistent management tool?

Reducing discards of unwanted sizes and species which have a low survival rate is one of the major challenges in fisheries worldwide today. Numerous devices and fishing gears aiming at improving both species and size selectivity have been developed and implemented by various fisheries. Selective gears are often developed in collaboration between scientists and fishers. Part of the development is a controlled scientific test documenting the selectivity effect. In this study, we compared two versions of a mandatory escape panel that were introduced into the mixed species fishery in the Skagerrak in 2013: the version implemented in the legislation (pre-implementation version) and the version the industry was using one year after its implementation, the post-implementation version (post-version). The post-version went through some simple adjustments that resulted in a panel section with a larger vertical distance between the upper panel (escape panel) and the bottom panel compared to the pre-version. Both designs are legal and considered identical. The results of this study showed significantly higher catches (lower selectivity) for the post-version for all five species examined; cod (Gadus morhua), saithe (Pollachius virens), haddock (Melanogrammus aeglefinus), plaice (Pleuronectes platesssa) and Norway lobster (Nephrops norvegicus). Thus the modification by fishers of certain gear properties not specified in the legislation can significantly influence the efficiency of an escape panel. We discuss to what extent catch quotas instead of the former landings quotas could provide the economic incentives for fishers to actively use selective gear designs more optimally and thereby play an active role in the management of fisheries.
Estimating seabed pressure from demersal trawls, seines, and dredges based on gear design and dimensions

This study assesses the seabed pressure of towed fishing gears and models the physical impact (area and depth of seabed penetration) from trip-based information of vessel size, gear type, and catch. Traditionally fishing pressures are calculated top-down by making use of large-scale statistics such as logbook data. Here, we take a different approach starting from the gear itself (design and dimensions) to estimate the physical interactions with the seabed at the level of the individual fishing operation. We defined 14 distinct towed gear groups in European waters (eight otter trawl groups, three beam trawl groups, two demersal seine groups, and one dredge group), for which we established gear “footprints”. The footprint of a gear is defined as the relative contribution from individual larger gear components, such as trawl doors, sweeps, and groundgear, to the total area and severity of the gear’s impact. An industry-based survey covering 13 countries provided the basis for estimating the relative impact-area contributions from individual gear components, whereas sediment penetration was estimated based on a literature review. For each gear group, a vessel size–gear size relationship was estimated to enable the prediction of gear footprint area and sediment penetration from vessel size. Application of these relationships with average vessel sizes and towing speeds provided hourly swept-area estimates by métier. Scottish seining has the largest overall gear footprint of ~1.6 km² h⁻¹ of which 0.08 km² has an impact at the subsurface level (sediment penetration ≥ 2 cm). Beam trawling for flatfish ranks low when comparing overall footprint size/hour but ranks substantially higher when comparing only impact at the subsurface level (0.19 km² h⁻¹). These results have substantial implications for the definition, estimation, and monitoring of fishing pressure indicators, which are discussed in the context of an ecosystem approach to fisheries management.
Estimation of by catch in the commercial fishery for Greenland halibut at West Greenland based on survey data
The by catch in the commercial fishery for Greenland halibut in NAFO Div. 1CD was estimated based on information from ground fish surveys conducted by Greenland Institute of Natural Resources in the same area as the commercial fishery. The survey is conducted with a trawl with 30 mm in the cod end while the minimum mesh size in the cod end in the commercial trawls is 140 mm and the survey catches are converted to potential commercial by catches. The conversion is based on a number of assumptions and the results should be considered as indicative. The total by-catch in weight is estimated to be 13% of the total catch of Greenland halibut. Macrourus berglax is the most abundant by species and constituted 3.2% of the weight of Greenland halibut followed by Antimora rostrata (2.7%), Alepocephalus agassizzi (2.0%) and Hydrolagus affinis (1.2%). None of the remaining species constituted more than 1% of the weight of the Greenland halibut catches. The impact of the fishery for Greenland halibut in Div. 1CD on the stocks of the bycatch species seems, however, to be limited. The by-catch in Div. 0B is at the same level as in Div. 1CD.

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EU’s dødsliste over invasive arter er nu trådt i kraft

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Berg, S. (Intern)
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Publication: Communication › Internet publication – Annual report year: 2016

Evaluating genetic traceability methods for captive-bred marine fish and their applications in fisheries management and wildlife forensics
Growing demands for marine fish products is leading to increased pressure on already depleted wild populations and a rise in aquaculture production. Consequently, more captive-bred fish are released into the wild through accidental escape or deliberate releases. The increased mixing of captive-bred and wild fish may affect the ecological and/or genetic integrity of wild fish populations. Unambiguous identification tools for captive-bred fish will be highly valuable to manage risks (fisheries management) and tracing of escapees and seafood products (wildlife forensics). Using single nucleotide polymorphism (SNP) data from captive-bred and wild populations of Atlantic cod Gadus morhua L. and sole Solea solea L., we explored the efficiency of population and parentage assignment techniques for the identification and tracing of captive-bred fish. Simulated and empirical data were used to correct for stochastic genetic effects. Overall, parentage assignment performed well when a large effective population size characterized the broodstock and escapees originated from early generations of captive breeding. Consequently, parentage assignments are particularly useful from a fisheries management perspective to monitor the effects of deliberate releases of captive-bred fish on wild populations. Population assignment proved to be more efficient after several generations of captive breeding, which makes it a useful method in forensic applications for well-established aquaculture species. We suggest the implementation of a case-by-case strategy when choosing the best method.
Evaluation of otolith shape as a tool for stock discrimination in marine fishes using Baltic Sea cod as a case study

In the Western Baltic Sea two genetically distinct cod stocks “Eastern Baltic cod” and “Western Baltic cod” occur with considerable mixing of stocks. In this study we evaluated the applicability of otolithshape analysis for classification of individuals caught in the mixed stock cod fishery, using SNP (singlenucleotide polymorphism) based genetic assignment of otolith shape baselines. We further developed a management aimed approach for mixed stock assignment by robust
stochastic baseline selection and posterior bias correction by individual reassignment of the least likely classifications into the alternate test stock. Classification criteria selected by Monte Carlo runs of Linear Discriminant Analysis were captured by otolith area and 20 Elliptic Fourier Descriptors of primarily low frequency harmonics. Classification success was considerably lower when using a baseline of spawning individuals only, compared to the better spatial coverage of a combined baseline also including genotyped individuals from the mixed stock area. Furthermore, the inclusion of genotyped individuals balanced the baseline size composition and to a large extent removed a strong size related bias in classification success. These results demonstrate the interplay of environmental, ontogenetic and genetic influences on otolith shape, which complicates the application of otolith shape for stock discrimination in mixed-stock scenarios. Rigours genetic validation and further studies on the temporal dynamics of shape formation are necessary.

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Marine Living Resources, Section for Ecosystem based Marine Management
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Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
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Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Evolution determines how global warming and pesticide exposure will shape predator-prey interactions with vector mosquitoes

How evolution may mitigate the effects of global warming and pesticide exposure on predator-prey interactions is directly relevant for vector control. Using a space-for-time substitution approach, we addressed how 4°C warming and exposure to the pesticide endosulfan shape the predation on Culex pipiens mosquitoes by damselfly predators from replicated low- and high-latitude populations. Although warming was only lethal for the mosquitoes, it reduced predation rates on these prey. Possibly, under warming escape speeds of the mosquitoes increased more than the attack efficiency of the predators. Endosulfan imposed mortality and induced behavioral changes (including increased filtering and thrashing and a positional shift away from the bottom) in mosquito larvae. Although the pesticide was only lethal for the mosquitoes, it reduced predation rates by the low-latitude predators. This can be explained by the combination of the evolution of a faster life history and associated higher vulnerabilities to the pesticide (in terms of growth rate and lowered foraging activity) in the low-latitude predators and pesticide-induced survival selection in the mosquitoes. Our results suggest that predation rates on mosquitoes at the high latitude will be reduced under warming unless predators evolve toward the current low-latitude phenotype or low-latitude predators move poleward.
Expanding the concept of sustainable seafood using Life Cycle Assessment

Fisheries management and sustainability assessment of fisheries more generally have recently expanded their scope from single-species stock assessment to ecosystem-based approaches, aiming to incorporate economic, social and local environmental impacts, while still excluding global-scale environmental impacts. In parallel, Life Cycle Assessment (LCA) has emerged as a widely used and recommended framework to assess environmental impacts of products, including global-scale impacts. For over a decade, LCA has been applied to seafood supply chains, leading to new insights into the environmental impact of seafood products. We present insights from seafood LCA research with particular focus on evaluating fisheries management, which strongly influences the environmental impact of seafood products. Further, we suggest tangible ways in which LCA could be taken up in management. By identifying trade-offs, LCA can be a useful decision support tool and avoids problem shifting from one concern (or activity) to another. The integrated, product-based and quantitative perspective brought by LCA could complement existing tools. One example is to follow up fuel use of fishing, as the production and combustion of fuel used dominates overall results for various types of environmental impacts of seafood products, and is also often linked to biological impacts of fishing. Reducing the fuel use of fisheries is therefore effective to reduce overall impacts. Allocating fishing rights based on environmental performance could likewise facilitate the transition to low-impact fisheries. Taking these steps in an open dialogue between fishers, managers, industry, NGOs and consumers would enable more targeted progress towards sustainable fisheries.

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SINTEF, University of Tasmania, SP Technical Research Institute of Sweden, Chalmers University of Technology, Pontificia Universidad Catolica del Peru, Commonweath Scientific and Industrial Research Organisation
Authors: Ziegler, F. (Ekstern), Hornborg, S. (Ekstern), Green, B. S. (Ekstern), Eigaard, O. R. (Intern), Farmery, A. K. (Ekstern), Hammar, L. (Ekstern), Hartmann, K. (Ekstern), Molander, S. (Ekstern), Parker, R. W. R. (Ekstern), Skontorp Hognes, E. (Ekstern), Vázquez-Rowe, I. (Ekstern), Smith, A. D. M. (Ekstern)
Pages: 1073-1093
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Experimental insights into the importance of aquatic bacterial community composition to the degradation of dissolved organic matter

Bacteria play a central role in the cycling of carbon, yet our understanding of the relationship between the taxonomic composition and the degradation of dissolved organic matter (DOM) is still poor. In this experimental study, we were able...
to demonstrate a direct link between community composition and ecosystem functioning in that differently structured aquatic bacterial communities differed in their degradation of terrestrially derived DOM. Although the same amount of carbon was processed, both the temporal pattern of degradation and the compounds degraded differed among communities. We, moreover, uncovered that low-molecular-weight carbon was available to all communities for utilisation, whereas the ability to degrade carbon of greater molecular weight was a trait less widely distributed. Finally, whereas the degradation of either low- or high-molecular-weight carbon was not restricted to a single phylogenetic clade, our results illustrate that bacterial taxa of similar phylogenetic classification differed substantially in their association with the degradation of DOM compounds. Applying techniques that capture the diversity and complexity of both bacterial communities and DOM, our study provides new insight into how the structure of bacterial communities may affect processes of biogeochemical significance.

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Lund University, Uppsala University, University of Copenhagen, KTH - Royal Institute of Technology, Swedish University of Agricultural Sciences
Authors: Logue, J. (Ekstern), Stedmon, C. (Intern), Kellerman, A. (Ekstern), Nielsen, N. (Ekstern), Andersson, A. (Ekstern), Laudon, H. (Ekstern), Lindström, E. (Ekstern), Kritzberg, E. (Ekstern)
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Scopus rating (2016): CiteScore 8.91 SJR 4.771 SNIP 2.188
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 5.056 SNIP 2.181 CiteScore 8.42
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 4.71 SNIP 2.175 CiteScore 8.62
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 4.673 SNIP 2.07 CiteScore 8.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.536 SNIP 1.777 CiteScore 6.5
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.245 SNIP 1.626
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.563 SNIP 1.445
Web of Science (2009): Indexed yes
Explaining the catch efficiency of different cod pots using underwater video to observe cod entry and exit behaviour

Cod pots are considered seal-safe fishing gear and are proposed as a solution to mitigate the ongoing seal-fisheries conflict in the Baltic Sea. This study examined various factors which could affect the entry and exit behaviour of cod in relation to cod pots. Statistical modelling was used to determine which of these factors most affected the pots’ catch per unit effort (CPUE). Two fishing trials were conducted off the coast of Bornholm, Denmark, using six pot types with different design features, equipped with underwater camera systems to record the behaviour of the cod in relation to the pots. Four pot types were floating pots with one entrance and two were bottom standing with three entrances. Different pot types showed significantly different CPUEs and the pot type was an explanatory factor for entry and exit rates for both trials. In trial 1 artificial light was used for filming and results showed an increase in entry rates during the night time, suggesting that lights attract fish to the pot when the dark surroundings make the effect of the light more noticeable. Exit rates in trial 1 increased with an increasing number of fish in the pot while they decreased with soak time. In trial 2, when no artificial light was used, a saturation effect was found in that the probability of cod entering the pot lessened as the number of cod already in the pot increased. However, the exit rates in trial 2 also decreased with increasing number of fish in the pot. The study offers greater depth to the understanding of CPUE results by examining fish behaviour around the pots and not just the raw catch data. This in turn contributes to the ongoing search for the most favourable pot designs.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences
Authors: Hedgärde, M. (Ekstern), Berg, C. W. (Intern), Kindt-Larsen, L. (Intern), Lunneryd, S. G. (Ekstern), Königson, S. (Ekstern)
Pages: 67-90
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information

Journal: Journal of Ocean Technology
Volume: 11
Issue number: 4
ISSN (Print): 1718-3200
Ratings:
Scopus rating (2016): CiteScore 0.13 SJR 0.121 SNIP 0.445
Scopus rating (2015): CiteScore 0.22 SNIP 0.604 SJR 0.153
Scopus rating (2014): CiteScore 0.13 SNIP 0.479 SJR 0.126
Scopus rating (2013): CiteScore 0.11 SNIP 0.408 SJR 0.117
Scopus rating (2012): CiteScore 0.07 SNIP 0.076 SJR 0.112
Scopus rating (2011): CiteScore 0.09 SNIP 0.246 SJR 0.105
Scopus rating (2010): SNIP 0.278 SJR 0.108
Original language: English
Attraction, Behaviour, Cod, CPUE, Pot, Saturation
Electronic versions:
Publishers version
Links:
http://www.thejot.net/?page_id=837&show_article_preview=824
Links:
http://www.scopus.com/inward/record.url?scp=85030121587&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 85030121587
Publication: Research - peer-review › Journal article – Annual report year: 2017
Exploring methods for predicting multiple pressures on ecosystem recovery: A case study on marine eutrophication and fisheries

Efforts to attain good environmental status in the marine realm require decisions which cannot be done without knowledge of effects of different management measures. Given the wide diversity of marine ecosystems, multitude of pressures affecting it and the still poor understanding on linkages between those, there are likely no models available to give all the required answers. Hence, several separate approaches can be used in parallel to give support for management measures. We tested three completely different methods - a spatial impact index, a food web model and a Bayesian expert method. We found that a large uncertainty existed regarding the ecosystem response to the management scenarios, and that the three different modelling approaches complemented each other. The models indicated that in order to reach an improved overall state of the ecosystem nutrient reductions are the more effective of the two management variables explored, and that cumulative effects of the management of nutrient inputs and fishing mortality are likely to exist.

General information
State: Published
Authors: Uusitalo, L. (Ekstern), Korpinen, S. (Ekstern), Andersen, J. H. (Ekstern), Niiranen, S. (Ekstern), Valanko, S. (Ekstern), Heiskanen, A. S. (Ekstern), Dickey-Collas, M. (Intern)
Pages: 48-60
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Continental Shelf Research
Volume: 121
ISSN (Print): 0278-4343
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.27 SJR 1.051 SNIP 1.15
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.002 SNIP 1.117 CiteScore 2.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.109 SNIP 1.218 CiteScore 2.08
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.21 SNIP 1.448 CiteScore 2.28
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.137 SNIP 1.207 CiteScore 2.02
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.409 SNIP 1.438 CiteScore 2.31
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.352 SNIP 1.312
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.305 SNIP 1.307
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.176 SNIP 1.33
Scopus rating (2007): SJR 1.376 SNIP 1.56
Exposure to a heat wave under food limitation makes an agricultural insecticide lethal: a mechanistic laboratory experiment

Extreme temperatures and exposure to agricultural pesticides are becoming more frequent and intense under global change. Their combination may be especially problematic when animals suffer food limitation. We exposed Coenagrion puella damselfly larvae to a simulated heat wave combined with food limitation and subsequently to a widespread agricultural pesticide (chlorpyrifos) in an indoor laboratory experiment designed to obtain mechanistic insights in the direct effects of these stressors in isolation and when combined. The heat wave reduced immune function (activity of phenoloxidase, PO) and metabolic rate (activity of the electron transport system, ETS). Starvation had both immediate and delayed negative sublethal effects on growth rate and physiology (reductions in Hsp70 levels, total fat content, and activity levels of PO and ETS). Exposure to chlorpyrifos negatively affected all response variables. While the immediate effects of the heat wave were subtle, our results indicate the importance of delayed effects in shaping the total fitness impact of a heat wave when followed by pesticide exposure. Firstly, the combination of delayed negative effects of the heat wave and starvation, and the immediate negative effect of chlorpyrifos considerably (71%) reduced larval growth rate. Secondly and more strikingly, chlorpyrifos only caused considerable (ca. 48%) mortality in larvae that were previously exposed to the combination of the heat wave and starvation. This strong delayed synergism for mortality could be explained by the cumulative metabolic depression caused by each of these stressors. Further studies with increased realism are needed to evaluate the consequences of the here-identified delayed synergisms at the level of populations and communities. This is especially important as this synergism provides a novel explanation for the poorly understood potential of heat waves and of sublethal pesticide concentrations to cause mass mortality.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of Leuven, KU Leuven, Nha Trang University
Authors: Dinh, K. V. (Intern), Janssens, L. (Ekstern), Stoks, R. (Ekstern)
Pages: 3361-3372
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Global Change Biology
Volume: 22
Issue number: 10
ISSN (Print): 1354-1013
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Extreme temperature and oil contamination shape the relative abundance of copepod species in the Arctic

The retreat of sea ice in the Arctic under global warming is predicted to intensify oil exploitation and shipping activities in this region, posing the risk of oil contamination. Knowledge on how Arctic secondary producers deal with the combined...
effects of global warming, particularly the extreme temperature and oil exposure is limited. To address this, we exposed females of two copepods species Calanus glacialis and C. finmarchicus to pyrene at three temperatures: 2, 6 and 10°C. Both species co-exist in the Disko Bay, Greenland, but only C. glacialis is a true Arctic specialist while C. finmarchicus is of north Atlantic origin. Pyrene is one of the most toxic components of crude oil to marine copepods. The temperatures of 2, 6 and 10°C represent the mean sea water temperature, the 4°C increase in mean temperature by 2100 as predicted by IPCC scenario RCP8.5 (2013) and the extreme sea water temperature, respectively, in Disko Bay. Four-degree temperature increase did not have an effect on grazing rate and survival of both species. However, the extreme temperature (10°C) increased the grazing rate and mortality of C. glacialis, but not in C. finmarchicus. Exposure to high pyrene strongly reduced survival and grazing rate in both species and this pattern was independent of temperatures. Notably, exposure to high pyrene resulted in than 70% of mortality in C. finmarchicus that was two times higher than the mortality observed for C. glacialis. These results suggest that extreme temperature under global warming and oil pollution may drastically change the relative abundance of pelagic copepod community by changing the species-specific vulnerability to extreme temperature and oil exposure.
Fangstjournalen – et bæredygtigt tiltag

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2016

Publication information
Source/Publisher: FishingZealand
Main Research Area: Technical/natural sciences
Links:
http://fishingzealand.dk/blog/
Publication: Communication › Internet publication – Annual report year: 2016

Fangstjournalen runder 2000 brugere

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/Nyheder/2016/05/Fangstjournalen-runder-2000-brugere?id=c6646ad1-8384-45aa-b7ba-c88b5c1eb0d8&utm_source=newsletter&utm_media=mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2016

Fangstjournalen - ude med snøren efter citizen science

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern), Christoffersen, M. (Intern)
Publication date: 2016
Event: Poster session presented at Naturmødet, Hirtshals, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Fangstjournalen - ude med snøren efter citizen science

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern), Christoffersen, M. (Intern)
Publication date: 2016
Event: Poster session presented at Folkekødet 2016, Allinge, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Få ny viden om ørredbestandene i danske vandløb

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern), Nielsen, J. (Intern)
Fathers modify thermal reaction norms for hatching success in Atlantic cod, Gadus morhua

Climate-driven warming is altering marine ecosystems at an unprecedented rate and evolutionary adaptation may represent the last resort for many ectothermic organisms to avoid local extinction. The first step to elucidate the potential for adaptation to unfavorable thermal conditions is to assess the degree of genotype-based variation in thermal reaction norms of vital fitness traits. Marine broadcast spawning fishes experience extremely high rates of mortality during early life stages. Paternally derived (genetic) variation underlying offspring fitness in adverse environmental conditions may therefore hold important implications for resilience. This study examined how males differ in their ability to sire viable offspring and whether the paternal contribution modified thermal reaction norms for hatching success in two replicated trials with cod Gadus morhua from the Northwest Atlantic (trial 1) and Baltic Sea (trial 2). Each trial included five temperature treatments (2.0, 4.0, 6.0, 8.0, 10.0 °C in trial 1, and 6.5, 8.0, 9.5, 11.0, 12.5 °C in trial 2) encompassing optimum conditions as well as the amount of warming projected in various future pathways for the year 2100. In both trials, mean hatching success significantly decreased towards thermal extremes. However, half-sibling families varied in their response to different incubation temperatures as indicated by significant paternity × temperature interactions and crossing of reaction norms. The influence of paternity itself was highly significant and explained 56% and 44% of the observed variation in hatching success in trials 1 and 2, respectively. Early embryogenesis represented the most crucial developmental period in terms of thermal tolerance and paternally mediated variation in hatching success. High variation in daily embryo survival among half-sibling families and temperature treatments was observed during blastula and gastrulation stages (until 100% epiboly), while almost no mortality occurred during subsequent development and throughout the hatching period. The observed magnitude of genetic variation underlying thermal reaction norms for embryo viability represents a relevant resource for adaptive responses (favorable selection) of cod populations exposed to environmental variability and/or directional changes, such as ongoing ocean warming.
Fecundity regulation by atresia in turbot Scophthalmus maximus in the Baltic Sea

Down-regulation of fecundity through oocyte resorption was assessed in Baltic Sea turbot Scophthalmus maximus at three locations in the period from late vitellogenesis in April to spawning during June to July. The mean±s.d. total length of the sampled fish was 32.7±3.1 cm and mean±s.d. age was 6.2±1.5 years. Measurements of atresia were performed using the ‘profile method’ with the intensity of atresia adjusted according to the ‘dissectormethod’ (10-6% adjustment; coefficient of determination was 0.675 between methods). Both prevalence (portion of fish with atresia) and intensity (calculated as the average proportion of atretic cells in fish displaying atresia) of atresia were low in prespawning fish, but high from onset of spawning throughout the spawning period. Atretic oocytes categorized as in early alpha and in late alpha state occurred irrespective of maturity stage from late prespawning individuals up to late spawning fish, showing that oocytes may become atretic throughout the spawning period. Observed prevalence of atresia throughout the spawning period was almost 40% with an intensity of c. 20%. This indicates extensive down-regulation, i.e. considerably lower realized (number of eggs spawned) v. potential fecundity (number of developing oocytes), suggesting significant variability in reproductive potential. The extent of fecundity regulation in relation to fish condition (Fulton’s condition factor) is discussed, suggesting an association between levels of atresia and fish condition.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Uppsala University, Institute of Marine Research
Authors: Nissling, A. (Ekstern), Thorsen, A. (Ekstern), da Silva, F. (Intern)
Pages: 1301-1320
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 88
Issue number: 4
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Field clearance of an intertidal bivalve bed: relative significance of the co-occurring blue mussel Mytilus edulis and Pacific oyster Crassostrea gigas

At an approximately 12 000 m² sheltered intertidal bivalve bed in the western part of the Limfjord, Denmark, the Pacific oyster Crassostrea gigas co-occurs with the blue mussel Mytilus edulis. The relative significance of the impact of the 2 species on phytoplankton density during a tidal cycle was estimated by combining field measurements of clearance rates and modelling of the bivalve bed (topography, biomass distribution, temporal and spatial water coverage and depth). The average density of C. gigas and M. edulis was 35 ± 36 and 1001 ± 685 ind. m⁻², respectively. Therefore, M. edulis contributed 4 times as much as C. gigas to the bivalve bed’s clearance, and the 2 bivalves were estimated to clear the water volume 1.9 times during each tidal cycle. However, the estimated water column cleared during low tide is overestimated due to phytoplankton depletion. Hence, it is concluded that the bivalve bed clears the water close to 1 time each tidal cycle. This, together with a low dry weight of soft parts, indicates that the bivalve bed, in general, is food-limited.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, University of Copenhagen, Roskilde University, Orbicon, Greenland Institute of Natural Resources
Authors: Vismann, B. (Ekstern), Holm, M. W. (Intern), Davids, J. (Ekstern), Dolmer, P. (Intern), Pedersen, M. F. (Ekstern), Blanda, E. (Ekstern), Christensen, H. T. (Intern), Nielsen, P. (Intern), Hansen, B. W. (Ekstern)
Pages: 107-119
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquatic Biology
Volume: 25
ISSN (Print): 1864-7782
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.847 SNIP 0.895 CiteScore 1.82
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.767 SNIP 0.713 CiteScore 1.41
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.681 SNIP 0.678 CiteScore 1.44
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.641 SNIP 0.618 CiteScore 1.34
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.814 SNIP 0.813 CiteScore 1.7
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.844 SNIP 0.848 CiteScore 1.79
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.899 SNIP 0.666
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.631 SNIP 0.483
BFI (2008): BFI-level 1
Film "Ørredynglen som miljøvagt"

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Publication: Communication › Internet publication – Annual report year: 2016

Final Report on Aquaculture (Part C)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Lembo, G. (Ekstern), Sossidou, E. (Ekstern), Estevez, A. (Ekstern), Mente, E. (Ekstern), Jokumsen, A. (Intern), Sorgeloos, P. (Ekstern)
Number of pages: 13
Publication date: 2016

Publication information
Publisher: European Commission
Main Research Area: Technical/natural sciences
Publication: Research › Report – Annual report year: 2016

Final report on development and usage of electronic monitoring systems as a measure to monitor compliance with the landing obligation – 2015

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Ministry of Food, Agriculture and Fisheries
Authors: Bergsson, H. (Ekstern), Schreiber Plet-Hansen, K. (Intern)
Number of pages: 43
Publication date: 2016

Publication information
Publisher: Ministry of Food, Agriculture and Fisheries
Main Research Area: Technical/natural sciences
DOI:
10.13140/RG.2.2.13561.67683
Publication: Research › Report – Annual report year: 2018
First evidence of European eels exiting the Mediterranean Sea during their spawning migration

The migration route and the spawning site of the European eel Anguilla anguilla are still uncertain. It has been suggested that the Mediterranean eel stock does not contribute to spawning because there is no evidence of eels leaving the Mediterranean Sea. To test this hypothesis, we equipped eight female silver eels from the south of France with pop-up satellite tags during escapement from coastal waters. Once in deeper water, the eels quickly established diel vertical migration (DVM) between the upper and lower mesopelagic zone. Five tagged eels were taken by predators within the Mediterranean, but two eels reached the Atlantic Ocean after six months and at distances greater than 2000 km from release. These eels ceased their DVM while they negotiated the Gibraltar Strait, and remained in deep Water until they reached the Atlantic Ocean, when they recommenced DVM. Our results are the first to show that eels from Mediterranean can cross the Strait of Gibraltar and continue their migration into the Atlantic Ocean. This finding suggests that Mediterranean countries, as for other EU states, have an important role to play in contributing to conservation efforts for the recovery of the European eel stock.
First feeding behavior: A potential tool to select robust trout for organic aquaculture

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Gesto, M. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: ICROFS news
Original language: English

Bibliographical note
Communication to ICROFS bulletin (icrofs.dk)
Source: PublicationPreSubmission
Source-ID: 128002431
Publication: Research › Journal article – Annual report year: 2016

First-feeding by European eel larvae: A step towards closing the life cycle in captivity
First evidence of first-feeding European eel larvae that have been reared in captivity
• Up to 50% of larvae ingested a diet composed of concentrated rotifer paste, with or without natural feeding stimulants
• Documentation of a significant increase in feeding success under higher light intensities
• Results move us a step closer towards understanding an undisclosed phase in the European eel life cycle

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Butts, I. (Intern), Sørensen, S. R. (Intern), Politis, S. N. (Intern), Tomkiewicz, J. (Intern)
Pages: 451-458
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 464
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
First production of larvae using cryopreserved sperm: Effects of preservation temperature and cryopreservation on European eel sperm fertilization capacity

Sperm cryopreservation is a useful tool in captive fish reproduction management, that is to synchronize gamete production, especially in the case of species as the European eel, where the time of female spawning readiness is unpredictable. Several protocols to cryopreserve sperm of this species have been described, but until recently fertilization trials were not feasible. This study evaluated the effect of cold storage of diluted sperm prior to fertilizations and tested whether a previously defined protocol for European eel sperm cryopreservation can be successfully applied in fertilization trials to produce viable offspring. In our experiment, the sperm motility was evaluated after the extraction and the best samples were selected and pooled. Until stripping of eggs and fertilization, diluted sperm samples were maintained at either 4 or 20°C, or cryopreserved, following existing protocols. Fertilization of two egg batches was attempted. Diluted sperm caused a similar percentage of fertilized eggs and a similar number of embryos and larvae, independently of storage temperature (4 or 20°C). The cryopreserved sperm resulted in a lower percentage of fertilized eggs, but embryos developed and a few larvae ('cryolarvae') were obtained 55 h after fertilization in one of the two egg batches. This result evidences that the tested cryopreservation protocol is applicable for eel reproduction management, although improvements will be required to enhance fertilization success.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Universidad Politécnica de Valencia, Billund Aquakulturservice A/S
Authors: Asturiano, J. (Ekstern), Sørensen, S. R. (Intern), Perez, L. (Ekstern), Lauesen, P. (Ekstern), Tomkiewicz, J. (Intern)
First-year survival of North East Atlantic mackerel (Scomber scombrus) from 1998 to 2012 appears to be driven by availability of Calanus, a preferred copepod prey

Mackerel (Scomber scombrus) is one of the ecologically and economically most important fish species in the Atlantic. Its recruitment has, for unknown reasons, been exceptional from 1998 to 2012. The majority (75%) of the survivors in the first winter were found north of an oceanographic division at approximately 52°N, despite the fact that mackerel spawns over a wide range of latitudes. Multivariate time series modelling of survivor abundance in the north revealed a significant
correlation with the abundance of copepodites (stage I–IV) of Calanus sp. in the spawning season (April to June). The copepodites were a mix of C. helgolandicus (dominating) and C. finmarchicus. The growth of mackerel larvae is known to be positively related to the availability of nauplii and copepodites of preferred prey species, namely, large calanoid copepod species such as Calanus. The statistical relationship between mackerel survivors and abundance of Calanus, therefore, most likely, reflected a causal relationship: high availability of Calanus probably reduced starvation, stage-specific predation and cannibalism (owing to prey switching). The effects of other abundant, but less preferred zooplankton taxa, (Acartia sp., Branchiopoda spp. and Echinodermata spp. larvae), as well as stock size, temperature and wind-induced turbulence were not found to be significant. However, stock size was retained in the final model because of a significant interaction with Calanus in oceanic areas west of the North European continental shelf. This was suggested to be a consequence of a density driven expansion of the spawning area that increased the overlap between early life stages of mackerel and food (Calanus) in new areas.

**General information**
State: Published
Organisations: Section for Marine Living Resources, National Institute of Aquatic Resources, Greenland Institute of Natural Resources
Authors: Jansen, T. (Intern)
Pages: 457-469
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Fisheries Oceanography
Volume: 25
Issue number: 4
ISSN (Print): 1054-6006
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.19
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.4
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.61
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.61
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.21
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.42
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Fishing impact and environmental status in European seas: A diagnosis from stock assessments and ecosystem indicators

Stock-based and ecosystem-based indicators are used to provide a new diagnosis of the fishing impact and environmental status of European seas. In the seven European marine ecosystems covering the Baltic and the North-east Atlantic, (i) trends in landings since 1950 were examined; (ii) syntheses of the status and trends in fish stocks were consolidated at the ecosystem level; and (iii) trends in ecosystem indicators based on landings and surveys were analysed. We show that yields began to decrease everywhere (except in the Baltic) from the mid-1970s, as a result of the over-exploitation of some major stocks. Fishermen adapted by increasing fishing effort and exploiting a wider part of the ecosystems. This was insufficient to compensate for the decrease in abundance of many stocks, and total landings have halved over the last 30 years. The highest fishing impact took place in the late 1990s, with a clear decrease in stock-based and ecosystem indicators. In particular, trophic-based indicators exhibited a continuous decreasing trend in almost all ecosystems. Over the past decade, a decrease in fishing pressure has been observed, the mean fishing mortality rate of assessed stocks being almost halved in all the considered ecosystems, but no clear recovery in the biomass and ecosystem indicators is yet apparent. In addition, the mean recruitment index was shown to decrease by around 50% in all ecosystems (except the Baltic). We conclude that building this kind of diagnosis is a key step on the path to implementing an ecosystem approach to fisheries management. © 2014 John Wiley & Sons Ltd.
Fish stock assessment under data limitations developing a new method based on a size-structured theoretical ecology framework

Fish stock assessment is an integral part of every fisheries management system. Modern assessment methods require data about the fishery and the stock, such as catches, survey estimates, aging information and life history parameters, all of which is difficult and expensive to gather. However, the majority of global fish catches comes from species that lack an official assessment due to lack of data. That is true especially for small scale fisheries and fisheries in developing countries. New methods are in need that require little amount of easily attainable data and provide scientific advice for fish stocks that are not assessed. The goal of the thesis is to develop a new data-limited stock assessment method that is: rooted in theoretical ecology, requires only information about the size composition of the catch or surveys (i.e. aging is not required), and does not require time-series. The method provides estimates of fishing mortality and the FMSY reference point, it is tested and validated, and is implemented as software package making it easy to use by stakeholders of different levels. The basis of the method is a size-based theoretical ecology framework that describes exploited fish stocks. The model parameters correspond to Beverton-Holt life history invariants, which reduces the number of parameters and allows data-limited assessments to borrow information from data-rich stocks. The mathematical formulation of the single species population dynamics is used in a maximum-likelihood optimisation framework to estimate model parameters. The data-limited method estimates at the same time the fishing mortality rate and the biological reference point FMSY.

Minimum data requirements consist of a single size frequency distribution from the commercial catch or a scientific survey. If the total catch is known, important quantities about the stock (e.g. biomass of spawners, recruitment) can be quantified.
The method is tested using simulated data and validated using a subset of available data from data-rich fish stocks. The implementation of the method as a software package in the R programming language is publicly available.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Centre for Ocean Life, Department of Applied Mathematics and Computer Science
Authors: Kokkalis, A. (Intern), Andersen, K. H. (Intern), Thygesen, U. H. (Intern), Nielsen, A. (Intern)
Number of pages: 140
Publication date: 2016

**Publication information**
Publisher: Technical University of Denmark, National Institute of Aquatic Resources
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research › Ph.D. thesis – Annual report year: 2016

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**Fisker du i Isefjorden og vil du hjælpe forskningen?**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Geertz-Hansen, P. (Intern)
Publication date: 2016

**Publication information**
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/Nyheder/2016/02/Isefjorden-oerred-udsætning?id=c118741d-4fdb-4964-8bd0-88b15a8de62d&utm_source=newsletter&utm_media=mail&utm_campaign=2016_02_17_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2016

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**Fiskere kan være med til at aldersbestemme torsk**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Danish Fishermen’s Producers’ Organization
Authors: Hüssy, K. (Intern), Lund, H. S. (Ekstern)
Pages: 19
Publication date: 2016

**Publication information**
Pages (from-to): 19
Newspaper: Fiskeritidende
Volume: 23
No.: 8
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Main Research Area: Technical/natural sciences
Publication: Communication › Newspaper article – Annual report year: 2016

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**Fiskere og forskere styrker dialogen**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern), Vejrup, K. (Ekstern)
Pages: 9
Fiskeribiologisk vurdering af effekterne på ørredbestandene og havørredfiskeriet ved en forventet vandløbsindsats og etablering af vådområder

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Nielsen, J. (Intern), Koed, A. (Intern)
Number of pages: 49
Publication date: 2016

Fiskeri efter søstjerner i Limfjorden. Fagligt grundlag for en forvaltningsplan

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Section for Ecosystem based Marine Management, Section for Monitoring and Data
Authors: Petersen, J. K. (Intern), Gislason, H. (Intern), Fitridge, I. (Intern), Saurel, C. (Intern), Degel, H. (Intern), Nielsen, C. F. (Intern)
Number of pages: 35
Publication date: 2016

Fiskeri fra Thorupstrand. Forvaltning af kvoter samt redskaber, både og fiskepladser: The Fishery from Thorupstrand. Management, gear, boats and fishing grounds
Fluid dynamic constraints on resource acquisition in small pelagic organisms

Physicists have long examined the fluid dynamics of swimming at low Reynolds number, but the main scope has rarely been to understand the behavior and ecology of microorganisms. However, many ecological questions about the functioning of small aquatic organisms can only be addressed by the application of formal fluid physics. Here, I examine resource acquisition mechanisms in small aquatic organisms, ranging from uptake of dissolved molecules to feeding on suspended particulate prey, and examine how organism behaviors and morphologies may be shaped by the often non-intuitive small-scale fluid physics.
Scopus rating (2016): CiteScore 1.94 SJR 0.601 SNIP 0.96
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.627 SNIP 0.981 CiteScore 1.68
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.654 SNIP 0.808 CiteScore 1.44
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.939 SNIP 0.946 CiteScore 1.84
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.912 SNIP 0.745 CiteScore 1.44
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.748 SNIP 0.715 CiteScore 1.17
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.643 SNIP 0.539
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.422 SNIP 0.414
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.36 SNIP 0.424
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.235 SNIP 0.218
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.268 SNIP 0.375
Scopus rating (2005): SJR 0.24 SNIP 0.242
Scopus rating (2004): SJR 0.15 SNIP 0.15
Scopus rating (2003): SJR 0.137 SNIP 0.147
Scopus rating (2002): SJR 0.152 SNIP 0.118
Scopus rating (2001): SJR 0.156 SNIP 0.155
Scopus rating (2000): SJR 0.209 SNIP 0.223
Scopus rating (1999): SJR 0.245 SNIP 0.227
Original language: English
Physics, Condensed Matter Physics, Materials Science, general, Atomic, Molecular, Optical and Plasma Physics,
Physics, general, Measurement Science and Instrumentation, Classical Continuum Physics, SC12
DOIs:
10.1140/epjst/e2015-50261-1
Source: FindIt
Source-ID: 2306496839
Publication: Research - peer-review › Journal article – Annual report year: 2016

**Food security: Protect aquaculture from ship pathogens**

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, DHI,
Singapore., University of Tartu
Authors: Drillet, G. (Ekstern), Wisz, M. (Intern), Le Berre Lemaire-Lyons, Y. Y. (Ekstern), Baumler, R. (Ekstern), Ojaveer,
H. (Ekstern), Bondad-Reantaso, M. B. (Ekstern), Xu, J. (Ekstern), Alday-Sanz, V. (Ekstern), Saunders, J. (Ekstern),
McOwen, C. G. (Ekstern), Eikaas, H. (Ekstern)
Number of pages: 1
Pages: 31
Foraging mode and prey size spectra of suspension-feeding copepods and other zooplankton
Prey size spectra of suspension-feeding zooplankton may be predicted from foraging mode and a mechanistic understanding of prey perception and capture. I examine this for suspension-feeding copepods where 2 foraging modes can be distinguished: ambush feeding and active (i.e. cruising and feeding-current) feeding. Prey perception mechanisms differ between the 2 foraging modes. I use simple arguments to predict that the ambush strategy targets larger prey and has a narrower prey size spectrum than the cruising and feeding-current feeding strategies. I compile data from the literature that confirm the prediction. I also make qualitative predictions of food size spectra in zooplankton with other prey perception mechanisms that accord with observations.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Kiørboe, T. (Intern)
Pages: 15-20
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology Progress Series
Volume: 558
ISSN (Print): 1616-1599
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Web of Science (2010): Indexed yes
Web of Science (2009): Indexed yes
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2001): Indexed yes
Web of Science (2000): Indexed yes
Original language: English
ECOLOGY, MARINE, OCEANOGRAPHY, PLANKTON, SELECTIVITY, PERCEPTION, MECHANISMS, MORPHOLOGY, PATTERNS, CAPTURE, SIGNALS, GROWTH, RATES, Prey perception mechanism, Prey capture mechanism, Pelagic tunicates, Heterotrophic flagellates, Dinoflagellates, Cladocerans
DOIs:
10.3354/meps11877
Source: FindIt
Forår betyder flere sortmundede kutlinger ved kysterne

Forecasting the spawning distribution of blue whiting (Micromesistius poutassou)

Foreningspuljen for vandløbsrestaurering - genskabe egnede gydeområder

Formonsella pyramidosa (Haptophyta, Papposphaeraceae): A new weakly calcified coccolithophore genus from warm-water regions
From traits to life history strategies: deconstructing fish community composition across European Seas
Functional biology of sympatric krill species

Here we compare the functional biology of the sympatric krill species, Meganyctiphanes norvegica and Thysanoessa inermis. For M. norvegica, we investigated functional responses on diatoms and copepods, together with prey size spectra on plankton $\Phi 400$ mm and copepods in the size range $500-3220$ mm. For T. inermis, only prey size spectrum on plankton $\Phi 400$ mm were investigated. The prey size ranges of both species include organisms $\Phi 400$ mm, and they consequently graze on several trophic levels. However, T. inermis feed on cells $\Phi 10$ mm equivalent spherical diameter (ESD), whereas M. norvegica only feed on cells $\Phi 10$ mm. Meganyctiphanes norvegica show maximum predation on $800-1600$ mm sized copepods, corresponding to a predator:prey size ratio of $1.70 \pm 2.2$. Functional response experiments with M. norvegica follow a Holling type III functional response, both when feeding on diatoms and copepods, but with an order of magnitude higher ingestion rate on the copepod prey. The two functional groups, M. norvegica and Thysanoessa spp., overlap in prey size spectra. However, there are differences in their ability to exploit different prey classes. Here, we present clearance rates of both krill species on natural plankton illustrating the two species’ wide particle range spectra.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Greenland Climate Research Centre
Authors: Agersted, M. D. (Intern), Nielsen, T. G. (Intern)
Pages: 575-588
Publication date: 2016
Main Research Area: Technical/natural sciences
Functional characterisation of eel dopamine D2 receptors and involvement in the direct inhibition of pituitary gonadotrophins

In various vertebrate species, dopamine (DA) exerts an inhibitory action on reproduction. In the European eel, DA plays a pivotal role in the inhibitory control of gonadotroph function and the blockade of puberty. In vivo studies have suggested that this effect is mediated by receptors pharmacologically related to the D2 family. In the European eel, two distinct D2 receptor (D2-R) paralogous genes have been identified (D2A-R and D2B-R) and both were shown to be expressed in the pituitary. We investigated the potential role of each paralogue in the control of gonadotroph function in this species. Eel recombinant D2A-R or D2B-R were expressed in HEK 293 cells, with a universal Gα subunit, and receptor activation was followed by inositol phosphate production. Recombinant D2-Rs exhibited a comparable affinity for DA, although they had differential affinities for mammalian D2-R agonists and antagonists, supporting subtle structure/activity differences.

Furthermore, using eel pituitary cell primary cultures, the expression by gonadotroph cells of both native eel D2-R paralogues was examined by in situ hybridisation of D2A-R or D2B-R transcripts, coupled with immunofluorescence of luteinising hormone (LH)β or follicle-stimulating (FSH)β. LH and to a lesser extent, FSH cells expressed both D2-β transcripts but with a clear predominance of D2B-R. Notably, D2B-R transcripts were detected for the majority of LH cells. Accordingly, using these cultures, we showed that DA potently inhibited basal and testosterone-stimulated LHβ expression and less potently basal and activin-stimulated FSHβ expression. We also tested some D2-R antagonists, aiming to select the most adequate one to be used in innovative protocols for induction of eel sexual maturation. We identified eticlopride as the most potent inhibitor of DA action on basal and stimulated LH expression in vitro. Our data suggest a differential functionalisation of the duplicated receptor genes and demonstrate that mainly D2B-R is involved in the dopaminergic inhibitory control of eel gonadotroph function.

General information
Functional morphology, biology and sexual strategy of the circumboreal, adventitious crypt-building, Crenella decussata (Bivalvia: Mytiloidea: Crenellidae)

The anatomy of Crenella decussata (Mytiloidea) is described. Individuals of this circumboreal species occupy granular crypts composed of sand grains held in place by mucus. The swollen basal region of the tubule is occupied by an individual, which connects to the sediment surface by two posterior tubes accommodating the inhalant and exhalant streams. There is reduction in musculature and, most importantly, anterior foreshortening of the outer ctenidial demibranchs and loss of the labial palps. This creates an anterior space in the mantle for the initial brooding of fertilized ova by females to the prodissoconch stage. Subsequently, these larvae are transferred to the exhalant tube of the crypt wherein they attach by a single fine byssal thread and are further brooded until the crawl-away juvenile stage is attained. Experimental studies of larval behaviour suggest that parental pheromones sustain the female/offspring bond. Newly hatched individuals responded to parental exhalant water by actively attaching themselves using a byssal thread. This response persisted for 28 days, but not after 55 days when, we suggest, the pheromonal response ceases and offspring are developed sufficiently to take up life in their own nests. Offspring retrieved from parental crypts and fed continuously reached an average shell length of 500 mm after 7.5 months. Brooded offspring thus appear to rely on embryonal energy resources until post-metamorphosis, after which suspension feeding becomes essential for further growth and development before the parental crypt is vacated.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Hong Kong, University of Copenhagen
Authors: Morton, B. (Ekstern), Dinesen, G. E. (Intern), Ockelmann, K. W. (Ekstern)
Number of pages: 20
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of the Marine Biological Association of the United Kingdom
Volume: 96
Issue number: 8
Article number: 1597-1616
ISSN (Print): 0025-3154
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.382 SNIP 0.546 CiteScore 0.8
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.532 SNIP 0.683 CiteScore 0.96
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.484 SNIP 0.742 CiteScore 0.91
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.607 SNIP 0.859 CiteScore 1.1
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.531 SNIP 0.761 CiteScore 1.08
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.531 SNIP 0.747 CiteScore 0.95
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.595 SNIP 0.708
Temperature increase associated with global climate change can be expected to directly influence the spawning success of fish species, with implications for abundance and distribution. We conducted a meta-analysis to investigate and compare responses of development time, cumulative degree-days and survival of fish eggs from 32 populations of 17 species in the North Atlantic to different temperatures in order to determine potential consequences of global warming for these species. The response of development time exhibited a similar decreasing trend with respect to temperature across species. The similar slopes of regression lines relating ln-transformed development time and temperature indicate similar sensitivity to temperature changes. Across-species differences were mainly driven by intercept values, indicating up to 8-fold differences in development time at given temperature. There was an overall decrease, across species, in an index of thermal requirement (cumulative degree-days) for egg development with increasing temperature. Within an empirically derived optimal thermal range for egg survival, the thermal requirement was more variable in species adapted to cold waters compared to species adapted to warmer waters. Moreover, the sensitivity of survival of eggs from different species to increases in temperature differed, reflecting a pattern of sensitivity along a stenotherm-eurytherm gradient of vulnerability to temperature among species. The results quantify physiological effects of temperature on the eggs, and we propose that such effects are major factors leading to a close correspondence between the physiological optimal temperature for survival and observed temperature at spawning sites. Temperature during egg development appears to be a key evolutionary force affecting spawning time and location.
Genetic structure of West Greenland populations of lumpfish Cyclopterus lumpus

In this study, 11 microsatellite markers were used to determine the structure of West Greenlandic lumpfish Cyclopterus lumpus populations across six spawning locations spanning >1500 km and compared with neighbouring populations in Canada and Iceland. To evaluate whether data allow for identification of origin of C. lumpus in Greenlandic waters, genetic assignment analysis was performed for 86 C. lumpus sampled on a feeding migration. Significant structuring with isolation by distance was observed in the West Greenland samples and two major subpopulations, north and south, were suggested. Based on FST values, closer relationships were observed between Greenland and Canada, than Greenland and Iceland. Surprisingly, the North Greenland population showed more similarities with Canadian samples, than did the
geographically closer south-west Greenland population. Origin could be assigned for a high proportion of non-spawning fish and demonstrated a marked east-west spatial separation of fish of Greenlandic and Icelandic genotypes.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Greenland Institute of Natural Resources, Greenland Institute of Natural Resources
Authors: Mayoral, E. G. (Intern), Olsen, M. (Ekstern), Hedeholm, R. (Ekstern), Post, S. L. (Intern), Eg Nielsen, E. (Intern), Bekkevold, D. (Intern)
Pages: 2625-2642
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Journal of Fish Biology
Volume: 89
Issue number: 6
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Glacial meltwater influences on plankton community structure and the importance of top-down control (of primary production) in a NE Greenland fjord

Freshwater runoff from the Greenland Ice Sheet (GIS) can be an important driver influencing plankton community structure in Greenland fjords. In the present study, we describe physical, taxonomic and functional differences in the plankton community in Young Sound, a NE Greenland fjord, from the inner fjord close to the GIS towards the coastal region in late summer. The fjord is influenced by runoff from land-terminating glaciers that separated the surface layer from cold underlying waters. The highest chlorophyll a concentration (74.9% of the total copepod biomass at all stations, and their grazing impact was the highest among the copepod groups. Copepod grazing impact on the phytoplankton standing stock, however, was exceeded by microzooplankton grazing, investigated by dilution experiments, with the highest grazing impact on the phytoplankton standing stock of 63% d−1 in the inner part of the fjord. In spite of high phytoplankton instantaneous growth rates at the innermost fjord station, proto-zooplankton was capable of controlling the phytoplankton production. The study showed functional differences within the system and provides indications of how dynamic the coastal ecosystem of Greenland can be.
Global patterns in the feeding ecology of large marine fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Authors: van Denderen, P. D. (Intern), Lindegren, M. (Intern), MacKenzie, B. (Intern), Watson, R. A. (Ekstern), Andersen, K. H. (Intern)
Publication date: 2016
Event: Poster session presented at Gordon research conference and seminar: “Unifying ecology across scales”, Biddeford, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Grains of sand, a sunken treasure?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Sørensen, T. K. (Intern), Støttrup, J. G. (Intern), Dinesen, G. E. (Intern)
Pages: 8
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Journal article – Annual report year: 2016

Gross morphology and cnidocysts of the Edwardsiella anemone and larva (Anthozoa, Edwardsiidae) from the Swedish West Coast – The larva is parasitic in the invasive Mnemiopsis leidyi (Ctenophora)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Östman, C. (Ekstern), Møller, L. F. (Intern)
Publication date: 2016
Event: Abstract from International Jellyfish Blooms Symposium, Barcelona, Spain.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Growth performance, feed utilization and sensory characteristics of Nile Tilapia, Oreochromis niloticus fed diets with high inclusion levels of copra meal

Background: The low cost and wide-availability of copra meal in many tropical countries where aquaculture is practiced have generated much interest in its potential inclusion in fish diet formulations. The present study was designed to investigate the effect of very high inclusions of autoclaved copra meal on the growth and feed utilization parameters as well as the sensory qualities of the Nile tilapia, Oreochromis niloticus. Methods: Fish were fed three experimental diets, a control (CTRL) diet which had fishmeal as the main protein source at an inclusion of 365 g kg⁻¹ and two test diets which contained copra meal at 680 g kg⁻¹ inclusions for a 6-week period. One of the copra meal diets contained sesame meal supplementation (CM+S) as a natural high source of methionine which is the first limiting essential amino acid in copra meal. Results: The dietary treatments had no differential effects on growth, feed intake, or feed utilization parameters in O. niloticus. With the exception of the significantly higher lipid content of the CM+S group, the whole body compositions of the different fish groups were not significantly affected by the different dietary treatments. Remarkably, the high dietary inclusions of copra meal did not have any significant effects on fillet sensory attributes. Conclusions: The results of this
study demonstrate that it is possible to include autoclaved copra meal up to 680 g kg⁻¹ in Nile tilapia diets without any deleterious effects on fish growth or on flesh sensory characteristics.

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Aquaculture, Kwame Nkrumah University of Science and Technology  
**Authors:** Obirikorang, K. A. (Ekstern), Amisah, S. (Ekstern), Skov, P. V. (Intern)  
**Number of pages:** 7  
**Publication date:** 2016  
**Main Research Area:** Technical/natural sciences

**Publication information**

**Journal:** Journal of Animal Research and Nutrition  
**Volume:** 1  
**Issue number:** 4  
**Article number:** 18  
**Original language:** English  
**Electronic versions:**  
**Publishers version**  
**Links:**  
**Publication:** Research - peer-review › Journal article – Annual report year: 2016

**Habitat suitability of the Atlantic bluefin tuna by size class: An ecological niche approach**

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, European Commission - Joint Research Center, IFREMER, Fisheries and Oceans Canada, AZTI-Tecnalia, Institute of Oceanography and Fisheries, World Wide Fund for Nature (WWF), Instituto Nacional de Pesca, Institute of Marine Biological Resources and Inland Waters, Instituto Español de Oceanografía, Università degli Studi di Bari Aldo Moro, Istanbul University, University of Athens, Ege University, National Oceanographic and Atmospheric Administration, Universidade dos Açores, Università degli studi di Cagliari  
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**Scopus rating (2016):** CiteScore 3.4 SJR 1.922 SNIP 1.278  
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**Scopus rating (2015):** SJR 1.703 SNIP 1.348 CiteScore 3.34  
**Web of Science (2015):** Indexed yes  
**BFI (2014):** BFI-level 2  
**Scopus rating (2014):** SJR 1.999 SNIP 1.461 CiteScore 3.65  
**Web of Science (2014):** Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.397 SNIP 1.595 CiteScore 3.87
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.741 SNIP 1.794 CiteScore 4.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.279 SNIP 1.341 CiteScore 3.41
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.643 SNIP 1.586
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.669 SNIP 1.829
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.065 SNIP 1.422
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.859 SNIP 1.503
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.551 SNIP 1.175
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.619 SNIP 1.839
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.526 SNIP 1.571
Scopus rating (2003): SJR 2.523 SNIP 1.658
Scopus rating (2002): SJR 2.168 SNIP 1.807
Scopus rating (2001): SJR 2.389 SNIP 1.732
Scopus rating (2000): SJR 1.924 SNIP 1.245
Scopus rating (1999): SJR 2.094 SNIP 1.268
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Publication: Research - peer-review › Journal article – Annual report year: 2016

Har du fanget noget?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2016

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Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.aqua.dtu.dk/Nyheder/2016/04/Hardufangetnoget?id=a209626e-ab51-4c81-bf6c-b7e489b249c3&utm_source=newsletter&utm_media=mail&utm_campaign=
Has eutrophication promoted forage fish production in the Baltic Sea?
Reducing anthropogenic nutrient inputs is a major policy goal for restoring good environmental status of coastal marine ecosystems. However, it is unclear to what extent reducing nutrients would also lower fish production and fisheries yields. Empirical examples of changes in nutrient loads and concurrent fish production can provide useful insights to this question. In this paper, we investigate to what extent a multi-fold increase in nutrient loads from the 1950s to 1980s enhanced forage fish production in the Baltic Sea. We use monitoring data on fish stock dynamics covering the period of the nutrient increase, combined with nutrient concentrations from a 3-dimensional coupled physical-biogeochemical ocean model. The results suggest that nutrient enrichment enhanced the biomass level of forage fish by up to 50 % in some years and areas due to increased body weight of fish. However, the trends in fish biomasses were generally decoupled from changes in nutrient concentrations.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Swedish Meteorological and Hydrological Institute
Authors: Eero, M. (Intern), Andersson, H. C. (Ekstern), Almroth-Rosell, E. (Ekstern), MacKenzie, B. (Intern)
Pages: 649-660
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Main Research Area: Technical/natural sciences

Publication information
Journal: Ambio
Volume: 45
Issue number: 6
ISSN (Print): 0044-7447
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.19 SJR 1.221 SNIP 1.194
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.114 SNIP 1.089 CiteScore 2.6
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.23 SNIP 1.308 CiteScore 2.71
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.203 SNIP 1.278 CiteScore 2.56
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.953 SNIP 0.907 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.845 SNIP 0.897 CiteScore 1.65
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.176 SNIP 1.323
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.189 SNIP 1.082
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.871 SNIP 1.055
Scopus rating (2007): SJR 0.786 SNIP 1.091
High export via small particles before the onset of the North Atlantic spring bloom: Small particle export before the bloom

Sinking organic matter in the North Atlantic Ocean transfers 1-3 Gt carbon yr⁻¹ from the surface ocean to the interior. The majority of this exported material is thought to be in form of large, rapidly sinking particles that aggregate during or after the spring phytoplankton bloom. However, recent work has suggested that intermittent water column stratification resulting in the termination of deep convection can isolate phytoplankton from the euphotic zone, leading to export of small particles. We present depth profiles of large (>0.1 mm equivalent spherical diameter, ESD) and small (300 m depth, leading to deep mixing of particles as deep as 600 m. Subsequent restratification could trap these particles at depth and lead to high particle fluxes at depth without the need for aggregation ("mixed-layer pump"). Overall, we suggest that prebloom fluxes to the mesopelagic are significant, and the role of small sinking particles requires careful consideration.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, National Oceanography Centre, University of Bergen, University of Hamburg
Authors: Giering, S. L. C. (Ekstern), Sanders, R. (Ekstern), Martin, A. P. (Ekstern), Lindemann, C. (Ekstern), Möller, K. O. (Ekstern), Daniels, C. J. (Ekstern), Mayor, D. J. (Ekstern), St. John, M. (Intern)
Pages: 6929–6945
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Main Research Area: Technical/natural sciences

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Journal: Journal of Geophysical Research: Oceans
Volume: 121
Issue number: 9
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 Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.996 SNIP 1.313
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.288 SNIP 1.362 CiteScore 3.39
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.324 SNIP 1.349 CiteScore 3.27
Web of Science (2014): Indexed yes
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Greenland Climate Research Centre, Stanford University, Greenland Institute of Natural Resources, Aarhus University

Historical DNA documents long distance natal homing in marine fish
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.148 SNIP 1.564
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.964 SNIP 1.677
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 2.417 SNIP 1.816
Original language: English
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Relations
Activities:
Populationsgenetiske undersøgelser af torsk fra Vestgrønland
Publication: Research - peer-review › Journal article – Annual report year: 2016

Historie, status og prognoser - Den danske tun

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern)
Publication date: 2016
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Journal: Fisk & Fri
Issue number: 5
ISSN (Print): 0108-2000
Ratings:
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Original language: Danish
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General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jacobsen, L. (Intern)
Publication date: 2016

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Main Research Area: Technical/natural sciences
Links:
http://fishingzealand.dk/nyheder/hjaelp-vores-brakvandsgedder/
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Hjælp med at indsamle info om de unikke brakvandsgedder

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jacobsen, L. (Intern)
Publication date: 2016

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Source/Publisher: Fiskepleje.dk
Host-derived probiotics Enterococcus casseliflavus improves resistance against Streptococcus iniae infection in rainbow trout (Oncorhynchus mykiss) via immunomodulation

The present study evaluated the benefits of dietary administration of host-derived candidate probiotics Enterococcus casseliflavus in juvenile rainbow trout Oncorhynchus mykiss. Experimental diets were prepared by incorporating the microorganisms in the basal feed at 3 inclusion levels (i.e. 107 CFU g⁻¹ of feed [T1], 108 CFU g⁻¹ of feed [T2], 109 CFU g⁻¹ of feed [T3]). The probiotic feeds were administered for 8 weeks, with a group fed with the basal diet serving as control. The effects on growth performance, gut health, innate immunity and disease resistance were evaluated. Results showed that growth performance parameters were significantly improved in T2 and T3 groups. Activities of digestive enzymes such as trypsin and lipase were significantly higher in these two groups as well. Gut micro-ecology was influenced by probiotic feeding as shown by the significant increase in intestinal lactic acid bacteria and total viable aerobic counts in T2 and T3. Humoral immunity was impacted by dietary probiotics as total serum protein and albumin were significantly elevated in T3. The levels of serum IgM significantly increased in all probiotic fed groups at week 8; with the T3 group registering the highest increment. Respiratory burst activity of blood leukocytes were significantly improved in T2 and T3. Hematological profiling further revealed that neutrophil counts significantly increased in all probiotic fed groups. Challenge test showed that probiotic feeding significantly improved host resistance to Streptococcus iniae infection,
specifically in T2 and T3 where a considerable modulation of immune responses was observed. Taken together, this study demonstrated E. casseliflavus as a potential probiotics for rainbow trout with the capability of improving growth performance and enhancing disease resistance by immunomodulation.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Sari University of Agricultural Sciences and Natural Resources, Shahid Chamran University of Ahvaz, Agricultural Research Education and Extension Organization, Temasek Polytechnic
Authors: Safari, R. (Ekstern), Adel, M. (Ekstern), Lazado, C. C. (Intern), Caipang, C. M. A. (Ekstern), Dadare, M. (Ekstern)
Pages: 198-205
Publication date: 2016
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Web of Science (2018): Indexed yes
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Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.36 SJR 1.114 SNIP 1.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.268 SNIP 1.171 CiteScore 3.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.138 SNIP 1.089 CiteScore 2.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.001 SNIP 1.149 CiteScore 3.11
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.151 SNIP 1.174 CiteScore 3.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.196 SNIP 1.265 CiteScore 3.52
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.131 SNIP 1.056
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.96 SNIP 1.101
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.952 SNIP 1.062
Scopus rating (2007): SJR 0.842 SNIP 1.378
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.954 SNIP 1.298
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.789 SNIP 0.861
Host size-dependent anisakid infection in Baltic cod Gadus morhua associated with differential food preferences

A significant increase in the infection level of Baltic cod Gadus morhua with the anisakid nematode larvae Contracaecum osculatum and Pseudoterranova decipiens has been recorded during recent years due to the expanding local population of grey seals Halichoerus grypus, which act as final hosts for these parasites. Here, we report from an investigation of 368 cod (total length [TL] 6-49 cm; caught in ICES Subdivision 25) that the infection level of juvenile cod (TL 6-30 cm) with larvae of C. osculatum and P. decipiens is absent or very low, whereas it increases drastically in larger cod (TL 31-48 cm). A third nematode Hysterothylacium aduncum was rarely found. The study indicates that the prey animals for large cod act as transport hosts for the parasite larvae. Analyses of stomach contents of cod caught in the same area (2007-2014) showed that small benthic organisms (including polychaetes Harmothoe sarsi) are preferred food items by small cod, the isopod Saduria entomon is taken by all size classes, and sprat Sprattus sprattus are common prey items for cod larger than 30 cm. Parasitological investigations (microscopic and molecular analyses) of H. sarsi (100 specimens) and S. entomon (40 specimens) did not reveal infection in these invertebrates, but 11.6% of sprat (265 specimens examined) was shown to be infected with 1-8 C. osculatum third stage larvae per fish. Analyses of sprat stomach contents confirmed that copepods and cladocerans are the main food items of sprat. These observations suggest that the C. osculatum life cycle in the Baltic Sea includes grey seals as final hosts, sprat as the first transport host and cod as second transport host. It may be speculated that sprat obtain infection by feeding on copepods and/or cladocerans, which could serve as the first intermediate hosts. One cannot exclude the possibility that the size-dependent C. osculatum infection of cod may contribute (indirectly or directly) to the differential mortality of larger cod (>38 cm) compared to smaller cod.
How much crude oil can zooplankton ingest? Estimating the quantity of dispersed crude oil defecated by planktonic copepods

We investigated and quantified defecation rates of crude oil by 3 species of marine planktonic copepods (Temora turbinata, Acartia tonsa, and Parvocalanus crassirostris) and a natural copepod assemblage after exposure to mechanically or chemically dispersed crude oil. Between 88 and 100% of the analyzed fecal pellets from three species of copepods and a natural copepod assemblage exposed for 48 h to physically or chemically dispersed light crude oil contained crude oil droplets. Crude oil droplets inside fecal pellets were smaller (median diameter: 2.4-3.5 μm) than droplets in the physically and chemically dispersed oil emulsions (median diameter: 6.6 and 8.0 μm, respectively). This suggests that copepods can reject large crude oil droplets or that crude oil droplets are broken into smaller oil droplets before or during ingestion. Depending on the species and experimental treatments, crude oil defecation rates ranged from 5.3 to 245 ng-oil copepod(-1) d(-1), which represent a mean weight-specific defecation rate of 0.026 μg-oil μg-C-copepod(-1) d(-1). Considering a dispersed crude oil concentration commonly found in the water column after oil spills (1 μL L(-1)) and copepod abundances in high productive coastal areas, copepods may defecate similar to 1.3-2.6 mg-oil m(-3) d(-1), which would represent similar to 0.15%-0.30% of the total dispersed oil per day. Our results indicate that ingestion and subsequent defecation of crude oil by planktonic copepods has a small influence on the overall mass of oil spills in the short term, but may be quantitatively important in the flux of oil from surface water to sediments and in the transfer of low-solubility, toxic petroleum hydrocarbons into food webs after crude oil spills in the sea. (C) 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
**Hvad ved vi om marine virkemidler?**

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Aarhus University, DHI Hørsholm, University of Southern Denmark
Authors: Timmermann, K. (Ekster), Erichsen, A. C. (Ekster), Bruhn, A. (Ekster), Fossing, H. (Ekster), Petersen, J. K. (Intern), Flindt, M. (Ekster)
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Marine virkemidler, Vandområdeplanl, Vandrammedirektiv
Source: FindIt
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Publication: Communication › Journal article – Annual report year: 2017
Hydrographic features of anguillid spawning areas: Potential signposts for migrating eels

Catadromous anguillid eels (genus Anguilla) migrate from their freshwater or estuarine habitats to marine spawning areas. Evidence from satellite tagging studies indicates that tropical and temperate eel species exhibit pronounced diel vertical migrations, from between 150-300 m nighttime depths to 600-800 m during the day. Collections of eggs and larvae of Japanese eels A. japonica suggest they may spawn at these upper nighttime migration depths. How anguillid eels navigate through the ocean and find their spawning areas remains unknown; thus, this study describes the salinity, temperature and geostrophic currents between 0 and 800 m depths within 2 confirmed and 3 hypothetical anguillid spawning areas during likely spawning seasons. Within the 4 ocean gyres in which these spawning areas are located, many eels would encounter subducted 'Subtropical Underwater' water masses during their nighttime ascents that could provide odor plumes as signposts. Four of the spawning areas are located near the western margins of where subducted water masses form cores of elevated salinities (∼35.0 to 36.8) around 150 m depths, and one is located near the center of subduction. Low salinity surface waters and fronts are present in some of the areas above the high-salinity cores. Spawning may occur at temperatures between 16 and 24°C where the thermocline locally deepens. At spawning depths, weak westward currents (∼0 to 0.1 m s⁻¹) prevail, and eastward surface countercurrents are present. Anguillid eels possess acute sensory capabilities to detect these hydrographic features as potential signposts, guiding them to their spawning areas.
Hypoxia increases the risk of egg predation in a nest-guarding fish

For fish with parental care, a nest should meet both the oxygenation needs of the eggs and help protect them against predators. While a small nest opening facilitates the latter, it impedes the former and vice versa. We investigated how the presence of potential egg predators in the form of shore crabs Carcinus maenas affects nest building, egg fanning, defensive displays and filial cannibalism of egg-guarding male sand gobies Pomatoschistus minutus under two levels of dissolved oxygen. In the high oxygen treatment, males retained their nest opening size in the presence of crabs, while males in low oxygen built large nest openings both in the absence and presence of crabs, despite the fact that crabs were more likely to successfully intrude into nests with large entrances. Males in low oxygen also fanned more. In the presence of crabs males increased their defensive displays, but while males in high oxygen reduced fanning, males in low oxygen did not. Filial cannibalism was unaffected by treatment. Sand gobies thus prioritize egg ventilation over the protection afforded by small nest openings under hypoxia and adopt defensive behaviour to avert predator attention, even though this does not fully offset the threat from the egg predators.
Investigating the factors regulating fish condition is crucial in ecology and the management of exploited fish populations. The body condition of cod (Gadus morhua) in the Baltic Sea has dramatically decreased during the past two decades, with large implications for the fishery relying on this resource. Here, we statistically investigated the potential drivers of the Baltic cod condition during the past 40 years using newly compiled fishery-independent biological data and hydrological observations. We evidenced a combination of different factors operating before and after the ecological regime shift that occurred in the Baltic Sea in the early 1990s. The changes in cod condition related to feeding opportunities, driven either by density-dependence or food limitation, along the whole period investigated and to the fivefold increase in the extent of hypoxic areas in the most recent 20 years. Hypoxic areas can act on cod condition through different mechanisms related directly to species physiology, or indirectly to behaviour and trophic interactions. Our analyses found statistical evidence for an effect of the hypoxia-induced habitat compression on cod condition possibly operating via crowding and density-dependent processes. These results furnish novel insights into the population dynamics of Baltic Sea cod that can aid the management of this currently threatened population.

Hypoxic areas, density-dependence and food limitation drive the body condition of a heavily exploited marine fish predator

Baltic Sea, cod (Gadus morhua), density-dependence, hypoxia, prey availability, suitable habitat

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Swedish University of Agricultural Sciences, Swedish Meteorological and Hydrological Institute, Institute of Food Safety, Animal Health and Environment, Swedish Museum of Natural History
Authors: Casini, M. (Ekstern), Käll, F. (Ekstern), Hansson, M. (Ekstern), Plikshs, M. (Ekstern), Baranova, T. (Ekstern), Karlsson, O. (Ekstern), Lundström, K. (Ekstern), Neuenfeldt, S. (Intern), Gårdmark, A. (Ekstern), Hjelm, J. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

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Journal: Royal Society Open Science
Volume: 3
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Scopus rating (2016): CiteScore 2.27 SJR 0.957 SNIP 1.017
Web of Science (2016): Indexed yes
Scopus rating (2015): SNIP 0.957 SJR 0.636 CiteScore 1.92
Original language: English
Baltic Sea, cod (Gadus morhua), density-dependence, hypoxia, prey availability, suitable habitat
Electronic versions:
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10.1098/rsos.160416
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Publication: Research - peer-review › Journal article – Annual report year: 2016
ICES meets marine historical ecology: placing the history of fish and fisheries in current policy context

General information
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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Cefas, University of Queensland, University of Adelaide, Swedish University of Agricultural Sciences, Marine Institute, Trinity College Dublin, University of Padova, Italian National Institute for Environmental Protection and Research, University of Leuven, Princeton University, Flanders Marine Institute, University of Cape Town
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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Identification of high-risk areas for harbour porpoise Phocoena phocoena bycatch using remote electronic monitoring and satellite telemetry data

The bycatch of harbour porpoise Phocoena phocoena is an issue of major concern for fisheries management and for porpoise conservation. We used high-resolution spatial and temporal data on porpoise abundance and fishing effort from the Danish Skagerrak Sea to identify areas with potentially higher and lower risk of porpoise bycatch. From May 2010 to April 2011, 4 commercial gillnet vessels were equipped with remote electronic monitoring (REM) systems. The REM system recorded time, GPS position and closed-circuit television (CCTV) footage of all gillnet hauls. REM data were used to identify fishing grounds, quantify fishing effort and document harbour porpoise bycatch. Movement data from 66 harbour porpoises equipped with satellite transmitters from 1997 to 2012 were used to model population density. A simple model was constructed to investigate the relationship between the response (number of individuals caught) and porpoise density and fishing effort described by net soak time, net string length and target species. Results showed that a model including both porpoise density and fishing effort data predicted bycatch better than models containing only one factor. We therefore conclude that porpoise telemetry or REM data allow for identification of areas of potential high and low bycatch risk, and better predictions are obtained when combining the 2 sources of data. The final model can thus be used as a tool to identify areas of bycatch risk.
Identifying blue whiting (Micromesistius poutassou) stock structure in the Northeast Atlantic by otolith shape analysis

Information on stock identification and spatial stock structure provide a basis for understanding fish population dynamics and improving fisheries management. In this study, otolith shape analysis was used to study the stock structure of blue whiting (Micromesistius poutassou) in the northeast Atlantic using 1693 samples from mature fish collected between 37°N and 75°N and 20°W and 25°E. The results indicated two stocks located north and south of ICES Divisions VIa and VIb (54°5N to 60°5N, 4°W to 11°W). The central area corresponds to the spawning area west of Scotland. Sampling year effects and misclassification in the linear discriminant analysis suggested exchanges between the northern and southern stocks. The results corroborate previous studies indicating a structuring of the blue whiting stock into two stocks, with some degree of mixing in the central overlap area.
Immediate and delayed interactions of global warming and contaminants on aquatic invertebrates

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Dinh, K. V. (Intern)
Publication date: 2016
Event: Abstract from Annual Meeting of the British Ecological Society, Liverpool, United Kingdom.
Main Research Area: Technical/natural sciences

Bibliographical note
Invited talk
Publication: Research › Conference abstract for conference – Annual report year: 2016

Impact and distribution of bottom trawl fishing on mud-bottom communities in the Kattegat

The Kattegat in the inner Danish waters has been trawled for at least 80 yr, but so far only few attempts have been made to quantify the trawl effort, its spatial distribution and its potential ecological impact on the benthic fauna. GIS-analyses of VMS-data from trawling in the Kattegat by both Danish (2005-2009) and Swedish (2007-2009) vessels show that 95% of all trawling occurs below 22 m depth. Most activity takes place on homogeneous benthic habitats with muddy sediment at depths below the halocline and with almost the same salinity across the entire area. Furthermore, the estimate of trawled area demonstrated that the habitats are nearly 100% impacted, and frequencies of trawling beneath 100 m depth can reach 20 events per year. Multivariate analysis of community composition could not discriminate between lightly trawled and heavily trawled areas. However, a strong habitat selectivity of the trawl activity and inter-correlation between trawl activity and depth-related community structures complicated interpretation of the results. Species with biological traits previously categorized as sensitive to physical disturbance showed higher abundance in areas with low trawl activity compared to areas with higher activity. Thus, the Kattegat has been impacted to an extent where areas with reference conditions for certain habitats below 22 m no longer exist. Consequently, it is unknown how the benthic communities would have appeared without trawl disturbance and, thus, difficult to determine the impact of continued disturbance.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Copenhagen, Aarhus University
Authors: Pommer, C. D. (Intern), Olesen, M. (Ekstern), Hansen, J. L. S. (Ekstern)
Pages: 47-60
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 548
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Impact of biotic interactions on biodiversity varies across a landscape

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Helsinki, University of Pretoria, Finnish Environment Institute
Authors: Mod, H. K. (Ekstern), Heikkinen, R. K. (Ekstern), le Roux, P. C. (Ekstern), Wisz, M. S. (Intern), Luoto, M. (Ekstern)
Pages: 2412–2423
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Biogeography
Volume: 43
Seaweeds are attractive as a sustainable aquaculture crop for food, feed, bioenergy and biomolecules. Further, the non-value ecosystem services of seaweed cultivation (i.e. nutrient recapture) are gaining interest as an instrument towards sustainable aquaculture and for fulfilling the aims of the EU Marine Strategy Framework Directive. Environmental factors determine the yield and quality of the cultivated seaweed biomass and, in return, the seaweed aquaculture affects the marine environment by nutrient assimilation. Consequently, site selection is critical for obtaining optimal biomass yield and quality and for successful bio-mitigation. In this study, 5 sites for cultivation of Saccharina latissima were selected within a eutrophic water body to guide site selection for future kelp cultivation activities. Results were coupled to marine monitoring data to explore the relationship between environmental conditions and cultivation success. The biomass yields fluctuated 10-fold between sites due to local variations in light and nutrient availability. Yields were generally low, i.e. up to 510 g fresh weight (FW) per meter seeded line; however, the dry matter contents of protein and high-value pigments were high (up to 17% protein and 0.1% fucoxanthin). Growth performance, biomass quality and bio-mitigation potential was restricted by low availability of light and bioavailable phosphorus, and biofouling through juvenile suspension feeders was a critical factor at all cultivation sites. At specific sites, the tissue metal contents (Pb and Hg) exceeded the limit values for feed or food. Our results emphasize the importance of careful site selection before establishing large-scale cultivation, and stress the challenges and benefits of kelp cultivation in eutrophic waters.
impact of temperature on ammonium and nitrite removal rates in RAS moving bed biofilters

The impact of temperature on bacterial processes is well known; however temperature related data on nitrification rates in aquaculture systems are fragmented and compiled from different studies. We sought to determine ammonium and nitrite removal kinetics over a temperature range from 6 to 36 °C by using moving bed bio-elements from a freshwater RAS in steady state operated at 18 °C. The impact of temperature on ammonium and nitrite oxidation rates was evaluated by transferring the colonized bio elements to six liter batch reactors (triplicated setup). Each reactor was acclimatized for 24 h at each of the six temperatures (6, 12, 18, 24, 30 and 36 °C) and then spiked with ammonium chloride or sodium nitrite under identical conditions. The average surface specific TAN removal (STR) increased a six-fold from 6 to 30 °C (0.04–0.25 g TAN m−2 day−1) and dropped significantly at 36 °C–0.14 g TAN m−2 day−1. The surface specific nitrite removal (SNR) increased linearly from 0.04 g N m−2 d−1 at 6 °C–0.14 g N m−2 day−1 at 30 °C, decreasing to 0.12 g N m−2 day−1 at 36 °C. Throughout the temperature range tested, STR remained significantly larger than SNR. The temperature coefficient, Ɵ (6–30 °C) for ammonium oxidation was 1.079; for nitrite oxidation the temperature coefficient was found to be 1.054. The data provided by this study can be applied dimensioning future RAS that utilizes temperature ranges below 10 and above 30 °C.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Sokoine University of Agriculture
Authors: Kinyage, J. P. H. (Ekstern), Pedersen, L. (Intern)
Implementing a generic method for bias correction in statistical models using random effects, with spatial and population dynamics examples

Statistical models play an important role in fisheries science when reconciling ecological theory with available data for wild populations or experimental studies. Ecological models increasingly include both fixed and random effects, and are often estimated using maximum likelihood techniques. Quantities of biological or management interest ("derived quantities") are then often calculated as nonlinear functions of fixed and random effect estimates. However, the conventional "plug-in" estimator for a derived quantity in a maximum likelihood mixed-effects model will be biased whenever the estimator is calculated as a nonlinear function of random effects. We therefore describe and evaluate a new "epsilon" estimator as a generic bias-correction estimator for derived quantities. We use simulated data to compare the epsilon-method with an existing bias-correction algorithm for estimating recruitment in four configurations of an age-structured population dynamics model. This simulation experiment shows that the epsilon-method and the existing bias-correction method perform equally well in data-rich contexts, but the epsilon-method is slightly less biased in data-poor contexts. We then apply the epsilon-method to a spatial regression model when estimating an index of population abundance, and compare results with an alternative bias-correction algorithm that involves Markov-chain Monte Carlo sampling. This example shows that the epsilon-method leads to a biologically significant difference in estimates of average abundance relative to the conventional plug-in estimator, and also gives essentially identical estimates to a sample-based bias-correction estimator. The epsilon-method has been implemented by us as a generic option in the open-source Template Model Builder software, and could be adapted within other mixed-effects modeling tools such as Automatic Differentiation Model Builder for random effects. It therefore has potential to improve estimation performance for mixed-effects models throughout fisheries science. Published by Elsevier B.V.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, National Oceanographic and Atmospheric Administration
Authors: Thorson, J. T. (Ekstern), Kristensen, K. (Intern)
Pages: 66-74
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Main Research Area: Technical/natural sciences

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Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
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Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Increasing levels of dietary crystalline methionine affect plasma methionine profiles, ammonia excretion, and the expression of genes related to the hepatic intermediary metabolism in rainbow trout (Oncorhynchus mykiss)

Strictly carnivorous fish with high requirements for dietary protein, such as rainbow trout (Oncorhynchus mykiss) are interesting models for studying the role of amino acids as key regulators of intermediary metabolism. Methionine is an essential amino acid for rainbow trout, and works as a signalling factor in different metabolic pathways. The study investigated the effect of increasing dietary methionine intake on the intermediary metabolism in the liver of juvenile rainbow trout. For this purpose, five diets were formulated with increasing methionine levels from 0.60 to 1.29% dry matter. The diets were fed in excess for six weeks before three sampling campaigns carried out successively to elucidate (i) the hepatic expression of selected genes involved in lipid, glucose and amino acid metabolism; (ii) the postprandial ammonia excretion; and (iii) the postprandial plasma methionine concentrations. The transcript levels of enzymes involved in lipid metabolism (fatty acid synthase, glucose 6 phosphate dehydrogenase and carnitine palmitoyl transferase 1 a), gluconeogenesis (fructose-1,6-bisphosphatase) and amino acid catabolism (alanine amino transferase and glutamate dehydrogenase) were significantly affected by the increase in dietary methionine. Changes in gene expression reflected to some extent the decrease in ammonia excretion (P=0.022) and in the hepatosomatic index (HSI; P

General information
State: Published
Individual Stress Level Analyses (ISLA) communicate impact of spatial management options on national or local fisheries communities to decision makers.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Thünen Institute of Sea Fisheries
Authors: Schulze, T. (Ekstern), Hamon, K. (Ekstern), Schulte, K. (Ekstern), Bastardie, F. (Intern), Hintzen, N. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Industry-led fishing gear selectivity improvements. How can we increase flexibility and ownership over the gears used whole ensuring an effective introduction of the new EU Common Fisheries Policy?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Danish Fishermen's Producers' Organization, Aalborg University
Publication date: 2016
Event: Abstract from ICES-FAO Working Group on Fishing Technology and Fish Behaviour, Mérida, Mexico.
Main Research Area: Technical/natural sciences

Inference in dynamic models of fitness optimization based on observed animal behaviour

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources
Authors: Thygesen, U. H. (Intern), Patterson, T. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Influence of twin and multi-rig trawl systems on CPUE in the Danish Norway lobster (Nephrops norvegicus) fishery

One of the most effective ways to alter catch and length compositions in trawls is to adjust the meshsize or add selective devices such as sorting grids and selective netting panels. These changes are oftentimes introduced into the fishery in a top down manner whereby fishermen are forced to comply with specific legislation. However, fishermen have also introduced gear modifications that have contributed to improving species selectivity in trawls. One of the simplest and most effective modifications that came from industry was the development and introduction of twin and multi-rig trawls. Here we analyse catchrates of four target species, Norway lobster (Nephrops norvegicus), cod (Gadus morhua), plaice (Pleuronectes platessa) and haddock (Melanogrammus aeglefinus), to try and understand how the use of multi-rig trawls have altered catch rates within the Danish demersal trawl fishery over the last 16 years (1997–2012). Results showed that catch rates of Nephrops in multi-rig trawls were significantly higher (1.89–2.03) than those in single trawls. For
cod, haddock and plaice there was no significant effect of gear type. The results are discussed in relation to the Common Fisheries Policy reform and the increasing importance of industry introduced gear modifications.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources
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Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
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ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.154 SNIP 1.135 CiteScore 1.7
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.022 SNIP 1.075
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.025 SNIP 1.274
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.906 SNIP 1.134
Influence of UVB radiation on the lethal and sublethal toxicity of dispersed crude oil to planktonic copepod nauplii

Toxic effects of petroleum to marine zooplankton have been generally investigated using dissolved petroleum hydrocarbons and in the absence of sunlight. In this study, we determined the influence of natural ultraviolet B (UVB) radiation on the lethal and sublethal toxicity of dispersed crude oil to naupliar stages of the planktonic copepods Acartia tonsa, Temora turbinata and Pseudodiaptomus pelagicus. Low concentrations of dispersed crude oil (1 μL L(-1)) caused a significant reduction in survival, growth and swimming activity of copepod nauplii after 48 h of exposure. UVB radiation increased toxicity of dispersed crude oil by 1.3-3.8 times, depending on the experiment and measured variables. Ingestion of crude oil droplets may increase photoenhanced toxicity of crude oil to copepod nauplii by enhancing photosensitization. Photoenhanced sublethal toxicity was significantly higher when T. turbinata nauplii were exposed to dispersant-treated oil than crude oil alone, suggesting that chemical dispersion of crude oil may promote photoenhanced toxicity to marine zooplankton. Our results demonstrate that acute exposure to concentrations of dispersed crude oil and dispersant (Corexit 9500) commonly found in the sea after oil spills are highly toxic to copepod nauplii and that natural levels of UVB radiation substantially increase the toxicity of crude oil to these planktonic organisms. Overall, this study emphasizes the importance of considering sunlight in petroleum toxicological studies and models to better estimate the impact of crude oil spills on marine zooplankton.
Innate immune defenses exhibit circadian rhythmicity and differential temporal sensitivity to a bacterial endotoxin in Nile tilapia (Oreochromis niloticus)

The present study investigated the daily dynamics of humoral immune defenses and the temporal influence in the sensitivity of these responses to a bacterial endotoxin in Nile tilapia (Oreochromis niloticus). The first experiment subjected the fish to two photoperiod conditions, 12L:12D (LD) and 0L:24D (DD), for
20 days to characterize the rhythms of humoral immunity. Serum alkaline phosphatase (ALP), lysozyme (LYZ), peroxidase (PER) and protease (PRO) exhibited significant rhythmicity under LD but not in DD. No significant rhythms were observed in esterase (ESA) and anti-protease (ANTI) in both photoperiod conditions. Fish reared under LD were subsequently subjected to DD while the group previously under DD was exposed to LD, and this carried on for 3 days before another set of samples was collected. Results revealed that the rhythms of LYZ, PER and PRO but not ALP persisted when photoperiod was changed from LD to DD. Nonetheless, immune parameters remained arrhythmic in the group subjected from DD to LD. Cluster analysis of the humoral immune responses under various light conditions revealed that each photic environment had distinct daily immunological profile. In the second experiment, fish were injected with bacterial endotoxin lipopolysaccharide (LPS) either at ZT3 (day) or at ZT15 (night) to evaluate the temporal sensitivity of humoral immunity to a pathogen-associated molecular pattern. The results demonstrated that responses to LPS were gated by the time of day. LPS significantly modulated serum ALP and ANTI activities but only when the endotoxin was administered at ZT3. Serum LYZ and PER were stimulated at both injection times but with differing response profiles. Modulated LYZ activity was persistent when injected at ZT3 but transient when LPS was applied at ZT15. The magnitude of LPS-induced PER activity was higher when the endotoxin was delivered at ZT3 versus ZT15. It was further shown that plasma cortisol was significantly elevated but only when LPS was administered at ZT3. On the other hand, plasma melatonin was significantly affected by LPS injection but only when exposed at ZT15. Taken together, this study shows that several key components of humoral immunity in tilapia exhibit circadian rhythms and adapt to photoperiodic changes. Further, results of the bacterial endotoxin challenge suggest that responsiveness of serum humoral factors to a biological insult is likely mediated by the time of day, highlighting the importance of circadian rhythm in the immunological functions of fish.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Lazado, C. C. (Intern), Skov, P. V. (Intern), Pedersen, P. B. (Intern)
Pages: 613-622
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
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Scopus rating (2016): CiteScore 3.36 SJR 1.114 SNIP 1.16
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.268 SNIP 1.171 CiteScore 3.19
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.138 SNIP 1.089 CiteScore 2.92
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.001 SNIP 1.149 CiteScore 3.11
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.151 SNIP 1.174 CiteScore 3.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.196 SNIP 1.265 CiteScore 3.52
ISI indexed (2011): ISI indexed yes
Interactive effects of dietary composition and hormonal treatment on reproductive development of cultured female European eel, Anguilla anguilla

Farmed female eels were fed two experimental diets with similar proximate composition but different n-3 polyunsaturated fatty acid (PUFA) levels. Both diets had similar levels of arachidonic acid (ARA), while levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in one diet were approximately 4.5 and 2.6 times higher compared to the other diet, respectively. After the feeding period, each diet group was divided into two and each half received one of two hormonal treatments using salmon pituitary extract (SPE) for 13 weeks: i) a constant hormone dose of 18.75mg SPE/kg initial body weight (BW) and ii) a variable hormone dosage that increased from 12.5mg SPE/kg initial BW to 25mg SPE/kg initial BW. Results showed a significant interaction between diets and hormonal treatments on gonadosomatic index (GSI), indicating that the effect of broodstock diets on ovarian development depends on both nutritional status and hormonal regime. Females fed with higher levels of n-3 series PUFAs and stimulated with the constant hormonal treatment reached higher GSIs than those receiving the variable hormonal treatment. However, when females were fed lower levels of n-3 series PUFAs there was no difference in the effect of hormonal treatments on GSI. We also found that, independent of hormonal treatment, the diet with higher levels of n-3 series PUFAs led to the most advanced stages of oocyte development, such as germinal vesicle migration. Concentration of sex steroids (E2, T, and 11-KT) in the plasma did not differ between diets and hormonal treatments, but was significantly correlated with ovarian developmental stage. In conclusion, increasing dietary levels of n-3 PUFAs seemed to promote oocyte growth, leading to a more rapid progression of ovarian development in European eel subjected to hormonal treatment.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Norwegian University of Science and Technology, Nofima AS
Authors: da Silva, F. (Intern), Støttrup, J. G. (Intern), Kjørsvik, E. (Ekstern), Tveiten, H. (Ekstern), Tomkiewicz, J. (Intern)
Pages: 17-26
Publication date: 2016
Main Research Area: Technical/natural sciences
Investigating the effectiveness of paracetic acid water disinfection to reduce post-vaccination Saprolegnia spp.-associated mortality in Atlantic salmon Salmo salar paa while assessing impact on nitrification in replicated Recirculating Aquaculture Systems
Investigating the phenology of seaward migration of juvenile brown trout (Salmo trutta) in two European populations

Recent evidence supports the existence of a downstream autumn-migratory phenotype in juvenile anadromous brown trout (Salmo trutta), however the precise timing, extent and ecological significance of such behaviour remains ambiguous. We investigated the phenology of downstream migration of wild juvenile trout using passive integrated transponder (PIT) telemetry over an eight-month period in two European rivers; the River Deerness, north-east England, and the River Villestrup, Denmark. The incidence of autumn–winter seaward migration was greater in the Deerness than the Villestrup, with at least 46% of migrating juveniles detected prior to spring smoltification in the Deerness. Timing of migration was strongly regulated by factors associated with river discharge in both systems. While autumn and spring downstream migrants did not differ in size at the time of tagging in either system, evidence that spring migrants were of better condition, travelled faster (autumn: 11.0 km day⁻¹; spring: 24.3 km day⁻¹) and were more likely to leave the Deerness suggests that autumn and spring migrant conspecifics respond to different behavioural motivations. Further investigation into the sex of autumn migrant juveniles, as well as the temporal and geographical variability in the incidence and fitness consequences of autumn emigration by juvenile trout would be beneficial.
Investigation of hatchery techniques and cultivation systems for cost-efficient production of valued seaweeds

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Schmedes, P. S. (Intern), Canal-Vergés, P. (Intern), Nielsen, M. M. (Intern), Reitan, K. (Ekstern), Petersen, J. K. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

"Jeg døber dig Havfisken"

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Pages: 18
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Publication information
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ISI indexed (2011): ISI indexed no
Main Research Area: Technical/natural sciences
Links:
http://emagstudio.win.dtu.dk/e-books/dtu-avisen/dtuavisen1602/pubData/source/147108%20DTUavisen_2_2016_TRYK_100ppi_web.pdf
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Kæmpelaksen fra Storå er ambassadør for en bestand i fremgang

General information
State: Published
Knowledge exchange for efficient passage of fish in the southern hemisphere (KEEPFISH)

The decline of freshwater fish biodiversity is proceeding at an alarming and persistent rate. Given that most fish must undertake some form of migration in order to complete their life-cycle, of particular concern is the proliferation of hydropower schemes that block migration routes, as well as a variety of other barriers such as weirs and culverts. Several locations in the southern hemisphere are among the major global hotspots of hydropower development. Mitigation measures for fish passage have traditionally relied on designs developed for strong swimming, generally salmonid species of the northern hemisphere. These designs are ineffective for smaller, relatively weak swimming ‘non-sport’ fish, such as those found in temperate regions of the southern hemisphere, but there is no detailed understanding of the mechanisms involved. This paper introduces an innovative EU-funded project, KEEPFISH, that aims to address gaps in the knowledge of passage requirements for non-sport fish of the temperate south. The project, beginning in 2016, represents the first systematic attempt to bring together world-leading practitioners in an effort to exchange knowledge and construct a shared vision for fish passage science and policy. This will be achieved through systematic review, expert consultation, ecological modelling, postgraduate training programmes, networking and stakeholder engagement using a novel combination of approaches.
Konflikt mellem skarv og den udryddelsestruede snæbel

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology, Aalborg University, Institut National des Sciences Appliquees de Lyon, Fisheries and Maritime Museum
Authors: Svendsen, J. C. (Intern), Aarestrup, K. (Intern), Hertz, M. (Ekstern), Thomsen, S. N. (Ekstern), Rognon, P. C. (Ekstern), Jensen, L. F. (Ekstern)
Publication date: 2016

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http://www.fiskepleje.dk/Nyheder/Nyhed?id=8eef00f1-f20b-442c-90a4-c5b9c575d7d3
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Konflikt mellem skarv og kystnære fisk i Danmark

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern)
Publication date: 2016
Event: Poster session presented at Den nationale temadag om dansk vildtforskning med emnet: Forskningsbaseret forvaltning af fugle og pattedyr – med fokus på ”konfliktarter”, Århus, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
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Publication: Research › Poster – Annual report year: 2016

Konsekvensvurdering af fiskeri efter blåmuslinger ved og øst for Horsens Fjord samt Endelave 2016

General information
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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Section for Monitoring and Data
Authors: Nielsen, P. (Intern), Nielsen, C. F. (Intern), Geitner, K. (Intern), Petersen, J. K. (Intern)
Number of pages: 41
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http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Publication: Research › Report – Annual report year: 2016

Kortlægning af fiskenes levesteder i den danske del af Øresund: Rapport til Miljø- og Fødevareministeriet

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, University of Copenhagen
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General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Jepsen, N. (Intern), Koed, A. (Intern), Sivebæk, F. (Intern)
Publication date: 2016

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Laksebestanden i Ribe Å 2014

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Pedersen, S. (Intern), Koed, A. (Intern), Aarestrup, K. (Intern), Jepsen, N. (Intern), Sivebæk, F. (Intern)
Number of pages: 88
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Publishers version
Links: http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Publication: Research › Report – Annual report year: 2016

Laksebestanden i Ribe Å kan blive meget større - men det kræver en indsats

General information
State: Published
Laksekvoter for fiskesæsonen 2016

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Marine Living Resources
Authors: Sivebæk, F. (Intern), Eg Nielsen, E. (Intern)
Publication date: 2016
Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/Fiskebiologi/laks/laksekvote/laksekvote-2016?utm_source=newsletter&utm_media=mail&utm_campaign=Nyhedsbrev%202015
Publication: Communication › Internet publication – Annual report year: 2016

Laksen i Storå skal fremover klare sig uden udsætninger

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management, Section for Marine Living Resources
Authors: Sivebæk, F. (Intern), Koed, A. (Intern), Eg Nielsen, E. (Intern), Jepsen, N. (Intern), Aarestrup, K. (Intern)
Publication date: 2016
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Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
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Laksens liv

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Fisheries and Maritime Museum
Authors: Jensen, L. F. (Ekstern), Svendsen, J. C. (Intern)
Number of pages: 95
Publication date: 2016
Publication information
Place of publication: Esbjerg
Publisher: Fiskeri- og Søfartsmuseet
ISBN (Print): 978-87-90982-81-2
Original language: Danish
Main Research Area: Technical/natural sciences
Publication: Communication › Book – Annual report year: 2016
Laksen som var tæt på at uddø

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.aqua.dtu.dk/nyheder/2016/12/laksens-liv?id=acf05afa-47b4-47d1-a94a-9d95df418fed&utm_source=newsletter&utm_media=mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2016

Langt fremme med produktion af åleyngel i Hirtshals

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Tomkiewicz, J. (Intern)
Pages: 6-8
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 36
Issue number: 2
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
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Original language: Danish
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Larval drift and settling of Greenland halibut (R. hippoglossoides Walbaum) in Northwest Atlantic with special focus on Greenlandic waters

General information
State: Published
Organisations: National Institute of Aquatic Resources, Arctic Section
Authors: Stenberg, C. (Ekstern), Ribergaard, M. H. (Ekstern), Boje, J. (Intern), Sundby, S. (Ekstern)
Number of pages: 32
Publication date: 2016

Publication information
Publisher: Danish Meteorological Institute
Original language: English

Series: DMI Report
Number: 16-21
ISSN: 1399-1388
Main Research Area: Technical/natural sciences
Electronic versions:
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Links:
http://www.dmi.dk/dmi/DMIRep16-21
Publication: Research › Report – Annual report year: 2016
Larval fish ecology - adaptations and physical linkages

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Munk, P. (Intern)
Publication date: 2016

Publication information
Place of publication: Charlottenlund
Publisher: DTU aqua. National Institute of Aquatic Resources
ISBN (Print): 978-87-7481-227-2
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research › Doctoral thesis – Annual report year: 2016

Learning from 'apparent consensus' in TAC disputes: Exploring knowledge overlaps in LEK and genetic categorization of Atlantic cod

The rapid development of genetic science has improved the methods for fisheries stock assessments with increasing implications for management. One key accomplishment has been the identification of different sub-populations of Atlantic cod. Recognizing that local coastal fishers in the North Atlantic have often held a local knowledge about local cod populations, this study examines the extent to which genetic analysis corroborates this local knowledge and vice versa. In Nuuk, capital of Greenland situated by the Nuuk fiord system, local fishers say that they and generations before them have been observing both inshore and offshore cod in the Nuuk fiord system. Fisher interviews were conducted in order to understand the construction as well as the content of this specific local ecological knowledge. Furthermore, fishers were invited to assign cod from their catches into categories based on their knowledge of inshore and offshore cod. These cod were subsequently analyzed and assigned to population using genetic methodologies. The comparison between visual and genetic assignment was not able to confirm any convincing consensus between fishers’ understanding of offshore and inshore cod and the corresponding genetic categories. However, an examination of existing inshore and off-shore catch surveys confirmed the relevance of the morphological characteristics (liver condition and shape) of ecologically defined inshore and off-shore cod that provided the basis for fishers’ categorizations. This opens a discussion of the fishers’ way of knowing about inshore and offshore cod respectively and if and how the content of their knowledge could be made relevant in relation to scientific advice procedures.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Greenland Institute of Natural Resources, Aalborg University
Authors: Hedeholm, R. B. (Ekstern), Jacobsen, R. B. (Ekstern), Eg Nielsen, E. (Intern)
Pages: 114-120
Publication date: 2016
Main Research Area: Technical/natural sciences

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Journal: Marine Policy
Volume: 69
ISSN (Print): 0308-597X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.7 SJR 1.335 SNIP 1.182
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.591 SNIP 1.397 CiteScore 3.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.438 SNIP 1.56 CiteScore 3.09
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.472 SNIP 1.635 CiteScore 2.71
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.339 SNIP 1.495 CiteScore 2.54
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.406 SNIP 1.263 CiteScore 2.07
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.289 SNIP 1.483
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.947 SNIP 1.142
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.838 SNIP 1.417
Scopus rating (2007): SJR 0.927 SNIP 1.377
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.961 SNIP 2.043
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.84 SNIP 1.229
Scopus rating (2004): SJR 0.793 SNIP 1.116
Scopus rating (2003): SJR 0.506 SNIP 1.11
Scopus rating (2002): SJR 0.444 SNIP 0.8
Scopus rating (2001): SJR 0.532 SNIP 0.639
Scopus rating (2000): SJR 0.391 SNIP 1.442
Scopus rating (1999): SJR 0.527 SNIP 1.141
Original language: English
DOIs: 10.1016/j.marpol.2016.04.020

Relations
Activities:
Populationsgenetiske undersøgelser af torsk fra Vestgrønland
Source: FindIt
Source-ID: 2303762939
Publication: Research - peer-review › Journal article – Annual report year: 2016

Linkages between the circulation and distribution of dissolved organic matter in the White Sea, Arctic Ocean
The White Sea is a semi-enclosed Arctic marginal sea receiving a significant loading of freshwater (225-231 km3 yr-1 equaling an annual runoff yield of 2.5 m) and dissolved organic matter (DOM) from river run-off. We report discharge weighed values of stable oxygen isotope ratios (δ18O) of -14.0‰ in Northern Dvina river for the period 10 May-12 October 2012. We found a significant linear relationship between salinity (S) and δ18O (δ18O=-17.66±0.58+0.52±0.02×S; R2=0.96, N=162), which indicates a dominant contribution of river water to the freshwater budget and little influence of sea ice formation or melt. No apparent brine additions from sea-ice formation is evident in the White Sea deep waters as seen from a joint analysis of temperature (T), S, δ18O and aCDOM(350) data, confirming previous suggestions about strong tidal induced vertical mixing in winter being the likely source of the deep waters. We investigated properties and distribution of colored dissolved organic matter (CDOM) and dissolved organic carbon (DOC) in the White Sea basin and coastal areas in summer. We found contrasting DOM properties in the inflowing Barents Sea waters and White Sea waters influenced by terrestrial runoff. Values of absorption by CDOM at 350 nm (aCDOM(350)) and DOC (exceeding 10 m-1 and 550 μmol l-1, respectively) in surface waters of the White Sea basin are higher compared to other river-influenced coastal Arctic domains. Linear relationship between S and CDOM absorption, and S and DOC (DOC(959.21±52.99-25.80±1.79×S; R2=0.85; N=154) concentrations suggests conservative mixing of DOM in the White Sea. The strongest linear correlation between CDOM absorption and DOC was found in the ultraviolet (DOC(56.31±2.78+4.13×aCDOM(254); R2=0.99; N=155), which provides an easy and robust tool to trace DOC using CDOM absorption measurements as well as remote sensing algorithms. Deviations from this linear relationship in
surface waters likely indicate contribution from different rivers along the coast of the White Sea. Characteristics of CDOM further indicate that there is limited removal or change in the DOM pool before it exits to the Barents Sea.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Norwegian Polar Institute, Tallinn University, Arctic and Antarctic Research Institute, Polish Academy of Sciences, Knipovich Polar Research Institute of Marine Fisheries and Oceanography
Authors: Pavlov, A. K. (Ekstern), Stedmon, C. A. (Intern), Semushin, A. V. (Ekstern), Martma, T. (Ekstern), Ivanov, B. V. (Ekstern), Kowalczyk, P. (Ekstern), Granskog, M. A. (Ekstern)
Pages: 1-13
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Continental Shelf Research
Volume: 119
ISSN (Print): 0278-4343
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.27 SJR 1.051 SNIP 1.15
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.002 SNIP 1.117 CiteScore 2.07
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.109 SNIP 1.218 CiteScore 2.08
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.21 SNIP 1.448 CiteScore 2.28
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.137 SNIP 1.207 CiteScore 2.02
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.409 SNIP 1.438 CiteScore 2.31
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.352 SNIP 1.312
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.305 SNIP 1.307
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.176 SNIP 1.33
Scopus rating (2007): SJR 1.376 SNIP 1.56
Scopus rating (2006): SJR 1.473 SNIP 1.445
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.922 SNIP 1.28
Scopus rating (2004): SJR 0.975 SNIP 1.246
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.285 SNIP 1.397
Web of Science (2003): Indexed yes
Peracetic acids can be used as sanitizers to control water quality in aquaculture systems. As an alternative to formalin, chloramine-T or copper sulphate, PAA has strong anti-microbial effects, degrades quickly and is relatively safe to use. Its mode of action and associated rapid decay can make optimizing treatment protocols a challenge. Continuous low-dose applications seem to be a promising solution. In this preliminary study behavioral response was used to assess potential correlations with PAA dosage. A behavioral change or response is not necessarily an indication of compromised welfare. Supportive enzymatic, biochemical and physiological biomarkers can be used along with gill and epidermal histological measures to evaluate the effects on water treatment regimens. The ultimate goal is to define the therapeutic window where fish welfare is not compromised. PAA is among the few disinfectants approved for organic aquaculture.

Local environmental conditions shape generalist but not specialist components of microbial metacommunities in the Baltic Sea

Marine microbes exhibit biogeographical patterns linked with fluxes of matter and energy. Yet, knowledge of the mechanisms shaping bacterioplankton community assembly across temporal scales remains poor. We examined bacterioplankton 16S rRNA gene fragments obtained from Baltic Sea transects to determine phylogenetic relatedness and assembly processes coupled with niche breadth. Communities were phylogenetically more related over time than expected by chance, albeit with considerable temporal variation. Hence, habitat filtering, i.e., local environmental conditions, rather than competition structured bacterioplankton communities in summer but not in spring or autumn. Species sorting (SS) was the dominant assembly process, but temporal and taxonomical variation in mechanisms was
observed. For May communities, Cyanobacteria, Actinobacteria, Alpha- and Betaproteobacteria exhibited SS while Bacteroidetes and Verrucomicrobia were assembled by SS and mass effect. Concomitantly, Gammaproteobacteria were assembled by the neutral model and patch dynamics. Temporal variation in habitat filtering and dispersal highlights the impact of seasonally driven reorganization of microbial communities. Typically abundant Baltic Sea populations such as the NS3a marine group (Bacteroidetes) and the SAR86 and SAR11 clade had the highest niche breadth. The verrucomicrobial Spartobacteria population also exhibited high niche breadth. Surprisingly, variation in bacterioplankton community composition was regulated by environmental factors for generalist taxa but not specialists. Our results suggest that generalists such as NS3a, SAR86, and SAR11 are reorganized to a greater extent by changes in the environment compared to specialists and contribute more strongly to determining overall biogeographical patterns of marine bacterial communities.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Linnaeus University, Lund University, Swedish University of Agricultural Sciences, Umeå University
Authors: Lindh, M. V. (Ekstern), Sjöstedt, J. (Intern), Casini, M. (Ekstern), Andersson, A. (Ekstern), Legrand, C. (Ekstern), Pinhassi, J. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Frontiers in Microbiology
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BFI (2018): BFI-level 1
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.16 SJR 1.731 SNIP 1.172
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.878 SNIP 1.208 CiteScore 4.15
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.861 SNIP 1.16 CiteScore 3.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.751 SNIP 0.951 CiteScore 3.56
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.415 SNIP 0.725 CiteScore 2.78
ISI indexed (2012): ISI indexed no
Scopus rating (2011): SJR 0.626 SNIP 0.187
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Original language: English
assembly mechanism, generalist, habitat filtering, metacommunity, net relatedness index, niche breadth, specialist, MICROBIOLOGY, BACTERIAL COMMUNITY COMPOSITION, BACTERIOPLANKTON COMMUNITIES, BIOGEOGRAPHIC PATTERNS, COMPETITIVE-EXCLUSION, HABITAT GENERALISTS, SPATIAL PROCESSES, DYNAMICS, ECOLOGY, PHYLOGENIES, DIVERSITY, BETA-LACTAM ANTIBIOTICS, TRANSFER-RNA SYNTHETASE, PSEUDOMONAS-AERUGINOSA, METHICILLIN-RESISTANT, ESCHERICHIA-COLI, ANTISTAPHYLOCOCCAL AGENTS, QUINOLONE SUSCEPTIBILITY, GENETIC-DETERMINANTS, 2-COMPONENT SYSTEM, DNA GYRASE, Staphylococcus aureus, antimicrobial agents, intrinsic resistance, potentiator targets, Galleria mellonella

DOIs:
10.3389/fmicb.2016.02078

Links:
Long-term tryptophan supplementation decreased the welfare and innate immune status of pikeperch juveniles

It has been demonstrated that short-term supplementation of L-tryptophan (TRP) can mitigate the primary neuroendocrine response to stress in some fish species, but such stress reduction was reported to be both dose- and context-dependent (Basic et al., 2013; Machado et al., 2015). So, the TRP responses may be species related or depend on the stress levels experienced by the fish. Since percid fish were reported to be more stress responsiveness than common aquaculture species such as rainbow trout (Jentoft et al., 2005), this study aimed (1) to determine to what extent a long-term dietary TRP mitigate the physiological response of pikeperch (Sander lucioperca) to emersion stress, and (2) to characterize the related immune status. Pikeperch juveniles of 10 g received four experimental diets: (CT) = control groups without any stress and any feed TRP supplement, (CTs) = control groups submitted to emersion stress but without any feed TRP supplement, 3TRPs = groups receiving 3-time TRP diet and submitted to emersion stress, 6TRPs = groups receiving 6-time TRP diet and submitted to emersion stress. Various organs were sampled on D7, D37 and D91 of TRP supplementation for evaluation of physiological and immune responses; samplings were done one hour after the emersion challenge stress. Specific growth rate (SGR) as well as food conversion rate (FCR) were also checked. Emersion stress induced a significant increase in plasma cortisol both after a single stress or repeated stress challenges. Dietary TRP significantly decreased cortisol levels in a dose related manner both after a single or repeated stress; but plasma glucose level was only affected after a single stress but not after long-term feeding. The two stress indicators measured showed that pikeperch displayed higher stress responsiveness as already demonstrated for European perch in comparison to salmonids (Jentoft et al., 2005). The reduction in physiological stress status by dietary TRP was associated to a significant decrease in plasma lysosomal activity, especially on D91; indicating negative interaction with the innate immune pathways. Growth rate was slowed by the long-term dietary TRP in association to an increase in FCR values. The available results indicate that long-term TRP supplementation has negative impact on the overall welfare status of pikeperch. Other analyses are ongoing and more results concerning key-brain neurotransmitters such as serotonin, dopamine and their metabolites concentrations as well as on the expressions of key-immune genes (C3-1, TNF-α, IL-1β, etc) will be discussed.
Low larval densities in northern populations reinforce range expansion by a Mediterranean damselfly

1. Contemporary climate change triggers a poleward range shift in many species. A growing number of studies document evolutionary changes in traits accelerating range expansion (such as growth rate and dispersal-related traits). In contrast, the direct impact of decreasing conspecific densities towards the very edge of the expansion front has been neglected. Density effects may, however, have a profound direct impact on traits involved in range expansion and influence range dynamics. 2. In this study, we contrast the effects of high conspecific larval density typical for established populations and low larval density typical for newly founded populations at the edge of the expansion front on a set of larval traits that may affect the range dynamics in the poleward moving damselfly Coenagrion scitulum. We therefore ran an outdoor mesocosm experiment with a low- and high-density treatment close to the species’ northern expansion front. Density effects on survival, growth rate and body size are scored both during the pre-winter growth period and during the subsequent winter period. Additionally, foraging activity was scored at the end of the pre-winter period and body condition [size-corrected body mass, fat content and activity of phenoloxidase (PO)] was scored at the end of the winter period. 3. The low-density treatment had strong direct positive effects on survival, growth rate and body size of larvae before winter indicating relaxed competition. Lower foraging activity at the low-density treatment indicated higher food availability at low conspecific densities. Interestingly, the initial density treatment had stronger effect than densities experienced at the time of quantification on survival during the pre-freezing winter period and body condition estimates at the end of the experiment, indicating also delayed effects of the initial density treatment. Survival throughout a freezing period indicated extreme winter conditions are not likely a limiting factor in the range
expansion of this Mediterranean species. 4. The increased survival and individual growth rates (through causing shifts in
voltinism) at low conspecific density will translate in increased population growth rates. Furthermore, nutritional
advantages at low conspecific density may increase investment in dispersal ability. Together, these direct and delayed
density-dependent effects that gradually increase towards the expansion front are expected to accelerate range expansion.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of
Leuven, Ghent University
Authors: Therry, L. (Ekstern), Swaegers, J. (Ekstern), Dinh, K. V. (Intern), Bonte, D. (Ekstern), Stoks, R. (Ekstern)
Pages: 1430-1441
Publication date: 2016
Main Research Area: Technical/natural sciences

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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
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Scopus rating (2016): CiteScore 3.36 SJR 1.568 SNIP 1.41
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.537 SNIP 1.371 CiteScore 2.95
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.487 SNIP 1.473 CiteScore 3.03
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.045 SNIP 1.9 CiteScore 4.02
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.075 SNIP 1.755 CiteScore 3.76
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.927 SNIP 1.628 CiteScore 3.33
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.736 SNIP 1.525
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.734 SNIP 1.514
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.618 SNIP 1.502
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.741 SNIP 1.701
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.943 SNIP 1.869
Scopus rating (2005): SJR 1.996 SNIP 1.882
Scopus rating (2004): SJR 1.584 SNIP 1.543
Scopus rating (2003): SJR 1.753 SNIP 1.552
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.34 SNIP 1.452
Web of Science (2002): Indexed yes
Magnitude, spatial scale and optimization of ecosystem services from a nutrient extraction mussel farm in the eutrophic Skive Fjord, Denmark

Suspended mussel aquaculture has been proposed as a possible mechanism by which to remove excess nutrients from eutrophic marine areas. In this study, seasonal mussel growth and water clarification (through seston and phytoplankton depletion) were studied at a commercial-scale nutrient extractive mussel farm in a highly eutrophic Danish fjord. Spatial variations in mussel biomass were examined throughout the year and no significant differences were detected within the farm. Food depletion by mussels was examined at spatial scales ranging from individuals to the entire farm and surrounding area. Phytoplankton depletion on the scale of individual mussel loops, determined using the siphon mimic approach, indicated between 27 and 44% depletion of chlorophyll a (chl a). Farm-scale depletion was detected and visualized based on intensive 3D spatial surveys of the distribution of chl a and total suspended particulate matter concentrations both inside and outside the farmed area. Average reductions in food supply within the farm ranged from 13 to 31%, with some areas showing >50% food depletion. A food depletion model was developed to estimate the optimal mussel density required to maximize removal of excess phytoplankton. The model employed mussel clearance rate estimates derived from the observed magnitude of food depletion within the farm. Model results indicate that the mussel population filtration rate could be increased by 80 to 120% without any negative feedback on mussel growth. This could be accomplished by approximately doubling the standing stock of mussels in the farm, hence doubling the amount if nutrients removed at mussel harvest.
Making a splash about eel

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management
Authors: Reeh, L. (Intern)
Publication date: 2016
Event: Abstract from International Marine Science Communication Conference (CommOCEAN), Brugge, Belgium.
Main Research Area: Technical/natural sciences

Marine Climate Services - Forecasting the state of the ocean at end-user relevant time-scale
Recent advances in oceanographic modelling mean that today we can forecast the state of the ocean with meaningful skill up to a decade in advance. Such forecasts are potentially of great value to society, as they span the gap between the short (days-to-weeks) time scales of weather forecasts and the long (century) time-scales of climate projections: importantly, these are the time scales where most users make important decisions. However, a translation step is required to convert the outputs from these models, which are typically physical variables, into variables that are directly relevant to end-users (e.g. distribution and productivity of fish stocks) to create so-called “climate services”. As an example of this process and its potential, I will describe the development of skilful forecasts of a biological variable on this 1-10 year time scale: the distribution of bluefin tuna (Thunnus thynnus) in the North Atlantic. Further opportunities for forecasting variables, both globally and that are of direct relevance to Danish end-users will also be presented.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Payne, M. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Marine ecosystem connectivity mediated by migrant–resident interactions and the concomitant cross-system flux of lipids

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Centre for Ocean Life, National Food Institute, Research Group for Bioactives – Analysis and Application, Section for Marine Ecology and Oceanography, Lund University, University of Bergen
Pages: 4076-4087
Marine virkemidler: Beskrivelse af virkemidlernes effekter og status for vidensgrundlag

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, DHI, Syddansk Universitet, Videncenter for landbrug (SEGES), Danmarks Naturfredningsforening, Naturstyrelsen, Aarhus University, NaturErhvervstyrelsen
Authors: Timmermann, K. (ed.) (Ekstern), Boye, A. G. (Ekstern), Bruhn, A. (Ekstern), Erichsen, A. C. (Ekstern), Flindt, M. (Ekstern), Fossing, H. (Ekstern), Gertz, F. (Ekstern), Jørgensen, H. M. (Ekstern), Petersen, J. K. (Intern), Schwærter, S. (Ekstern)
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Main Research Area: Technical/natural sciences
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Publishers version
Links:
http://dce2.au.dk/pub/MarineVirkemidler.pdf
Source: FindIt
Source-ID: 2291881309
Publication: Research › Report – Annual report year: 2016
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.451 SNIP 1.196
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.589 SNIP 1.379
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.621 SNIP 1.236
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.354 SNIP 1.267
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.558 SNIP 1.553
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.744 SNIP 1.542
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.097 SNIP 1.622
Scopus rating (2002): SJR 1.909 SNIP 1.457
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.769 SNIP 1.46
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.5 SNIP 1.464
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.928 SNIP 1.436
Original language: English
Electronic versions:
Maximizing_fisheries_yields.pdf
DOIs:
10.1139/cjfas-2015-0098
Methods for the study of marine biodiversity

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Pages: 129-163
Publication date: 2016

Host publication information
Title of host publication: The GEO Handbook on Biodiversity Observation Networks
Publisher: Springer
Editors: Walters, M., Scholes, R.
ISBN (Print): 978-3-319-27286-3
Main Research Area: Technical/natural sciences
Electronic versions:
Postprint
DOIs: 10.1007/978-3-319-27288-7_6
Publication: Research - peer-review › Book chapter – Annual report year: 2016

Microbial water quality - tools and challenges

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Pedersen, L. (Intern), Pedersen, P. B. (Intern)
Publication date: 2016
Event: Abstract from International Conference on Recirculating Aquaculture, Roanoke, VA, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Microplastic exposure studies should be environmentally realistic

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography
Authors: Lenz, R. (Intern), Enders, K. (Intern), Nielsen, T. G. (Intern)
Pages: E4121 - E4122
Publication date: 2016
Migration, distribution and population (stock) structure of shallow-water hake (Merluccius capensis) in the Benguela Current Large Marine Ecosystem inferred using a geostatistical population model

Shallow-water hake (Merluccius capensis) is of considerable ecological and economic importance in the Benguela Current Large Marine Ecosystem in South Africa and Namibia. Optimal management of the resource is currently constrained by the limited understanding of migration patterns and population (stock) structure. We combined data from multiple demersal trawl surveys from the entire distribution area to estimate growth rate, mortality and spatial and temporal patterns of M. capensis. Analyses were conducted using the geostatistical model GeoPop. The complexity of the model and the amount of data required a new level of soft- and hardware performance. This was achieved by utilizing Template Model Builder and high-end computational hardware (Amazon Elastic Compute Cloud, EC2). The data and the model enabled us to follow the distribution and infer movements of M. capensis from the recruitment/nursery areas, through the juvenile phase and the adults’ migration to the spawning areas outside/upstream of the nursery areas. This revealed some previously unknown migration patterns and indicated natal homing and the existence of three primary population components in the region, namely the Walvis (central and northern Namibia), the Orange (Southern Namibia-Northern SA) and the Agulhas (Southern part of SA) components. Our results also indicated substantial regional differences in mortality. We recommend that fisheries assessment, advice and management take consideration of these aspects of the distribution and population (stock) structure of M. capensis in the Benguela Current Large Marine Ecosystem.
Miljøindsats i ørredvandløb kan fordoble lystfiskernes fangst af wilde havørreder

General information
State: Published
Modelling gastric evacuation in gadoids feeding on crustaceans

A mechanistic, prey surface-dependent model was expanded to describe the course and rate of gastric evacuation in predatory fishes feeding on crustacean prey with robust exoskeletons. This was accomplished by adding a layer of higher resistance to the digestive processes outside the inner softer parts of a prey cylinder abstraction and splitting up the prey evacuation into two stages: an initial stage where the exoskeleton is cracked and a second where the prey remains are digested and evacuated. The model was parameterized for crustaceans with different levels of armour fed to Atlantic cod Gadus morhua or whiting Merlangius merlangus and recovered from the stomachs at different post-prandial times. The prey species were krill Meganyctiphanes norvegica; shrimps and prawns Crangon crangon, Pandalus borealis, Pandalus montagui and Eualus macilentus; crabs Liocarcinus depurator and Chionoecetes opilio. In accordance with the apparent intraspecific isometric relationship between exoskeleton mass and total body mass, the model described stage duration and rate of evacuation of the crustacean prey independently of meal and prey sizes. The duration of the first stage increased (0-33 h) and the evacuation rate of both stages decreased (by a half) with increasing level of the crustacean armament in terms of chitin and ash. A common, interspecific parameterization of the model within each of the categories krill, shrimp and crab can probably be used if the contents of chitin and ash are similar among prey species per prey category. The model offers a simple way for estimating evacuation rates from stomach content data in order to obtain food consumption rates of wild fishes, provided that information about digestion stage of crustacean prey is available. © 2016 The Fisheries Society of the British Isle
Modelling stressors on the eelgrass recovery process in two Danish estuaries

Eelgrass (Zostera marina L.) depth limit is used as an environmental indicator in Danish coastal waters in the Water Framework Directive (WFD) to evaluate coastal waters and their ecological condition. Even after decades of reduced nutrient loadings the reestablishment of eelgrass has not yet succeeded. The mechanisms hindering/delaying eelgrass recovery were recently identified: 1) lack of sediment anchoring capacity, 2) resuspension created by drifting ephemeral macroalgae, 3) seedling uprooting created by current and wave forces, 4) ballistic stress from attached macroalgae and 5) burial of seeds and seedlings by lugworms. These processes were quantified and introduced to an ecological MIKE 3D model. The developed model was calibrated and validated on two Danish estuaries, Odense Fjord and Roskilde Fjord. Analyses of the simulations were performed on area distribution maps. The parameterized stressors impact has been investigated over a three-year period. The results indicate accumulated effects from multiple stressors weakening the capability of eelgrass to recolonize. Combining all stressors in the model decreased the total area covered by eelgrass 83.72% in Odense Fjord and 80.30% in Roskilde Fjord compared to simulation without stressors. Eelgrass peak biomass declined in both fjords from 33.4 to 4.55 ton C km⁻² in Odense Fjord and from 24.42 to 5.58 ton C km⁻² in Roskilde Fjord. Combining lugworm burial of seeds and seedlings with resuspension from macroalgae and wave forcing had the second strongest negative impact on eelgrass growth, area reduction of 78.31% and 73.14% in Odense and Roskilde Fjord was seen. Ballistic stress from attached macroalgae also reduced growth drastically. Light conditions, sediment organic content along with shear stress at the sediment surface impact the ability of eelgrass to cope with above mentioned stressors. The spatial resolution of the model setup made it possible to generate maps where eelgrass is exposed to lowest stress, revealing areas for potential eelgrass recovery. The developed eelgrass model is now used as a national tool to predict areas where eelgrass restoration effort may be initiated.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, University of Southern Denmark, DHI Denmark
Authors: Kuusemäe, K. (Ekstern), Rasmussen, E. K. (Ekstern), Canal-Vergés, P. (Intern), Flindt, M. R. (Ekstern)
Pages: 11-42
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecological Modelling
Volume: 333
ISSN (Print): 0304-3800
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.43 SJR 0.941 SNIP 1.089
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.087 SNIP 1.112 CiteScore 2.43
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.135 SNIP 1.353 CiteScore 2.7
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.153 SNIP 1.329 CiteScore 2.53
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.029 SNIP 1.229 CiteScore 2.28
Modelling the effects of dietary methionine level and form on postprandial plasma essential amino acid profiles in rainbow trout (Oncorhynchus mykiss)

Aquafeed formulation is susceptible to affect amino acid (AA) availability for metabolic functions. Statistical models were applied to quantify the effect of dietary methionine level (from 6.01 to 16.17 g kg⁻¹ dry matter) and form (free, coated or bound) on postprandial concentrations of plasma essential amino acid (EAA) in rainbow trout. Twelve diets were formulated with pea and soya protein concentrate or fish meal as the main protein ingredients and were supplemented or not with increasing amount of either crystalline or agar-coated methionine. Fish were acclimatized to one of the 12 diets for 6 weeks before postprandial plasma sampling (six sampling points up to 36 h, seven fish each time), further analysed for EAA content. Using generalized additive models, we show that (i) dietary methionine level and form explained 74% postprandial methionine plasma variations and that (ii) the methionine dietary form and plasma concentrations significantly affected the plasma concentrations of the other EAAs. Finally, linear model revealed a positive relationship (R² > 0.9) between plasma concentrations of the three branched-chain AAs under the present experimental conditions. The results obtained add new information on the dietary effects on EAAs in the plasma availability and the interactions between them.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Section for Ecosystem based Marine Management, BioMar A/S
Authors: Rolland, M. (Intern), Feekings, J. P. (Intern), Dalsgaard, A. J. T. (Intern), Holm, J. (Ekstern), Skov, P. V. (Intern)
Pages: 1185–1201
Publication date: 2016
Main Research Area: Technical/natural sciences
Multidisciplinary perspectives on the history of human interactions with life in the ocean

There is an essentially circular interaction between the human social system and the marine ecosystem. The Oceans Past V Conference "Multidisciplinary perspectives on the history of human interactions with life in the ocean" held in Tallinn, Estonia, in May 2015 was an opportunity for the presentation and discussion of papers on a diverse array of topics that
examined this socio-ecological system from a historical perspective. Here we provide background to the disciplines participating in the conference and to the conference itself. We summarize the conference papers that appear in this special volume of the ICES JMS and highlight issues which arose during general discussion. We make two conclusions. First, to have greater impact and ensure more efficient use of knowledge gained from marine historical ecology (MHE) and marine environmental history (MEH) in ecosystem-based management and related policy development, practitioners need to work more routinely with population and ecological modellers and statisticians. This will allow greater processing of the available historical data to derive ecologically meaningful properties that can then be used to assess the ecological impact of long-term changes of affected species and define appropriate and realistic management targets. Second, increased multi- and trans-disciplinary effort is required to better understand the relative importance of different human demographic, technological, economic, and cultural drivers on the patterns, intensities and trajectories of human activities affecting marine ecosystems.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, NIWA, University of Tartu
Authors: MacDiarmid, A. (Ekstern), MacKenzie, B. (Intern), Ojaveer, H. (Ekstern)
Pages: 1382-1385
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 73
Issue number: 5
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Web of Science (2016): Indexed yes
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
Mussel longline extension of the production season

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Danish Shellfish Centre  
**Authors:** Saurel, C. (Intern), Andersen, L. K. (Intern), Barreau, P. D. A. (Intern), Boesen, H. (Intern), Errard, M. (Intern), Nielsen, P. (Intern), Petersen, J. K. (Intern)  
**Publication date:** 2016  
**Event:** Abstract from Aquaculture Europe, Edinburgh, United Kingdom.  
**Main Research Area:** Technical/natural sciences  
**Publication:** Research › Conference abstract for conference – Annual report year: 2016

Myfish : Maximising yield of fisheries while balancing ecosystem, economic and social concerns: Legacy booklet

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Hellenic Centre for Marine Research, AquaMarine Advisers, University of Copenhagen  
**Number of pages:** 53  
**Publication date:** 2016

Naturlig smoltudvandring fra danske vandløb

**General information**

**State:** Published  
**Organisations:** National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
New approaches to improve the removal of dissolved organic matter and nitrogen in aquaculture

Reducing the environmental impact of aquaculture requires that waste treatment practices are further improved. Currently applied treatment technologies achieve good solids removal and nitrification. Yet discharge of nitrogen (N) and organic matter (OM) from fish farms is still often an important issue constraining aquaculture development, especially in sensitive areas. Possibilities for efficient end-of-pipe treatment exist for large intensive recirculating aquaculture systems (RAS), while smaller and especially the technically less advanced fish farms, struggle to reduce nutrient discharge further due to the lack of cost-effective and easy applicable treatment methods for removing dissolved N and OM. The purpose of this PhD thesis was to assess the problem of removing dissolved N and OM in the context of the large differences in system intensity between farms, and to devise new, simple methods for removing dissolved N and OM from aquaculture effluents of technically less advanced farms in particular. The work split in two parts. The first part focused on the turnover of dissolved N-compounds (Paper I) and dissolved organic matter (DOM) (Paper II) and in aerobic biofilters operated at increasing long-term waste loadings. The second part examined the potential of using anoxic denitrifying woodchip bioreactors for removal of nitrate from aquaculture effluent (Paper III-V). Investigations within the first part showed that the effectiveness of biofilters, as determined by their areal removal rates, for removing DOM and degrading ammonia, nitrite and urea, increased with increasing long-term waste loading. The findings sustained/suggested? that DOM to (some extend)? can be removed by biofiltration, and that biofilters therefore may be applied for removing DOM from aquaculture effluents. The studies furthermore showed that degradation of urea contributes to the ongoing nitrification activity in aquaculture biofilters, and that the transition zone from first order (substrate dependent) to zero order (substrate independent) degradation of ammonia and nitrite was elevated with increasing long-term biofilter loading up to a certain threshold. The latter indicated that the removal capacity of biofilters operated at lower loadings is easily exceeded, and that they may not respond very well to sudden increases in total ammonia nitrogen (TAN) concentrations. In the second part of the thesis, a field study documented the start-up performance of a pilot-scale, denitrifying woodchip bioreactor at a commercial outdoor fish farm (Paper III). Nitrate removal was immediate after bioreactor start-up and was accompanied by short-term leaching of nutrients and organic matter from the woodchips. The study demonstrated that woodchip bioreactors are able to remove nitrate from dilute aquaculture effluents under commercial conditions. The obtained nitrate removal rate (7.06±0.81 g NO3-N /m3/d at ~8°C) was, however, relatively low, signifying that a quite large reactor would be required for complete removal of NO3-N at commercial farms. Laboratory studies were therefore carried out to test whether removal rates in woodchip bioreactor could be improved. Paper IV demonstrated that simultaneously changing the hydraulic retention time and adding bicarbonate to the inlet water of laboratory-scale woodchip bioreactors improved N removal. Moreover, the study indicated that sulfur-based autotrophic denitrification is potentially important to the overall N removal in woodchip bioreactors. A subsequent laboratory study demonstrated that higher N removal rates could be achieved in mixotrophic denitrification reactors containing mixtures of woodchips, sulfur granules and seashells (Paper V).

12 Altogether, the woodchip studies sustained that denitrifying woodchip bioreactors may represent an alternative and simple method for removing nitrate from dilute/low-organic-strength aquaculture effluents for which application of, for example, heterotrophic denitrification reactors needing input of organic carbon sources is generally not feasible.
New records of sabellids and serpulids (Polychaeta: Sabellidae, Serpulidae) from the Tropical Eastern Pacific

Sabellids and serpulids are two well represented families in the polychaete fauna of the Tropical Eastern Pacific, with 31 and 34 species respectively; however, most records come from the Gulf of California or the western coast of Baja California Peninsula. Only a few records are from localities in the large expanse of the central and southern Mexican Pacific. Thus, sabellids and serpulids were collected from several shallow water habitats along the coast of Mexican Pacific, such as coastal lagoons, coral reefs, rocky shores and from man-made structures as marinas, piers and ships of several harbors; additionally, specimens from national collections were revised. More than 8,400 specimens of sabellids and serpulids from the states of Baja California, Baja California Sur, Sonora, Sinaloa, Michoacan, Guerrero, Oaxaca and Chiapas, and some specimens from Panama and Peru were examined. In the present work we record new localities of four sabellids and 24 serpulids. One sabellid, Branchiomma bairdi, is an exotic/invasive species in Oaxaca, Sinaloa and Baja California Sur, while four species of serpulids are exotic and/or cryptogenic species: Ficopomatus uschakovi, Hydrodies dirampha, H. elegans and H. sanctaecrucis. Additionally, the geographical range has been extended for five species: the sabellids Pseudobranchiomma punctata from Oahu, Hawaii to La Paz Bay, and Parasabella pallida from California to Puerto Escondido, Baja California Sur; and for three serpulids, Hydrodies inermis from the Galapagos Islands to Agua Blanca, Oaxaca, H. gairacensis from Panama to Puerto Angel, Oaxaca, and H. panamensis from Panama to Huatulco, Oaxaca and Faro de Bucerias, Michoacan. Hydrodies cf. amri, previously recorded as H. brachyacantha from Oahu, Hawaii, is more similar to H. amri from Australia. The number of sabellids recorded for the Tropical Eastern Pacific increased to 33, the serpulid species to 35.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Ciudad Universitaria, Universidad Autonoma de Nuevo Leon, Universidad Nacional Mayor de San Marcos
Authors: Rolando Bastida-Zavala, J. (Ekstern), Rodriguez Buelna, A. S. (Intern), Angel De Leon-Gonzalez, J. (Ekstern), Andrea Camacho-Cruz, K. (Ekstern), Carmona, I. (Ekstern)
Pages: 401-457
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Zootaxa
Volume: 4184
Issue number: 3
ISSN (Print): 1175-5326
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.95 SJR 0.356 SNIP 0.948
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.633 SNIP 0.985 CiteScore 0.93
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.584 SNIP 0.949 CiteScore 0.84
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.345 SNIP 0.977 CiteScore 0.97
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.582 SNIP 1.014 CiteScore 0.86
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.568 SNIP 0.932 CiteScore 0.85
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.561 SNIP 0.922
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.555 SNIP 1.014
North Sea herring: Longer term perspective on management science behind the boom, collapse and recovery of the North Sea herring fishery

General information
State: Published
Authors: Dickey-Collas, M. (Intern)
Pages: 365-408
Publication date: 2016

Host publication information
Title of host publication: Management Science in Fisheries: An Introduction to Simulation-Based Methods
Place of publication: London
Publisher: Routledge
Editors: Edwards, C. T., Dankel, D. J.
ISBN (Print): 978-1138806801
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2016

Nu er det snart tid for udsætning af flodkrebs

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Berg, S. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/Nyheder/2016/06/Krebs-udsaaetning-i-soer-tilskud?id=8120ae4e-de0f-47d2-b487-72f0ebe9808&utm_source=newsletter&utm_media=mail&utm_campaign=2016_06_09_Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2016

Nutrient compensation as management tool– Sugar kelp production in sustainable aquaculture

Integrating multi-trophic aquaculture (IMTA) is theoretically a sustainable production form, which minimizes waste products from e.g. fish farms, by the co-production of bivalves or/and seaweed. For the Danish fish farmers the extractive organisms could be the solution for increasing fish production, but do the principles of IMTA fully mitigate the nutrient impact from open net-pen fish production at realistic production scales?

In this project, commercial scale cultivation of sugar kelp (Saccharina latissima) was investigated with regard to operation, yield, biofilter capacity and mapping the biomass composition for one year incl. protein content, amino acid profiles, lipids and fatty acid composition, minerals and vitamins. Results were obtained from an IMTA site and compared to a reference site with no impact from the fish (175 t year−1) and mussel farm, both located just outside Horsens Fjord, Denmark. The nitrogen content in sugar kelp varied between 0.5-3.7% of dw with the highest concentration in September 2013 with an estimated maximum yield of 5.1-7.1 tons ww ha-1 year-1. Potentially, a cultivation area of 204-340 ha would be needed to achieve 100% N recovery, based on the tonnage of the specific fish farm. The harvest contained protein (10%), lipids (3%) and vitamin A (34 mg/kg per dw), however with large seasonal variations. Sugar kelp increased the biodiversity by

BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.481 SNIP 0.897
Scopus rating (2007): SJR 0.389 SNIP 0.875
Scopus rating (2006): SJR 0.294 SNIP 0.687
Original language: English
ZOOLOGY, GULF-OF-CALIFORNIA, FICOPOMATUS-USCHAKOVI POLYCHAETA, ANNELIDA POLYCHAETA,
COSTA-RICA, PHYLOGENETIC-RELATIONSHIPS, MORPHOLOGICAL DATA, BAJA-CALIFORNIA, MEXICAN PACIFIC
, NATIONAL-PARK, HYDROIDS, Cryptogenic species, Hydroides, Parasabella, Pseudobranchiomma, Micheloran

DOIs:
10.11646/zootaxa.4184.3.1
Source: FindIt
Source-ID: 2348722597
Publication: Research - peer-review › Journal article – Annual report year: 2016
functioning as hanging reefs, but did not significantly affect the sediment by shading (5% in a scenario of 5 kg/meter
dropper rope). During the project a number of improvements of the existing techniques for producing seaweed on
suspended line systems were developed, however, further optimization of techniques for deployment, production as well
as harvest is needed. This would also allow sugar kelp production as a viable and robust mitigation tool for nitrogen
removal and hopefully allow for future expansion of sustainable marine fish production in Denmark.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, National Food Institute, Research Group
for Bioactives – Analysis and Application, Aarhus University
Authors: Schmedes, P. S. (Intern), Boderskov, T. (Forskerdatabase), Silva Marinho, G. (Intern), Holdt, S. L. (Intern)
Number of pages: 1
Publication date: 2016
Event: Abstract from 22nd International Seaweed Symposium, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences

Bibliographical note
OR-19-02
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

Nye miljøvenlige desinfektionsmidler til økologiske dambrug
Pereddikesyre og brintoverilte kan anvendes til vandrensning og kontrol af vandkvalitet i akvakultur systemer. Her
beskrives seneste praktiske erfaringer som alternativ til f. eks. formalin. De nye desinficerende midler er mildere og kan
håndteres på en væsentlig mere sikker måde end formalin. Da begge produkter nedbrydes hurtigt, omsættes en stor del
af den tilsatte mængde direkte i dammene. Ved nedbrydningen frigives ilt fra brintoverilte, mens pereddikesyre nedbrydes
til vand og kuldioxid. Der udledes således mindre mængder af de to stoffer til vandløbet, og da de effektive
behandlingskonzentrationer i forvejen er lave, er miljøpåvirkningen minimal.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: Pedersen, L. (Intern)
Pages: 1-4
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Økologi & Erhverv
Issue number: 590
ISSN (Print): 1904-1586
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: FindIt
Source-ID: 2306320167
Publication: Research › Journal article – Annual report year: 2016

Ny forvaltningsplan for skarv

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Publication date: 2016

Publication Information
Type: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2016/10/skarv-regulering-forvaltningsplan?id=4c3cd3aa-89a9-4eaf-b991-f230011b618e&utm_source=newsletter&utm_media@mail&utm_campaign=2016-10-05
Observations on the morphological diversity and distribution of two siliceous nannoplankton genera, Hyalolithus and Petasaria

Scale-bearing siliceous nannoplankton are occasionally encountered in surface seawater samples, but are rarely identified or illustrated. In this study, the morphological diversity of the haptophyte Hyalolithus neolepis and the enigmatic Petasaria heterolepis are investigated in scanning and transmission electron microscopes using materials from around the world. Results show that H. neolepis scales exhibit variation in the width of the marginal hyaline area, but intermediate specimens make separation of the two morphologies difficult. Petasaria heterolepis scales also show differences, in the presence of tubercle rows in the hyaline area and degree of hyaline areal coverage, but separation into discrete varieties is difficult at present. However, specimens with scales bearing a protuberance are considered to be distinct enough to warrant the erection of a new species, Petasaria protuberans Jordan, Malinverno, Šupraha, Thomsen et Young sp. nov.
Ocean warming expands habitat of a rich natural resource and benefits a national economy

Geographic redistribution of living natural resources changes access and thereby harvesting opportunities between countries. Internationally shared fish resources can be sensitive to shifts in the marine environment and this may have great impact on the economies of countries and regions that rely most heavily on fisheries to provide employment and food supply. Here we present a climate change-related biotic expansion of a rich natural resource with substantial economic consequences, namely the appearance of northeast Atlantic mackerel (Scomber scombrus) in Greenlandic waters. In recent years, the summer temperature has reached record highs in the Irminger Current, and this development has expanded the available and realized mackerel habitat in time and space. Observations in the Irminger Current in east Greenland in 2011 of this temperature-sensitive epipelagic fish were the first records so far northwest in the Atlantic. This change in migration pattern was followed by a rapid development of a large-scale fishery of substantial importance for the national economy of Greenland (23% of Greenland's export value of all goods in 2014). A pelagic trawl survey was conducted in mid-summer 2014 and the results showed that the bulk of similar to 1 million Mg (=t) of mackerel in the Irminger Current in southeast Greenland were located in the relatively warm (>8.5 degrees C) surface layer. Mackerel was also observed in southwest Greenland. Finally, 15 CMIP5 Earth System Model projections of future marine climate were used to evaluate the epipelagic environment in Greenland. These projections for moderate and high CO2 emission scenarios (representative concentration pathways [RCP] 4.5 and 8.5) suggest how the available mackerel habitat may expand further in space and time. Overall, our results indicate that, if the stock remains large, productive, and continues its current migration pattern, then climate change has provided Greenland with a new unique opportunity for commercial exploitation. However, positive cases like this should not be cherry-picked and misused as arguments against timely and effective mitigation of climate change.

General information
State: Published
Organisations: Section for Marine Living Resources, National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Greenland Institute of Natural Resources, Institute of Marine Research, Marine Research Institute, Greenland Institute of Natural Resources
Authors: Jansen, T. (Intern), Post, S. L. (Intern), Kristiansen, T. (Ekstern), Oskarsson, G. J. (Ekstern), Boje, J. (Intern), MacKenzie, B. R. (Intern), Broberg, M. (Ekstern), Siegstad, H. (Ekstern)
Pages: 2021-2032
Publication date: 2016
Main Research Area: Technical/natural sciences
Oddere er hårde ved ørrederne i Gudenåen

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Publication date: 2016

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Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Publication: Communication › Internet publication – Annual report year: 2016

Oil spills and dispersants can cause the initiation of red tides

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Almeda, R. (Intern), Buskey, E. (Ekstern)
Publication date: 2016
Event: Abstract from 7th SETAC World Congress, Orlando, United States.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Ontogeny and growth of early life stages of captive-bred European eel

Captive breeding of European eel, Anguilla anguilla is challenged by the complex hormonal control of Anguillid eel reproduction and the distinctive ontogeny of the leptocephalus larvae that are unique to the Elopomorph superorder. Recent experimental research has succeeded in the production of viable eggs and larvae of European eel, providing the basis for studies on early life stages of this species in captivity. In this study, we describe and illustrate morphological characteristics of eggs, embryos, and larvae from fertilization to termination of the yolk sac stage and provide a comparison with additional commercially important eel species. Furthermore, we model growth during the critical first phase in larval ontogeny, i.e. the yolk sac stage, and test for maternal effects. The eggs of A. anguilla typically have numerous oil droplets that coalesce into a single large oil droplet, while the zygote forms a large perivitelline space, reaching an egg diameter of 1.45 ± 0.12 mm at 3.0 to 3.5 h post fertilization. Embryonic development from fertilization to larval hatch lasted ~46–48 h at 20 °C with the larvae emerging in a relatively undeveloped stage with a protuberant yolk sac. During the period of yolk and oil absorption, the larvae undertook significant changes in head and body morphology. At the completion of yolk sac absorption, the largely transparent larvae had a set of protruding teeth, pigmented eyes and tail, and a simple alimentary tract. Larvae appeared capable of feeding at ~12 days post hatch at 20 °C, and were able to survive another ~10 days without feeding. Larval length approached and symptotic maximum of 6.8mm by round day 10 in non-fed larvae. Larval batches from different maternal origins varied in yolk sac size and the extent of yolk sac resources influenced larval size at the end of the yolk sac stage. The ontogenetic description presented here fills a gap in knowledge about the yet undiscovered early life stages of native European eel, which can provide a framework of reference for the development of hatchery technology. Such progress is urgently needed for a self-sustained aquaculture of this high-value and critically endangered species. Statement of relevance: European eel is a high-value species in aquaculture, however, production is presently hampered by reliance on wild caught fry. Captive production of glass eels will reopen markets in Europe and Asia, benefiting European eel producers. The results presented here document recent progress within assisted reproduction and larval culture of this species in aquaculture and aid establishing hatchery technology of this species

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Marine Living Resources, Billund Aquakulturservice A/S, Danish Aquaculture Organisation
Optimizing nitrate removal in woodchip beds treating aquaculture effluents

Nitrate is typically removed from aquaculture effluents using heterotrophic denitrification reactors. Heterotrophic denitrification reactors, however, require a constant input of readily available organic carbon (C) sources which limits their application in many aquaculture systems for practical and/or economic reasons. A potential alternative technology for removing nitrate currently applied for treating surface and drainage water is based on using wood by-products as a carbon source for denitrification. Using lab-scale horizontal-flow woodchip filters, the current study investigated the potential of optimizing woodchip reactors for treating aquaculture effluent. A central composite design (CCD) was applied to assess the effects of simultaneously changing the empty bed contact time (EBCTs of 5.0-15.0 h; corresponding to theoretical hydraulic retention times of 3.3-9.9 h) and bicarbonate (HCO₃⁻) inlet concentration (0.50-1.59 g HCO₃⁻/l) on the removal rate of NO₃⁻-N, and additional organic and inorganic nutrients, in effluent deriving from an experimental recirculating aquaculture system (RAS). Volumetric NO₃⁻-N removal rates ranged from 5.20 ± 0.02 to 8.96 ± 0.19 g/m³/day and were enhanced by adding bicarbonate, suggesting that parts of the removal was due to autotrophic denitrification. The highest N removal rate (8.96 ± 0.05 g/m³/day) was achieved at an EBCT and HCO₃⁻ combination of 15 h and 1.59 g HCO₃⁻/l. Bicarbonate inlet concentration as a single factor had the strongest effect on N removal rates followed by the interaction...
with EBCT, and EBCT2 (quadratic term). The study thus indicates that woodchip beds may be applied and optimized for removing nitrate from aquaculture effluents. Statement of relevance: This study is a relevant contribution to research in aquaculture as it presents an alternative method for removing nitrates from aquaculture effluents especially for less intensive fish farms. Furthermore, it shows how this method can be optimized to yield higher removal rates of nitrate.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Aarhus University
Authors: von Ahnen, M. (Intern), Pedersen, P. B. (Intern), Hoffmann, C. C. (Ekstern), Dalsgaard, A. J. T. (Intern)
Pages: 47-54
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Main Research Area: Technical/natural sciences

**Publication information**

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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.263
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.008 SNIP 1.689
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.915 SNIP 1.236
Organic extractive aquaculture state of the art and challenges

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquaculture
Authors: d’Orbcastel, R. (Ekstern), Abbink, W. (Ekstern), Jokumsen, A. (Intern), Przybyla, C. (Ekstern), Callier, M. (Ekstern), Delélée, S. (Ekstern), Blancheton, J. (Ekstern)
Publication date: 2016
Event: Abstract from Aquaculture Europe 2016, Edinburgh, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2016

Ørreder gør ikke altid, som der står i lærebøgerne

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Sivebæk, F. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Publication: Communication › Internet publication – Annual report year: 2016

Ørredkort: Nyt Danmarkskort viser, at ørredene gyder i mange vandløb

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern), Baktoft, H. (Intern), Sivebæk, F. (Intern)
Publication date: 2016

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Main Research Area: Technical/natural sciences
Links:
Ørred og laks er nu "miljøindikatorer"

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern), Sivebæk, F. (Intern), Bakttoft, H. (Intern)
Publication date: 2016

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Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links: http://www.fiskepleje.dk/Nyheder/2016/03/Oerreden-er-nu-miljoeindikator?id=b71e2a39-0c79-4e49-b865-9969a33099b&utm_source=newsletter&utm_media=mail&utm_campaign=10-03-20016-Nyhedsbrev
Publication: Communication › Internet publication – Annual report year: 2016

Outlier loci detect intraspecific biodiversity amongst spring and autumn spawning herring across local scales
Herring, Clupea harengus, is one of the ecologically and commercially most important species in European northern seas, where two distinct ecotypes have been described based on spawning time; spring and autumn. To date, it is unknown if these spring and autumn spawning herring constitute genetically distinct units. We assessed levels of genetic divergence between spring and autumn spawning herring in the Baltic Sea using two types of DNA markers, microsatellites and Single Nucleotide Polymorphisms, and compared the results with data for autumn spawning North Sea herring. Temporally replicated analyses reveal clear genetic differences between ecotypes and hence support reproductive isolation. Loci showing non-neutral behaviour, so-called outlier loci, show convergence between autumn spawning herring from demographically disjoint populations, potentially reflecting selective processes associated with autumn spawning ecotypes. The abundance and exploitation of the two ecotypes have varied strongly over space and time in the Baltic Sea, where autumn spawners have faced strong depression for decades. The results therefore have practical implications by highlighting the need for specific management of these co-occurring ecotypes to meet requirements for sustainable exploitation and ensure optimal livelihood for coastal communities.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Estonian University of Life Sciences, University of Tartu, Queen's University Belfast
Authors: Bekkevold, D. (Intern), Gross, R. (Ekstern), Arula, T. (Ekstern), Helyar, S. J. (Ekstern), Ojaveer, H. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication information
Journal: PLOS ONE
Volume: 11
Issue number: 4
Article number: e0148499
ISSN (Print): 1932-6203
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.201 SNIP 1.092
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.414 SNIP 1.131 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Papposphaera heldalii sp nov (Haptophyta, Papposphaeraceae) from Svalbard

In an attempt to establish a taxonomy for the polar contingent of lightly calcified coccolithophores, we are currently dealing with species of Papposphaera. Here we describe a new species, Papposphaera heldalii sp. nov., based on material from Svalbard. The species is unique in terms of calyx design, which is an elegant modification of the standard P. sagittifera
theme, and also in terms of the absence of central area calcification in body coccoliths. The species thus occupies a further step in a sequence of five Arctic forms ranging from P. sagittifera via P. sarion, P. arctica and P. iugifera to P. heldalii showing a gradual reduction of central area calcification in body coccoliths. P. heldalii is unique also in the sense that the species has not been found during any of the major Arctic TEM nanoplankton surveys conducted during the last decades.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, University of Bergen
Authors: Thomsen, H. A. (Intern), Egge, J. K. (Ekstern)
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Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Acta Protozoologica
Volume: 55
Issue number: 1
ISSN (Print): 0065-1583
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.51 SJR 0.513 SNIP 0.81
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.754 SNIP 0.959 CiteScore 1.61
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.498 SNIP 0.526 CiteScore 0.98
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.458 SNIP 0.507 CiteScore 1.17
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.294 SNIP 0.44 CiteScore 0.82
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.721 SNIP 0.745 CiteScore 1.41
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.533 SNIP 0.577
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.506 SNIP 0.786
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.489 SNIP 0.569
Scopus rating (2007): SJR 0.933 SNIP 0.831
Scopus rating (2006): SJR 0.721 SNIP 0.805
Scopus rating (2005): SJR 0.642 SNIP 1.154
Scopus rating (2004): SJR 0.49 SNIP 1.11
Scopus rating (2003): SJR 0.445 SNIP 0.902
Scopus rating (2002): SJR 0.257 SNIP 0.505
Scopus rating (2001): SJR 0.648 SNIP 0.782
Scopus rating (2000): SJR 0.443 SNIP 0.639
We are currently revisiting coccolithophore genera and species described from high latitudes in both hemispheres, and also in the process describing new taxa when appropriate, with the aim of providing the best possible framework for polar species segregation based on external morphological features only. The present paper thus introduces Papposphaera iugifera nov. sp. from West Greenland (Disko - type locality), Svalbard (Isfjorden) and the Baltic Sea (Bothnian Sea). P. iugifera is clearly related to P. sagittifera, P. sarion and P. arctica and forms with these a continuum of species that are, with the exception of P. sarion, on the one hand much similar with respect to calicate spine details, while on the other hand clearly differentiated with respect to the complexity of central area calcification. While this is extensive in P. sagittifera it is reduced to just a single transverse bar or even completely absent in P. iugifera
Papposphaera obpyramidalis (Haptophyta, Papposphaeraceae): New findings from both Polar Regions

Papposphaera obpyramidalis is reinvestigated based on additional high latitude sampling from the southern hemisphere. The material used here comprises better preserved transmission electron microscope (TEM) material including several cells with complete flagellation, as well as light microscopy (LM) of living material. The re-examination basically confirms the findings that were part of the species description but also adds details on, for example, nutritional mode and the presence of an underlayer of unmineralized scales. P. obpyramidalis has hitherto been considered confined to Antarctic waters. However, here we present also findings of the species from Arctic realms based on recent SEM surveys from the Svalbard region, indicating a bipolar distribution.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, University of Bergen
Authors: Thomsen, H. A. (Intern), Egge, J. K. (Ekstern), Heldal, M. (Ekstern)
Pages: 267-273
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Revue de Micropaleontologie
Volume: 59
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.386 SNIP 0.802 CiteScore 1.02
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.472 SNIP 0.639 CiteScore 1.05
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.7 SNIP 0.808 CiteScore 1.11
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.079 SNIP 1.557 CiteScore 2.16
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.938 SNIP 1.579 CiteScore 1.59
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.5 SNIP 0.889 CiteScore 1.07
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.585 SNIP 0.557
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.658 SNIP 0.636
BFI (2008): BFI-level 1
Partitioning the metabolic scope: the importance of anaerobic metabolism and implications for the oxygen- and capacity-limited thermal tolerance (OCLTT) hypothesis

Ongoing climate change is predicted to affect the distribution and abundance of aquatic ectotherms owing to increasing constraints on organismal physiology, in particular involving the metabolic scope (MS) available for performance and fitness. The oxygen- and capacity-limited thermal tolerance (OCLTT) hypothesis prescribes MS as an overarching benchmark for fitness-related performance and assumes that any anaerobic contribution within the MS is insignificant. The MS is typically derived from respirometry by subtracting standard metabolic rate from the maximal metabolic rate; however, the methodology rarely accounts for anaerobic metabolism within the MS. Using gilthead sea bream (Sparus aurata) and Trinidadian guppy (Poecilia reticulata), this study tested for trade-offs (i) between aerobic and anaerobic components of locomotor performance; and (ii) between the corresponding components of the MS. Data collection involved measuring oxygen consumption rate at increasing swimming speeds, using the gait transition from steady to unsteady (burst-assisted) swimming to detect the onset of anaerobic metabolism. Results provided evidence of the locomotor performance trade-off, but only in S. aurata. In contrast, both species revealed significant negative correlations between aerobic and anaerobic components of the MS, indicating a trade-off where both components of the MS cannot be optimized simultaneously. Importantly, the fraction of the MS influenced by anaerobic metabolism was on average 24.3 and 26.1% in S. aurata and P. reticulata, respectively. These data highlight the importance of taking anaerobic metabolism into account when assessing effects of environmental variation on the MS, because the fraction where anaerobic metabolism occurs is a poor indicator of sustainable aerobic performance. Our results suggest that without accounting for anaerobic metabolism within the MS, studies involving the OCLTT hypothesis could overestimate the metabolic scope available for sustainable activities and the ability of individuals and species to cope with climate change.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Section for Ecosystem based Marine Management, Aalborg University, University of Porto, University of Copenhagen, Fisheries and Maritime Museum
Authors: Ejbye-Ernst, R. (Ekstern), Michaelsen, T. Y. (Ekstern), Tirsgaard, B. (Ekstern), Michaelsen, T. Y. (Ekstern), Wilson, J. M. (Ekstern), Jensen, L. F. (Ekstern), Steffensen, J. F. (Ekstern), Pertoldi, C. (Ekstern), Aarestrup, K. (Intern), Svendsen, J. C. (Intern)
Number of pages: 13
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Publication information
Journal: Conservation Physiology
Volume: 4
Issue number: 1
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Web of Science (2017): Indexed Yes
Scopus rating (2016): CiteScore 1.66 SJR 0.648 SNIP 0.501
Web of Science (2016): Indexed yes
Past climate-driven range shifts and population genetic diversity in arctic plants

High intra-specific genetic diversity is necessary for species adaptation to novel environments under climate change, but species tracking suitable conditions are losing alleles through successive founder events during range shift. Here, we investigated the relationship between range shift since the Last Glacial Maximum (LGM) and extant population genetic diversity across multiple plant species to understand variability in species responses.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University Centre in Svalbard, UiT The Arctic University of Norway, University of Fribourg, University of Innsbruck, University of Salzburg, Norwegian Institute for Nature Research, University of Lausanne, ETH Zurich, Aarhus University, University of Oslo, Tromsø University Museum, University of Helsinki
Pages: 461–470
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Journal: Journal of Biogeography
Volume: 43
Issue number: 3
ISSN (Print): 0305-0270
Ratings:
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Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.35
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.33
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.58
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.54
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 4.42
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.95
BFI (2010): BFI-level 2
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Paths to enhance the development and the uptake of industry-led technical solutions to improved selectivity

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aalborg University
Publication date: 2016
Event: Abstract from International Institute of Fisheries Economics and Trade Conference, Aberdeen, United Kingdom.
Main Research Area: Technical/natural sciences

Patterns and drivers of fish community assembly in a large marine ecosystem

The presence and survival of the species in a community depend on their abilities to maximize fitness in a given environment. The study of the processes that control survival and co-existence, termed ‘assembly rules’, follows various mechanisms, primarily related to biotic or abiotic factors. To determine assembly rules, ecological similarities of co-occurring species are often investigated. This can be evaluated using trait-based indices summarizing the species’ niches in a given community. In order to investigate the underlying processes shaping community assembly in marine ecosystems, we investigated the patterns and drivers of fish community composition in the Baltic Sea, a semi-enclosed sea characterized by a pronounced environmental gradient. Our results showed a marked decline in species- and functional richness, largely explained by decreasing salinities. In addition, habitat complexity and oxygen were found to be significant drivers. Furthermore, we showed that the trait composition of the fish community in the western Baltic Sea is more similar than expected by random chance alone. This implies that environmental filtering, acting along the salinity gradient, is the dominant factor shaping community composition. However, community composition in the eastern part, an area beyond the steep decline in salinity, was characterized by fewer species with largely different trait characteristics, indicating that community assembly is also affected by biotic interactions. Our results add to the knowledge base of key abiotic drivers impacting marine fish communities and their vulnerability to environmental changes, a key concern for fisheries and marine ecosystem management.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life
Authors: Pécuchet, L. (Intern), Törnroos, A. (Intern), Lindegren, M. (Intern)
Pages: 239-248
Patterns and mechanisms of dispersal in a keystone seagrass species

Z. noltei shows low genetic connectivity (from 10 s to 100 s of km) in the Black Sea. Physical modelling of dispersal well agree with estimates of genetic connectivity. Physical and genetic connectivity show possible but rare long distance
dispersal. Seeds get dispersed locally while shoots have higher dispersal potential. Physical and genetic measures estimate potential and realized connectivity.
Peracetic acid is a suitable disinfectant for recirculating fish-microalgae integrated multi-trophic aquaculture systems

Integrated multi-trophic aquaculture (IMTA) is a promising direction for the sustainable development of aquaculture. Microalgae have good potential to be integrated with recirculating aquaculture systems because they can use the nitrogen excreted from fish and share the same optimal pH value as in aquaculture. As a byproduct, the microalgae biomass can be used for fish feed or biofuel. However, the recirculating fish-microalgae IMTA system is under constant threat from fish pathogens and phytoplankton-lytic bacteria. Therefore, it is necessary to apply proper disinfectants as prophylaxis or treatment which are effective against these threats, but safe to fish and microalgae. For this purpose, peracetic acid (PAA) is a valid option because it is highly effective against fish pathogens and bacteria at low concentrations and degrades spontaneously to harmless residues. In the present study, we exposed the culture of a marine microalgae Tetraselmis chuii once per day for four days to four PAA products with differing hydrogen peroxide (H2O2/PAA) proportions at two concentrations (1 and 2 mg L−1PAA). The H2O2 solutions at equivalent total peroxide (H2O2 + PAA) concentrations were tested in parallel. The results show that the growth and photosynthesis of T. chuii were not affected by three of the PAA products (Wofasteril®E400, Wofasteril®E250 and Applichem®150) and equivalent H2O2 solutions at both concentrations. In contrast, Wofasteril®Lspez and an equivalent H2O2 solution at both concentrations caused irreversible culture collapse, photosynthesis dysfunction and irreversible cell damage. In conclusion, PAA products with low proportions of H2O2 are optimal disinfectants for fish-microalgae IMTA systems.

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Authors: Liu, D. (Ekstern), Behrens, S. (Ekstern), Pedersen, L. (Intern), Straus, D. L. (Ekstern), Meinelt, T. (Ekstern)
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Persistent shift of Calanus spp. in the south-western Norwegian Sea since 2003, linked to ocean climate

The southwestern Norwegian Sea is characterized by an inflow of warm and saline Atlantic water from the southwest and cold and less saline East Icelandic Water (EW), of Arctic origin, from the northwest. These two water masses meet and form the Iceland-Faroe Front (IFF). In this region, the copepod Calanus finmarchicus plays a key role in the pelagic ecosystem. Time-series of C. finmarchicus and Calanus hyperboreus in May and September, extending back to the early 1990s, were studied in relation to phytoplankton bloom dynamics and hydrography. The main reproductive period of C. finmarchicus started consistently earlier south of the IFF, resulting in different life cycles and stage compositions in the twowater masses. In 2003, a sudden shift occurred north of the IFF, resulting in a similar phenology pattern to south of the IFF. Before this, only one generation of C.
finmarchicus was produced in the Arctic water, but the earlier reproduction enabled the species to produce two
generations after 2003.
Simultaneously, C. hyperboreus, an expatriate in the EIW, largely disappeared. Food availability is unlikely the reason for
the phenological differences
observed across the front, as the typical pattern of the phytoplankton spring bloom showed an earlier onset north of the
IFF. Temperature and
salinity peaked at record high values in 2003 and 2004, and therefore possible links to oceanography are discussed. The
dominant role of
Calanus spp. and the potential linkages to water mass exchanges may herald strong effects on the ecosystem and pelagic
fish in this subpolar
Atlantic region under expected climate change

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Faroe Marine
Research Institute
Authors: Kristiansen, I. (Ekstern), Gaard, E. (Ekstern), Hátún, H. (Ekstern), Jonasdottir, S. (Intern), Ferreira, A. S. (Intern)
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BFI (2013): BFI-level 1
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Web of Science (2013): Indexed yes
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BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
To maximize reproductive success, many animal species have evolved functional sex change. Theory predicts that transitions between sexes should occur when the fitness payoff of the current sex is exceeded by the fitness payoff of the opposite sex. We examined phenotypic differences between the sexes in a sexchanging vertebrate, the mangrove rivulus fish (Kryptolebias marmoratus), to elucidate potential factors that might drive the ‘decision’ to switch sex. Rivulus populations consist of self-fertilizing hermaphrodites and males. Hermaphrodites transition into males under certain environmental conditions, affording us the opportunity to generate 40 hermaphrodite–male pairs where, within a pair, individuals possessed identical genotypes despite being different sexes. We quantified steroid hormone levels, behavior (aggression and risk taking), metabolism and morphology (organ masses). We found that hermaphrodites were more aggressive and risk averse, and had higher maximum metabolic rates and larger gonadosomatic indices. Males had higher steroid hormone levels and showed correlations among hormones that hermaphrodites lacked. Males also had greater total mass and somatic body mass and possessed considerable fat stores. Our findings suggest that there are major differences between the sexes in energy allocation, with hermaphrodites exhibiting elevated maximum metabolic rates, and showing evidence of favoring investments in reproductive tissues over somatic growth. Our study serves as the foundation for future research investigating how environmental challenges affect both physiology and reproductive investment and, ultimately, how these changes dictate the transition between sexes.
Phenotypic variation in metabolism and morphology correlating with animal swimming activity in the wild: relevance for the OCLTT (oxygen- and capacity-limitation of thermal tolerance), allocation and performance models

Ongoing climate change is affecting animal physiology in many parts of the world. Using metabolism, the oxygen- and capacity-limitation of thermal tolerance (OCLTT) hypothesis provides a tool to predict the responses of ectothermic animals to variation in temperature, oxygen availability and pH in the aquatic environment. The hypothesis remains controversial, however, and has been questioned in several studies. A positive relationship between aerobic metabolic scope and animal activity would be consistent with the OCLTT but has rarely been tested. Moreover, the performance model and the allocation model predict positive and negative relationships, respectively, between standard metabolic rate and activity. Finally, animal activity could be affected by individual morphology because of covariation with cost of transport. Therefore, we hypothesized that individual variation in activity is correlated with variation in metabolism and morphology. To test this prediction, we captured 23 wild European perch (Perca fluviatilis) in a lake, tagged them with telemetry transmitters, measured standard and maximal metabolic rates, aerobic
metabolic scope and fineness ratio and returned the fish to the lake to quantify individual in situ activity levels. Metabolic rates were measured using intermittent flow respirometry, whereas the activity assay involved high-resolution telemetry providing positions every 30 s over 12 days. We found no correlation between individual metabolic traits and activity, whereas individual fineness ratio correlated with activity. Independent of body length, and consistent with physics theory, slender fish maintained faster mean and maximal swimming speeds, but this variation did not result in a larger area (in square metres) explored per 24 h. Testing assumptions and predictions of recent conceptual models, our study indicates that individual metabolism is not a strong determinant of animal activity, in contrast to individual morphology, which is correlated with in situ activity patterns.

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Photoregulation in a Kleptochloroplastidic Dinoflagellate, Dinophysis acuta
Some phagotrophic organisms can retain chloroplasts of their photosynthetic prey as so-called kleptochloroplasts and maintain their function for shorter or longer periods of time. Here we show for the first time that the dinoflagellate Dinophysis acuta takes control over “third-hand” chloroplasts obtained from its ciliate prey Mesodinium spp. that originally ingested the cryptophyte chloroplasts. With its kleptochloroplasts, D. acuta can synthesize photosynthetic as well as photoprotective pigments under long-term starvation in the light. Variable chlorophyll fluorescence measurements showed that the kleptochloroplasts were fully functional during 1 month of prey starvation, while the chlorophyll a-specific inorganic carbon uptake decreased within days of prey starvation under an irradiance of 100 μmol photons m(-2) s(-1). While a acute cells can regulate their pigmentation and function of kleptochloroplasts they apparently lose the ability to maintain high inorganic carbon fixation rates.

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Plan for fiskepleje i Hover Å: Distrikt 25, vandsystem 17

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Authors: Christensen, H. A. (Intern)
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Authors: Christensen, H. A. (Intern)
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Authors: Mikkelsen, J. S. (Intern)
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Plan for fiskepleje i Ryå: Distrikt 18 - vandsystem 13

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Plan for fiskepleje i Sæby Å: Distrikt 17 - vandsystem 06

General information
State: Published
Plankton community composition and vertical migration during polar night in Kongsfjorden

The polar night in the Arctic is characterized by up to six months of darkness, low temperatures and limited food availability. Biological data on species composition and abundance during this period are scarce due to the logistical challenges posed when sampling these regions. Here, we characterize the plankton community composition during the polar night using water samplers and zooplankton net...
samples (50, 64, 200, 1500 lm), supplemented by acoustics (ADCPs, 300 kHz), to address a previously unresolved question–which species of zooplankton perform diel vertical migration during the polar night? The protist community (smallest plankton fraction) was mainly represented by ciliates (Strombidida). In the larger zooplankton fractions (50, 64, 200 lm) the species composition was represented primarily by copepod nauplii and small copepods (e.g., Microcalanus spp., Pseudocalanus spp. and Oithona similis). In the largest zooplankton fraction (>1500 lm), the euphausiid, Thysanoessa inermis, was the most abundant species followed by the chaetognath Parasagitta elegans. Classical DVM was not observed throughout the darkest parts of the polar night (November–mid-January), although, subtle vertical migration patterns were detected in the acoustic data. With the occurrence of a more distinct day–night cycle (i.e., end of January), acoustical DVM signals were observed, paralleled by a classical DVM pattern in February in the largest fractions of zooplankton net samples. We suggest that Thysanoessa spp. are main responsible for the acoustical migration patterns throughout the polar night, although, chaetognaths and copepods may be co-responsible.
Pressure sensor calibrations of acoustic telemetry transmitters

General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Carleton University, Vemco-Amirix Ltd., Michigan State University, Fisheries and Oceans Canada, University of Toronto
Authors: Veilleux, M. A. N. (Ekstern), Lapointe, N. W. R. (Ekstern), Webber, D. M. (Ekstern), Binder, T. R. (Ekstern), Blanchfield, P. J. (Ekstern), Cruz-Font, L. (Ekstern), Wells, M. G. (Ekstern), Larsen, M. H. (Intern), Doka, S. E. (Ekstern), Cooke, S. J. (Ekstern)
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Prey perception in feeding-current feeding copepods: Reply to comment

We reply to the comments of Paffenhöfer and Jiang () who argues that remote chemical prey perception is necessary for feeding-current feeding copepods to fulfill their nutritional requirements in a dilute ocean, that remote chemical prey detection may only be observed at very low prey concentrations, and that chemical prey perception is feasible if prey cells release dissolved organic material in short-lasting but intense bursts. We demonstrate that mechanoreception at a very short range is sufficient to sustain a living, even in a dilute ocean. Further, if chemoreception requires that prey cells have short intense leakage burst, only a very small fraction of prey cells would be available to the copepod at any instance in time and, thus would be inefficient at low prey concentration. Finally, we report a few new observations of prey capture in two species of copepods, Temora longicornis and Centropages hamatus, offered a 45-μm sized dinoflagellate at very low concentration. The observed short prey detection distances, up to a few prey cell radii, are consistent with mechanoreception and we argue briefly that near-field mechanoreception is the most likely and common prey perception mechanism in calanoid copepods.

General information
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Authors: Kiørboe, T. (Intern), Goncalves, R. J. (Ekstern), Florian Couespel, D. (Ekstern), van Someren Gréve, H. (Intern), Saiz, E. (Ekstern), Tiselius, P. (Intern)
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  Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
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  Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
  Web of Science (2015): Indexed yes
  BFI (2014): BFI-level 2
  Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
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  Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
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  Web of Science (2013): Indexed yes
  BFI (2012): BFI-level 2
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  ISI indexed (2012): ISI indexed yes
  Web of Science (2012): Indexed yes
  BFI (2011): BFI-level 2
  Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
Probiotics as beneficial microbes in aquaculture: an update on their multiple modes of action: a review

Wide and discriminate use of antibiotics has resulted in serious biological and ecological concerns, especially the emergence of antibiotic resistance. Probiotics, known as beneficial microbes, are being proposed as an effective and eco-friendly alternative to antibiotics. They were first applied in aquaculture species more than three decades ago, but considerable attention had been given only in the early 2000s. Probiotics are defined as live or dead, or even a component of the microorganisms that act under different modes of action in conferring beneficial effects to the host or to its environment. Several probiotics have been characterized and applied in fish and a number of them are of host origin. Unlike some disease control alternatives being adapted and proposed in aquaculture where actions are unilateral, the immense potential of probiotics lies on their multiple mechanisms in conferring benefits to the host fish and the rearing environment. The staggering number of probiotics papers in aquaculture highlights the multitude of advantages from these microorganisms and conspicuously position them in the dynamic search for health-promoting alternatives for cultured fish. This paper provides an update on the use of probiotics in finfish aquaculture, particularly focusing on their modes of action. It explores the contemporary understanding of their spatial and nutritional competitiveness, inhibitory metabolites, environmental modification capability, immunomodulatory potential and stress-alleviating mechanism. This timely update affirms the importance of probiotics in fostering sustainable approaches in aquaculture and provides avenues in furthering its research and development.

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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Iranian Fisheries Science Research Institute (IFSRI), Shiraz University, Indian Veterinary Research Institute
Produktionsbidrag og dambrugsmodel: manual og modelforudsætninger

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Pulse vs. Continuous treatment: which is better for applying peracetic acid in RAS?

General information
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Organisations: National Institute of Aquatic Resources, Section for Aquaculture, Agricultural Research Service, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Authors: Liu, D. (Ekstern), Pedersen, L. (Intern), Lazado, C. C. (Intern), Straus, D. L. (Ekstern), Meinelt, T. (Ekstern)
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Quantifying changes in abundance, biomass and spatial distribution of Northeast Atlantic (NEA) mackerel (Scomber scombrus) in the Nordic Seas from 2007 to 2014

The Northeast Atlantic (NEA) mackerel (Scomber scombrus) is a widely distributed pelagic fish species that plays a key role in the marine ecosystem.
In recent years, there has been a large fishery targeting mackerel in the NEA. At the same time as the geographic range of the mackerel fishery has expanded and the spatial distribution of the stock been defeectively determined, the stock assessment has been considered to be highly uncertain by ICES. Limited tuning data, with only a triennial egg survey, have created challenges for the assessment and management of NEA mackerel, and ICES
has repeatedly stated the need for an annual age-disaggregated abundance index of this stock. These were the motivations for establishment of an international pelagic trawl survey in 2007, the International Ecosystem Summer Surveys in the Nordic Seas (IESSNS).
The estimated total biomass indices for NEA mackerel based on coordinated and standardized swept-area surface trawling in July–August from IESSNS increased from 1.96 million t [relative standard error (RSE) ¼ 30.35%) in 2007 to 8.77 million t (RSE ¼ 7.95%) in 2014. Simultaneously, the mackerel stock expanded its geographic range during the feeding season from 1.3 million km2 in 2007 to at least 2.9 million km2 in 2014, mainly towards western and northern regions of the Nordic seas. Estimates of abundance indices by age group were fairly precise (RSE 20%) for ages 3–12, while the precision was poorer for ages 1 and 2 and for age groups 13 and older (RSE . 50%). Furthermore, evaluation of the performance of the estimated abundance indices by age for this time-series, based on internal consistency and catch curves, suggest that the abundance indices of ages 3–12 track the temporal
variation in abundance reasonably, and thus is applicable for stock assessments

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Authors: Nøttestad, L. (Ekstern), Utne, K. R. (Ekstern), Öskarsson, G. … (Ekstern), Jonsson, S. (Ekstern), Jacobsen, J. A. (Ekstern), Tangen, Ø. (Ekstern), Anthonypillai, V. (Ekstern), Aanes, S. (Ekstern), Vølstad, J. H. (Ekstern), Bernasconi, M. (Ekstern), Debes, H. (Ekstern), Smith, L. (Ekstern), Sveinbjörnsson, S. (Ekstern), Holst, J. C. (Ekstern), Jansen, T. (Intern), Slotte, A. (Ekstern)
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Scopus rating (2011): CiteScore 2.32
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Web of Science (2011): Indexed yes
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Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
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Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
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Web of Science (2002): Indexed yes
Quantifying the escape mortality of trawl caught Antarctic krill (Euphausia superba)

Antarctic krill (Euphausia superba) is an abundant fishery resource, the harvest levels of which are expected to increase. However, many of the length classes of krill can escape through commonly used commercial trawl mesh sizes. A vital component of the overall management of a fishery is to estimate the total fishing mortality and quantify the mortality rate of individuals that escape from fishing gear. The methods for determining fishing mortality in krill are still poorly developed.

We used a covered codend sampling technique followed by onboard observations made in holding tanks to monitor mortality rates of escaped krill. Haul duration, hydrological conditions, maximum fishing depth and catch composition all had no significant effect on mortality of krill escaping 16 mm mesh size nets, nor was any further mortality associated with the holding tank conditions. A non-parametric Kaplan-Meier analysis was used to model the relationship between mortality rates of escapees and time. There was a weak tendency, though not significant, for smaller individuals to suffer higher mortality than larger individuals. The mortality of krill escaping the trawl nets in our study was 4.4 ± 4.4%, suggesting that krill are fairly tolerant of the capture-and-escape process in trawls.

General information
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Authors: Krafft, B. A. (Ekstern), Krag, L. A. (Intern), Engås, A. (Ekstern), Nordrum, S. (Ekstern), Bruheim, I. (Ekstern), Herrmann, B. (Ekstern)
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Web of Science (2015): Indexed yes
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Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.369 SNIP 1.23 CiteScore 4.58
Quantifying trawl caught escape mortality of Antarctic krill (Euphausia superba).

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Institute of Marine Research, Olympic Seafood AS, SINTEF
Authors: Krafft, B. A. (Ekstern), Krag, L. A. (Intern), Engås, A. (Ekstern), Nordrum, S. (Ekstern), Bruheim, I. (Ekstern), Herrmann, B. (Ekstern)
Number of pages: 32
Publication date: 2016

Quantum yields of natural organic matter and organic compounds: Implications for the fluorescence-based interpretation of organic matter composition

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, University of New South Wales
Authors: Wünsch, U. (Intern), Murphy, K. R. (Ekstern), Stedmon, C. (Intern)
Publication date: 2016

Rapid adaptation to oil exposure in the cosmopolitan copepod Acartia tonsa
Oil spills are potential environmental hazards to marine ecosystems worldwide. Oil spills may persist in seawater longer than one generation of many zooplankton species. However, whether populations of short-lived and fast growing marine organisms adapt to oil exposure through natural selection is not known. To test this, the cosmopolitan estuarine copepod Acartia tonsa was exposed to pyrene continuously for two generations, at the concentrations 0, acetone control, 1, 10, 100 and the saturated pyrene concentration in seawater, 100+ nM. Pyrene is one of the most toxic components in crude oil to marine copepods. The key fitness-related traits were quantified: survival, size at maturity, grazing rate and the
reproductive success. Exposure to the concentration of pyrene saturated in seawater (100+ nM) resulted in 100 %
mortality before adulthood in the first generation. In the other treatments (≤ 100nM), the first generation had a higher
grazing rate than the second generation. Exposure to pyrene had no effect on the grazing rate. At the concentration of 100
nM, pyrene exposure caused reductions in survival, size at maturity of females, egg production and hatching success. The
reduction in size at maturity of females was less pronounced in the second generation. Strikingly, both survival, egg
production and hatching success were recovered in the second generation, indicating a rapid selection towards individuals
with adaptations to deal with pyrene exposure. Our results show that populations of short-lived and fast-growing copepods
have the potential of showing surprisingly strong resilience to the type of oil contamination they might face in their natural
coastal habitats

Recent trends in the abundance of plaice Pleuronectes platessa and cod Gadus morhua in shallow coastal waters of the
Northeastern Atlantic continental shelf – a review

Shallow, near-shore water habitats on the continental shelf of the Northeast Atlantic have been productive fishing areas in
the past. Here, we review the present knowledge about (i) recent trends in the abundance of plaice and cod in these
habitats and (ii) hypotheses regarding the factors responsible for any trends. At present, only a few studies exist on the
trends of abundance of plaice or cod, namely from the Bay of Biscay, the North Sea and the Skagerrak/Kattegat. They
suggest a declining abundance in coastal, shallow areas and – at least for plaice – a latitudinal gradient with an erosion of
the southern distribution boundary in the Bay of Biscay and deepening of stocks in the North Sea. In contrast, no trend in
shallow water abundance of plaice similar to a decline in deep-water stocks during the 1970s and their slow recovery
during the 2000s is apparent in the Skagerrak/Kattegat. Although shallow habitats fundamentally differ from deeper areas
by the prevalence of juvenile stages, the declining trends coincide with decreasing abundance/landings and spatial stock
relocations in the deeper areas. Whether this indicates a common trend pointing at connectivity between shallow and deep
water remains open. Fundamental differences exist in the suggested causes of the trends in different geographical areas.
High fishing pressure together with low local recruitment apparently prevents the recovery of overexploited plaice and cod
stocks in the Skagerrak/Kattegat. In contrast, the responses of juveniles and adult fish to increasing seawater temperature
are the main hypotheses for changes in distribution and abundance of both fish species in the North Sea/Bay of Biscay.
However, temperature alone cannot explain the observed decline of fish in coastal areas, and the causes may be more
complex, involving nutrient loading, primary productivity or food availability, although at present, knowledge of these
factors is insufficient
Recombination patterns reveal information about centromere location on linkage maps
Linkage mapping is often used to identify genes associated with phenotypic traits and for aiding genome assemblies. Still, many emerging maps do not locate centromeres – an essential component of the genomic landscape. Here, we demonstrate that for genomes with strong chiasma interference, approximate centromere placement is possible by phasing the same data used to generate linkage maps. Assuming one obligate crossover per chromosome arm, information about centromere location can be revealed by tracking the accumulated recombination frequency along linkage groups, similar to half-tetrad analyses. We validate the method on a linkage map for sockeye salmon (Oncorhynchus nerka) with known centromeric regions. Further tests suggest that the method will work well in other salmonids and other eukaryotes. However, the method performed weakly when applied to a male linkage map (rainbow trout; O. mykiss) characterized by low and unevenly distributed recombination – a general feature of male meiosis in many species. Further, a high frequency of double crossovers along chromosome arms in barley reduced resolution for locating centromeric regions on most linkage groups. Despite these limitations, our method should work well for high-density maps in species with strong recombination interference and will enrich many existing and future mapping resources.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, University of Washington
Authors: Limborg, M. T. (Intern), McKinney, G. J. (Ekstern), Seeb, L. W. (Ekstern), Seeb, J. E. (Ekstern)
Pages: 655-661
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Molecular Ecology Resources
Volume: 16
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 6.06 SJR 2.864 SNIP 2.176
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.305 SNIP 1.564 CiteScore 4.47
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.842 SNIP 2.217 CiteScore 5.04
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 3.472 SNIP 2.986 CiteScore 7.31
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.172 SNIP 1.87 CiteScore 4.26
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.395 SNIP 1.173 CiteScore 2.75
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.94 SNIP 0.814
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.277 SNIP 1.291
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.926 SNIP 0.938
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.042 SNIP 0.928
Scopus rating (2006): SJR 0.927 SNIP 0.958
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.057 SNIP 1.152
Scopus rating (2004): SJR 0.941 SNIP 0.95
Scopus rating (2003): SJR 0.698 SNIP 0.55
Scopus rating (2002): SJR 0.465 SNIP 0.373

Original language: English
centromeres, genomic architecture, genotyping by sequencing, linkage mapping, recombination

Electronic versions:

DOIs:
10.1111/1755-0998.12484

Source: FindIt
Source-ID: 277427287

Publication: Research - peer-review › Journal article – Annual report year: 2016
Records of five bryozoan species from offshore gas platforms rare for the Dutch North Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Wageningen University, Wageningen
IMARES, Royal Belgian Institute of Natural Sciences
Authors: Beukhof, E. D. (Intern), Coolen, J. W. P. (Ekstern), van der Weide, B. E. (Ekstern), Cuperus, J. (Ekstern), de Blauwe, H. (Ekstern), Lust, J. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Biodiversity Records
Volume: 9
Issue number: 1
ISSN (Print): 1755-2672
Ratings:
Web of Science (2018): Indexed yes
Scopus rating (2016): SJR 0.213 SNIP 0.267 CiteScore 0.33
Web of Science (2016): Indexed yes
Scopus rating (2015): SJR 0.27 SNIP 0.41 CiteScore 0.44
Scopus rating (2014): SJR 0.294 SNIP 0.58 CiteScore 0.42
Scopus rating (2013): SJR 0.285 SNIP 0.464 CiteScore 0.4
Scopus rating (2012): SJR 0.221 SNIP 0.358 CiteScore 0.35
Original language: English
Electronic versions:
Publishers version
DOIs:
10.1186/s41200-016-0086-6
Source: FindIt
Source-ID: 2347241540
Publication: Research - peer-review › Journal article – Annual report year: 2016

Reduced rearing density increases postrelease migration success of Atlantic salmon (Salmo salar) smolts
The overall aim of this study was to investigate the effect of rearing density on the post-release survival of Atlantic salmon (Salmo salar) smolts during seaward migration. Fish were either reared at conventional hatchery density or at one-third of conventional density. Three hundred one-year old smolts from each density treatment were individually tagged with passive integrated transponder (PIT) tags and released 3.2 km upstream of a stationary antenna array in a natural stream. There were no significant differences in length, body mass, or condition between fish from the two density treatments during rearing in the hatchery. However, individuals reared at reduced density had less eroded dorsal fins and opercula relative to those from the high-density treatment. In the stream, the downstream migration success was 16% higher for fish reared at reduced density than for conspecifics kept at high-density, but the timing of migration was similar for both groups. These novel results suggest that conventionally high rearing densities may reduce welfare and the post-release migration success of hatchery-reared Atlantic salmon

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, University of Gothenburg, Danish Center for Wild Salmon
Authors: Larsen, M. H. (Intern), Johnsson, J. I. (Ekstern), Näslund, J. (Ekstern), Thomassen, S. T. (Ekstern), Aarestrup, K. (Intern)
Pages: 804-810
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 73
Issue number: 5
ISSN (Print): 0706-652X
Ratings:
Remaining questions in the case for balanced harvesting
Balanced harvesting – harvesting all species and sizes in an ecosystem in proportion to their productivity – is a fisheries management strategy that has been suggested recently to increase yields, while reducing overall ecosystem impact. However, some aspects of balanced harvesting are controversial, including its call for extensive harvesting of juveniles and forage fish. Balanced harvesting also calls for targeting species and size-classes that are not currently marketable, possibly at a significant economic cost. Some have argued that this cost is outweighed by the ecological benefits of maintaining the ecosystem size and trophic structures and by the benefits of extra yield for food security. There is broad consensus that balanced harvesting would require major changes to fishery management institutions and consumer behaviour, and it is unclear to what extent it is physically possible with current technologies. For this reason, we argue that steps to implement balanced harvesting are difficult to justify until the case for it is more clearly resolved. We outline some of the pivotal questions that must be answered to make a convincing case for or against balanced harvesting, many of which can be answered.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of California, Santa Barbara
Authors: Burgess, M. G. (Ekstern), Diekert, F. K. (Ekstern), Jacobsen, N. S. (Intern), Andersen, K. H. (Intern), Gaines, S. D. (Ekstern)
Pages: 1216-1226
Publication date: 2016
Main Research Area: Technical/natural sciences

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Journal: Fish and Fisheries
Volume: 17
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ISSN (Print): 1467-2960
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BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.7 SJR 3.606 SNIP 3.245
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.668 SNIP 3.034 CiteScore 7.05
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 3.462 SNIP 3.327 CiteScore 7.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.488 SNIP 3.12 CiteScore 6.19
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.565 SNIP 2.852 CiteScore 6.14
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 4.025 SNIP 2.854 CiteScore 6.2
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.456 SNIP 2.434
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography, University of Copenhagen, DHI Denmark, University of Hamburg
Number of pages: 129
Publication date: 2016

Publication information
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research › Report – Annual report year: 2016

Report on the eel stock and fishery in Denmark 2015/2016

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Pedersen, M. I. (Intern)
Pages: 152-177
Publication date: 2016

Host publication information
Title of host publication: Joint EIFAAC/ICES WGEEL REPORT 2016
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea (ICES)
Series: ICES CM 2016
Number: ACOM:18
Main Research Area: Technical/natural sciences
Links:
http://ices.dk/community/groups/Pages/WGEEL.aspx
Publication: Research › Report chapter – Annual report year: 2016
Reproductive traits (Fecundity, egg diameter, parental care) of marine European fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Marine Ecology and Oceanography
Publication date: 2016

Publication information
Original language: English
Main Research Area: Technical/natural sciences
DOIs: 10.1594/PANGAEA.868610
Links: https://doi.pangaea.de/10.1594/PANGAEA.868610
Publication: Research › Dataset – Annual report year: 2017

Research on wildlife and wild fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern)
Publication date: 2016

Publication information
Source/Publisher: norecopa
Main Research Area: Technical/natural sciences
Links: https://norecopa.no/wildlife-and-wild-fish
Publication: Research › Internet publication – Annual report year: 2016

Resilience and stability of a pelagic marine ecosystem
The accelerating loss of biodiversity and ecosystem services worldwide has accentuated a long-standing debate on the role of diversity in stabilizing ecological communities and has given rise to a field of research on biodiversity and ecosystem functioning (BEF). Although broad consensus has been reached regarding the positive BEF relationship, a number of important challenges remain unanswered. These primarily concern the underlying mechanisms by which diversity increases resilience and community stability, particularly the relative importance of statistical averaging and functional complementarity. Our understanding of these mechanisms relies heavily on theoretical and experimental studies, yet the degree to which theory adequately explains the dynamics and stability of natural ecosystems is largely unknown, especially in marine ecosystems. Using modelling and a unique 60-year dataset covering multiple trophic levels, we show that the pronounced multi-decadal variability of the Southern California Current System (SCCS) does not represent fundamental changes in ecosystem functioning, but a linear response to key environmental drivers channelled through bottom-up and physical control. Furthermore, we show strong temporal asynchrony between key species or functional groups within multiple trophic levels caused by opposite responses to these drivers. We argue that functional complementarity is the primary mechanism reducing community variability and promoting resilience and stability in the SCCS.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of California, San Diego
Authors: Lindegren, M. (Intern), Checkley, D. M. (Ekstern), Ohman, M. D. (Ekstern), Koslow, J. A. (Ekstern), Goericke, R. (Ekstern)
Number of pages: 9
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Proceedings of the Royal Society B: Biological Sciences
Volume: 283
Issue number: 1822
Article number: 2020151931
Global ocean biogeochemistry models currently employed in climate change projections use highly simplified representations of pelagic food webs. These food webs do not necessarily include critical pathways by which ecosystems interact with ocean biogeochemistry and climate. Here we present a global biogeochemical model which incorporates ecosystem dynamics based on the representation of ten plankton functional types (PFTs): six types of phytoplankton, three types of zooplankton, and heterotrophic procaryotes. We improved the representation of zooplankton dynamics in our model through (a) the explicit inclusion of large, slow-growing macrozooplankton (e.g. krill), and (b) the introduction of trophic cascades among the three zooplankton types. We use the model to quantitatively assess the relative roles of iron vs. grazing in determining phytoplankton biomass in the Southern Ocean high-nutrient low-chlorophyll (HNLC) region during summer. When model simulations do not include macrozooplankton grazing explicitly, they systematically overestimate Southern Ocean chlorophyll biomass during the summer, even when there is no iron deposition from dust. When model simulations include a slow-growing macrozooplankton and trophic cascades among three zooplankton types, the high-chlorophyll summer bias in the Southern Ocean HNLC region largely disappears. Our model results suggest that the observed low phytoplankton biomass in the Southern Ocean during summer is primarily explained by the dynamics of the Southern Ocean zooplankton community, despite iron limitation of phytoplankton community growth rates. This result has implications for the representation of global biogeochemical cycles in models as zooplankton faecal pellets sink rapidly and partly control the carbon export to the intermediate and deep ocean.
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.366 SNIP 1.312 CiteScore 3.92
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.524 SNIP 1.178 CiteScore 3.86
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.36 SNIP 1.108
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.951 SNIP 1.197
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.848 SNIP 1.234
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.465 SNIP 1.113
Scopus rating (2006): SJR 0.997 SNIP 0.688
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.293 SNIP 1.043
Web of Science (2005): Indexed yes
Original language: English
Earth-Surface Processes, Ecology, Evolution, Behavior and Systematics, Euphausiacea, Prokaryota
Electronic versions:
Publishers version
DOIs:
Source: FindIt
Source-ID: 2306637849
Publication: Research - peer-review › Journal article – Annual report year: 2016

Sådan laver man gydebanker for laksefisk - genskabelse af naturlige stryg med et varieret dyre- og planteliv

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Nielsen, J. (Intern), Sivebæk, F. (Intern)
Number of pages: 28
Publication date: 2016

Publication information
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:
Publishers version
Publication: Research › Report – Annual report year: 2016

Same-Risk-Area Assessment Model (SRAAM) User's manual

General information
State: Published
Organisations: National Institute of Aquatic Resources, Arctic Section, Section for Marine Living Resources
Authors: Hansen, F. T. (Intern), Christensen, A. (Intern)
Number of pages: 42
Publication date: 2016
**Same stock, different management: quantifying the sustainability of three shrimp fisheries in the Skagerrak from a product perspective**

The northern shrimp (Pandalus borealis L.) stock in the Skagerrak is shared by Sweden, Norway, and Denmark. Although the fishery is regulated by an annual agreement between the EU and Norway, there are also national regulations as well as differences in fleet composition and shrimp markets. In early 2014, the World Wildlife Fund gave all Skagerrak shrimp a red light in their seafood consumer guide, which led to an extensive debate, especially in Sweden, about the sustainability of this fishery. The aim of this study was to quantify a set of indicators that together give a broad picture of the sustainability of the three fisheries to provide an objective basis for a discussion on needed measures. The different indicators concerned environmental, economic or social aspects of sustainability and were quantified per tonne of shrimp landed by each country in 2012. The Danish fishery was most efficient in terms of environmental and economic indicators, while the Swedish fishery provided most employment per tonne of shrimp landed. Fuel use in all fisheries was high, also when compared with other shrimp fisheries. Interesting patterns emerged, with smaller vessels being more fuel efficient than larger ones in Sweden and Norway, with the opposite trend in Denmark. The study also demonstrated major data gaps and differences between the countries in how data are collected and made available. Various improvement options in the areas data collection and publication, allocation of quotas and enforcement of regulations resulted. Product-oriented studies could be useful to follow-up performance of fisheries over time and to identify how to best utilize the Skagerrak shrimp stock. This could involve evaluating novel solutions in terms of technology and management, based on current and future scenarios aiming to maximize societal benefits generated from this limited resource, at minimized environmental impacts.
**Scaling laws in phytoplankton nutrient uptake affinity**

Nutrient uptake affinity affects the competitive ability of microbial organisms at low nutrient concentrations. From the theory of diffusion limitation it follows that uptake affinity scales linearly with the cell radius. This is in conflict with some observations suggesting that uptake affinity scales to a quantity that is closer to the square of the radius, i.e. cell surface area. We show that this apparent conflict can be resolved by nutrient uptake theory. Pure diffusion limitation assumes that the cell is a perfect sink which means that it is able to absorb all encountered nutrients instantaneously. Here we provide empirical evidence that the perfect sink strategy is not common in phytoplankton. Although small cells are indeed favored by a large surface to volume ratio, we show that they are punished by higher relative investment cost in order to fully benefit from the larger surface to volume ratio. We show that there are two reasons for this. First, because the small cells need a higher transporter density in order to maximize their affinity, and second because the relative cost of a transporter is higher for a small than for a large cell. We suggest that this might explain why observed uptake affinities do not scale linearly with the cell radius.
Seasonal occurrence of Loricate Choanoflagellates in Danish inner waters

It is a trend in loricate choanoflagellate research that our knowledge of species diversity is insufficient in terms of understanding annual successional changes at any specific locality, whereas there is a fairly decent coverage worldwide – at least in more coastal realms – in terms of biodiversity within more narrowly defined time windows. To help address this knowledge gap, we have compiled all available loricate choanoflagellate occurrence data from Danish sampling sites covering an overall time span of close to four decades. The close to 100 samples analysed have a good annual coverage and they encompass in total more than 50 species. We demonstrate clear successional trends among well-defined clusters of species. A large contingent of ‘non-native’ species, which are in a global context largely considered part of the loricate choanoflagellate warm water community, occurred in September 2014 samples from the Baltic Sea entrance, i.e. the Sound between Denmark and Sweden. While the occurrence of these species is likely due to a large inflow of southern Atlantic water, we also discuss whether the findings may instead reflect recent and more permanent climate change-induced alterations to choanoflagellate biodiversity in inner Danish waters.
Sediment extracted organic matter fluorescence: an archive of organic matter flux and origins?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Lund University
Authors: Stedmon, C. (Intern), Funkey, C. (Ekstern), Conley, D. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Selection for high reproduction rates during establishment of non-indigenous species: A case study of a successful marine invader

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life
Authors: Jaspers, C. (Intern), Marty, L. (Intern), Kiørboe, T. (Intern)
Publication date: 2016
Event: Abstract from International Jellyfish Blooms Symposium, Barcelona, Spain.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Selective silicate-directed motility in diatoms

Diatoms are highly abundant unicellular algae that often dominate pelagic as well as benthic primary production in the oceans and inland waters. Being strictly dependent on silica to build their biomineralized cell walls, marine diatoms precipitate $240 \times 10^{12}$ mol Si per year, which makes them the major sink in the global Si cycle. Dissolved silicic acid (dSi) availability frequently limits diatom productivity and influences species composition of communities. We show that benthic diatoms selectively perceive and behaviourally react to gradients of dSi. Cell speed increases under dSi-limited conditions in a chemokinetic response and, if gradients of this resource are present, increased directionality of cell movement promotes chemotaxis. The ability to exploit local and short-lived dSi hotspots using a specific search behaviour likely contributes to micro-scale patch dynamics in biofilm communities. On a global scale this behaviour might affect sediment-water dSi fluxes and biogeochemical cycling.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Friedrich-Schiller-Universität Jena, Lund University, Universiteit Gent
Shape shifting predicts ontogenetic changes in metabolic scaling in diverse aquatic invertebrates

Metabolism fuels all biological activities, and thus understanding its variation is fundamentally important. Much of this variation is related to body size, which is commonly believed to follow a 3/4-power scaling law. However, during ontogeny, many kinds of animals and plants show marked shifts in metabolic scaling that deviate from 3/4-power scaling predicted by general models. Here, we show that in diverse aquatic invertebrates, ontogenetic shifts in the scaling of routine metabolic rate from near isometry \((b_R = \text{scaling exponent approx. 1})\) to negative allometry \((b_R < 1)\), or the reverse, are associated with significant changes in body shape (indexed by \(b_L = \text{the scaling exponent of the relationship between body mass and body length}\)). The observed inverse correlations between \(b_R\) and \(b_L\) are predicted by metabolic scaling theory that emphasizes resource/waste fluxes across external body surfaces, but contradict theory that emphasizes resource transport through internal networks. Geometric estimates of the scaling of surface area (\(SA\)) with body mass (\(bA\)) further show that ontogenetic shifts in \(bR\) and \(bA\) are positively correlated. These results support new metabolic scaling theory based on \(SA\) influences that may be applied to ontogenetic shifts in \(bR\) shown by many kinds of animals and plants.
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Juniata College Huntingdon, University of Liverpool
Authors: Glazier, D. S. (Ekstern), Hirst, A. G. (Intern), Atkinson, D. (Ekstern)
Number of pages: 9
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**
- **Journal:** Proceedings of the Royal Society B-Biological Sciences
- **Volume:** 282
- **Issue number:** 1802
- **Article number:** 20142302
- **ISSN (Print):** 0962-8452
- **Ratings:**
  - BFI (2018): BFI-level 2
  - Web of Science (2018): Indexed yes
  - BFI (2017): BFI-level 2
  - Web of Science (2017): Indexed yes
  - BFI (2016): BFI-level 2
  - Scopus rating (2016): CiteScore 3.89 SJR 2.541 SNIP 1.474
  - Web of Science (2016): Indexed yes
  - BFI (2015): BFI-level 2
  - Scopus rating (2015): SJR 2.948 SNIP 1.535 CiteScore 4.08
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 2
  - Scopus rating (2014): SJR 2.916 SNIP 1.673 CiteScore 4.18
  - Web of Science (2014): Indexed yes
  - BFI (2013): BFI-level 2
  - Scopus rating (2013): SJR 3.091 SNIP 1.762 CiteScore 5.08
  - ISI indexed (2013): ISI indexed yes
  - BFI (2012): BFI-level 2
  - Scopus rating (2012): SJR 2.947 SNIP 1.881 CiteScore 4.99
  - ISI indexed (2012): ISI indexed yes
  - Web of Science (2012): Indexed yes
  - BFI (2011): BFI-level 2
  - Scopus rating (2011): SJR 3.234 SNIP 1.789 CiteScore 5.02
  - ISI indexed (2011): ISI indexed yes
  - Web of Science (2011): Indexed yes
  - BFI (2010): BFI-level 2
  - Scopus rating (2010): SJR 2.894 SNIP 1.61
  - Web of Science (2010): Indexed yes
  - BFI (2009): BFI-level 2
  - Scopus rating (2009): SJR 2.581 SNIP 1.389
  - Web of Science (2009): Indexed yes
  - BFI (2008): BFI-level 2
  - Scopus rating (2008): SJR 2.364 SNIP 1.372
  - Web of Science (2008): Indexed yes
  - Scopus rating (2007): SJR 2.475 SNIP 1.447
  - Web of Science (2007): Indexed yes
  - Scopus rating (2006): SJR 2.925 SNIP 1.713
  - Web of Science (2006): Indexed yes
  - Scopus rating (2005): SJR 2.633 SNIP 1.52
  - Web of Science (2005): Indexed yes
  - Scopus rating (2004): SJR 2.872 SNIP 1.699
  - Web of Science (2004): Indexed yes
  - Scopus rating (2003): SJR 2.891 SNIP 1.561
  - Scopus rating (2002): SJR 3.005 SNIP 1.5
Shellfish and seaweed gardening: Danish experience

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Petersen, J. K. (Intern), Nielsen, C. F. (Intern), Bak, F. (Intern)
Publication date: 2016
Event: Abstract from Aquaculture Europe, Edinburgh, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2016

Signalkrebs er nu fundet i Gram Å

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Berg, S. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/nyheder/2016/09/signalkrebs-spreder-sig-hurtigt?id=26e20fbe-32ce-44b9-b0a4-6a2e04626616&utm_source=newsletter&utm_media=mail&utm_campaign=
Publication: Communication › Internet publication – Annual report year: 2016

Skånsomt fiskeri og genudsætning

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern), Sivebæk, F. (Intern)
Pages: 22-25
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Issue number: 4
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Publication: Communication › Journal article – Annual report year: 2016

Skarven er hård ved stallingen i Kongeåen
Skarv, sæl og fremmede fisk på Folkemødet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern)
Publication date: 2016

Publication information
Source/Publisher: Fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/Nyheder/Nyhed?id=56AD16E0-3217-41D9-81FE-7AB86335FCF0
Publication: Communication › Internet publication – Annual report year: 2016

Slave to the rhythm: Can seasonal signals in otolith microchemistry be used as a tool for age estimation?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic
Authors: Hüssy, K. (Intern), Heidemann, F. (Ekstern), Hinrichsen, H. (Ekstern), Marohn, L. (Ekstern), Gröger, J. (Ekstern), Limburg, K. E. (Ekstern)
Publication date: 2016
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2017

Slave to the rhythm: seasonal signals in otolith microchemistry reveal age of eastern Baltic cod (Gadus morhua)
Annual growth zones in cod otoliths from the eastern Baltic stock are less discrete than in other cod stocks leading to biased age reading, which recently led to a failure of age-based assessment in the eastern Baltic cod stock. In this study, we explored the applicability of minor and trace element patterns in cod otoliths for age determination. By first identifying elements of interest in a stock without ageing problems, western Baltic cod, we then tested their applicability on another stock without ageing problems, North Sea cod, and finally applied this knowledge to estimate age of eastern Baltic cod. In western Baltic cod, matching patterns with respect to occurrence of minima and maxima in both otolith opacity and element concentrations were found for Cu, Zn, and Rb, and inverse patterns with Mg and Mn. No match was found for Pb, Ba, and Sr. In the test stock, the North Sea cod, the same patterns in Cu, Zn, Rb, Mg, and Mn signals occurred. All eastern Baltic cod with low visual contrast between growth zones exhibited clearly defined synchronous cycles in Cu, Zn, Rb and Pb. Using a combined finite differencing method and structural break models approach, the statistical significance of the local profile minima were identified, based on which their age could be estimated. Despite extensive environmental differences between the three areas examined, the element concentrations of Cu, Zn, and Rb were strongly correlated in all individuals with similar correlations in all three areas, suggesting that the incorporation mechanisms are the same for these elements and independent of environmental concentrations.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Thünen Institute of Fisheries Ecology, GEOMAR - Helmholtz Centre for Ocean Research Kiel, University of Kiel
Authors: Hüssy, K. (Intern), Gröger, J. (Ekstern), Heidemann, F. (Ekstern), Hinrichsen, H. (Ekstern), Marohn, L. (Ekstern)
Pages: 1019-1032
Publication date: 2016
Main Research Area: Technical/natural sciences
Små udsætningsål er bedst

**General information**

State: Published  
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology  
Authors: Pedersen, M. I. (Intern), Rasmussen, G. (Intern)  
Publication date: 2016

**Publication information**

Source/Publisher: Fiskepleje.dk  
Main Research Area: Technical/natural sciences  
Links:  
http://www.fiskepleje.dk/Nyheder/2016/02/Aal-udsaetning?id=3310e388-15d3-484b-963c-6e24acd2c266&utm_source=newsletter&utm_media=mail&utm_campaign=2016_02_17_Nyhedsbrev  
Publication: Communication › Internet publication – Annual report year: 2016

Snæblens tilbagegang i Anthropocæn

**General information**

State: Published  
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University Hospital  
Authors: Alstrup, A. K. O. (Ekstern), Svendsen, J. C. (Intern), Jensen, L. F. (Ekstern)  
Pages: 31-36  
Publication date: 2016  
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Habitat  
Issue number: 14  
Original language: Danish  
Publication: Research › Journal article – Annual report year: 2016

**Socio-economic Impacts—Fisheries**

Fishers and scientists have known for over 100 years that the status of fish stocks can be greatly influenced by prevailing climatic conditions. Based on historical sea surface temperature data, the North Sea has been identified as one of 20 ‘hot spots’ of climate change globally and projections for the next 100 years suggest that the region will continue to warm. The consequences of this rapid temperature rise are already being seen in shifts in species distribution and variability in stock recruitment. This chapter reviews current evidence for climate change effects on fisheries in the North Sea—one of the most important fishing grounds in the world—as well as available projections for North Sea fisheries in the future. Discussion focuses on biological, operational and wider market concerns, as well as on possible economic consequences. It is clear that fish communities and the fisheries that target them will be very different in 50 or 100 years’ time and that management and governance will need to adapt accordingly

**General information**

State: Published  
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, University of British Columbia, Cefas, University of Hamburg, Wageningen IMARES  
Authors: Pinnegar, J. K. (Ekstern), Engelhard, G. H. (Ekstern), Jones, M. C. (Ekstern), Cheung, W. W. (Ekstern), Peck, M. A. (Ekstern), Brander, K. (Intern), Rijnsdorp, A. D. (Ekstern)  
Pages: 375-395  
Publication date: 2016

**Host publication information**

Title of host publication: North Sea Region Climate Change Assessment  
Publisher: Springer  
Editors: Quante, M., Colijn, F.  
ISBN (Print): 978-3-319-39743-6  
ISBN (Electronic): 978-3-319-39745-0  
Chapter: 12  
Series: Regional climate studies

Main Research Area: Technical/natural sciences  
Electronic versions:
Solid phase extraction and metabolic profiling of exudates from living copepods

Copepods are ubiquitous in aquatic habitats. They exude bioactive compounds that mediate mate finding or induce defensive traits in prey organisms. However, little is known about the chemical nature of the copepod exometabolome that contributes to the chemical landscape in pelagic habitats. Here we describe the development of a closed loop solid phase extraction setup that allows for extraction of exuded metabolites from live copepods. We captured exudates from male and female Temora longicornis and analyzed the content with high resolution LC-MS. Chemometric methods revealed 87 compounds that constitute a specific chemical pattern either qualitatively or quantitatively indicating copepod presence. The majority of the compounds were present in both female and male exudates, but nine compounds were mainly or exclusively present in female exudates and hence potential pheromone candidates. Copepodamide G, known to induce defensive responses in phytoplankton, was among the ten compounds of highest relative abundance in both male and female extracts. The presence of copepodamide G shows that the method can be used to capture and analyze chemical signals from living source organisms. We conclude that solid phase extraction in combination with metabolic profiling of exudates is a useful tool to develop our understanding of the chemical interplay between pelagic organisms.
Citizen science as a method to collect recreational fisheries data; Strengths and limitations

National Institute of Aquatic Resources
Period: 15/04/2018 → 14/04/2021
Number of participants: 4
Phd Student: Jørgensen, Casper Gundelund (Intern)
Supervisor: Aarestrup, Kim (Intern) Baktoft, Henrik (Intern)
Main Supervisor: Skov, Christian (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Gillnet modifications to reduce by-catch of seabirds and harbour porpoises in the Baltic Sea

National Institute of Aquatic Resources
Period: 01/01/2018 → 31/12/2020
Number of participants: 4
Phd Student: Kratzer, Isabella (Intern)
Supervisor: Kindt-Larsen, Lotte (Intern) Stepputtis, Daniel (Ekstern)
Main Supervisor: Larsen, Finn (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Population Genomics of Archived Shark Samples

National Institute of Aquatic Resources
Period: 01/01/2018 → 31/12/2020
Number of participants: 5
Phd Student: Christensen, Camilla (Intern)
Supervisor: Bekkevold, Dorte (Intern) Bennett, Michael B. (Ekstern) Ovenden, Jennifer (Ekstern)
Main Supervisor: Eg Nielsen, Einar (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Vaccination of Seabass against a lethal viral disease and characterization of protective immunity

National Institute of Aquatic Resources
Period: 01/12/2017 → 30/11/2020
Number of participants: 3
Phd Student:
Hansen, Sofie (Intern)
Supervisor:
Lorenzen, Niels (Intern)
Main Supervisor:
Olesen, Niels Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Bacteriophage based technology to control Flavobacterium pathogens in aquaculture
National Institute of Aquatic Resources
Period: 01/10/2017 → 30/09/2020
Number of participants: 4
Phd Student:
Donati, Valentina Laura (Intern)
Supervisor:
Madsen, Lone (Intern)
Middelboe, Mathias (Ekstern)
Main Supervisor:
Dalsgaard, Inger (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Trait-based modelling of copepod communities
National Institute of Aquatic Resources
Period: 01/10/2017 → 30/09/2020
Number of participants: 4
Phd Student:
Serra Pompei, Maria Camila (Intern)
Supervisor:
Kiørboe, Thomas (Intern)
Visser, Andre (Intern)
Main Supervisor:
Andersen, Ken Haste (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Vertical migration and the structure and function of pelagic ecosystems
National Institute of Aquatic Resources
Period: 01/10/2017 → 30/09/2020
Number of participants: 4
Phd Student:
Pinti, Jerome Pierre Alexandre (Intern)
Supervisor:
Kiørboe, Thomas (Intern)
Mariani, Patrizio (Intern)
Main Supervisor:
Visser, Andre (Intern)
**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Adaptability of tropical copepods to warmer and polluted future: with emphasis on metagenomics after multiple-generation exposure**
The adaptability of tropical copepods to global warming and polluted environment will be tested using metagenomics approach.

National Institute of Aquatic Resources
Section for Oceans and Arctic
Period: 01/09/2017 → 31/08/2019
Number of participants: 1
tropical marine ecosystem, Pseudodiaptomus annandalei, global warming, adaptation, metagenomics, gut microbiomes, contaminants, PAH
Project Manager, academic:
Dinh, Khuong Van (Intern)

**Ecology of Atlantic Salmon**
National Institute of Aquatic Resources
Period: 01/08/2017 → 31/07/2020
Number of participants: 4
Phd Student:
Flávio, Hugo de Moura (Intern)
Supervisor:
Jepsen, Niels (Intern)
Koed, Anders (Intern)
Main Supervisor:
Aarestrup, Kim (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Influence of Parasite Load on the Growth and Bioenergetics of Baltic cod**
National Institute of Aquatic Resources
Period: 01/08/2017 → 31/07/2020
Number of participants: 3
Phd Student:
Plambech Ryberg, Marie (Intern)
Supervisor:
Skov, Peter Vilhelm (Intern)
Main Supervisor:
Behrens, Jane (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Capelin Migration and Stock Structure using Otolith Microchemistry**
National Institute of Aquatic Resources
Period: 01/06/2017 → 31/05/2020
Number of participants: 3
Phd Student:
Fink-Jensen, Peter (Intern)
Supervisor:
Jansen, Teunis (Intern)
Main Supervisor:
Hüssy, Karin (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Fishery and Fisheries Ecosystem Impac Modelling**
National Institute of Aquatic Resources
Period: 01/06/2017 → 31/05/2020
Number of participants: 5
Phd Student:
Rufener, Marie-Christine (Intern)
Supervisor:
Dinesen, Grete E. (Intern)
Kristensen, Kasper (Intern)
Nielsen, J. Rasmus (Intern)
Main Supervisor:
Bastardie, Francois (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Mitigation Cultures of Mussels - Ecological Impact**
National Institute of Aquatic Resources
Period: 01/05/2017 → 30/04/2020
Number of participants: 4
Phd Student:
Taylor, Daniel (Intern)
Supervisor:
Nielsen, Pernille (Intern)
Saurel, Camille (Intern)
Main Supervisor:
Petersen, Jens Kjerulf (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**PhD Scholarship in Fish Stock Assessment and Population Dynamics Modelling**
National Institute of Aquatic Resources
Period: 01/05/2017 → 30/04/2020
Number of participants: 4
Phd Student:
Mildenberger, Tobias (Intern)
Supervisor:
Berg, Casper Willestofte (Intern)
Kokkalis, Alexandros (Intern)
Main Supervisor:
Nielsen, J. Rasmus (Intern)
**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Danish seaweed resources - for food, feed and as a helping hand to the marine environment (Tang.nu) (39442)**

The overall goal of Tang.nu is to change the flow of nutrient from land to sea from a linear flow where excess nutrients are lost and causes problems with eutrophication, to a circular flow where cultivation and harvest of seaweed will contribute to recapture the nutrients and put them back into the bio-economical system on land.

Seaweed is a valuable resource presently used e.g. in production of food and feed products. Tang.nu will increase the pull and push mechanisms in the seaweed value chain. This will be done by supporting producers (public, commercial, private), and buyers (businesses (feed and food), agriculture, aquaculture, citizens) – partly by documenting the value of seaweed as a bioactive feed additive, and partly by gathering existing knowledge about seaweed legislation and composition and make it publicly assessable.

All part components of the project will be put together in an analysis and a documentation of seaweed cultivation and harvest as a tool to recirculate nutrients from the sea and back on land as a mean of a future sustainable use of bio-resources.

Tang.nu will deliver essential results for future legislation concerning food and feed safety and marine management and will furthermore add to groundwork for the establishment of a balanced and sustainable management of production systems at sea and on land.

This project is coordinated by Aarhus University and funded by the Velux Foundations.

National Food Institute
National Institute of Aquatic Resources
Danish Shellfish Centre
Aarhus University
Roskilde University
Kattegatcentret
Teknologisk Institut
Fødevarestyrelsen
SEGES, Danish Agriculture & Food Council,
Økologisk landsforening
Seaweed Societe
Multidyk
Nordisk Tang
Bisserup Havbrug
Havhaverne i Ebeltoft Vig

**Determining the influence of benthic substrate on Biodiversity-Ecosystem Function relationships in coral reef ecosystems**

National Institute of Aquatic Resources
Creating the scientific foundation for alternative ways of managing North Sea sandeel

National Institute of Aquatic Resources
Period: 15/02/2017 → 14/02/2020
Number of participants: 3
Phd Student:
Henriksen, Ole (Intern)
Supervisor:
Christensen, Asbjørn (Intern)
Main Supervisor:
van Deurs, Mikael (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Relations
Activities:
Forvaltning af Tobis i Nordsøen
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG

Understanding the biodiversity-ecosystem functioning relationship in marine food webs through large-scale observations and modelling

National Institute of Aquatic Resources
Period: 15/02/2017 → 14/02/2020
Number of participants: 3
Phd Student:
Maureaud, Aurore (Intern)
Supervisor:
Andersen, Ken Haste (Intern)
Main Supervisor:
Lindegren, Martin (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet

Micro particles in Aquaculture: cause and effects and ways to remove them

National Institute of Aquatic Resources
Period: 15/01/2017 → 31/03/2020
Number of participants: 4
Phd Student:
de Jesus Gregersen, Joao (Intern)
Supervisor:
Pedersen, Per Bovbjerg (Intern)
Pedersen, Lars-Flemming (Intern)
Main Supervisor:
Dalsgaard, Anne Johanne Tang (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Analysis of protected areas in the North Sea and the Central Baltic (Beskyttede områder) (39425)
The project aims at delivering a report on the scientific basis and coherence of the current system of marine protected areas in the Danish North Sea, Skagerrak and central Baltic Sea EEZ’s. This will enable the Danish Nature Agency to decide whether the existing network of protected areas is coherent (representative, adequate and connected) with respect to the requirements of the MSFD art. 13 part 4.

The most important biodiversity elements, habitats and ecological processes of the North Sea/Skagerrak and the central Baltic Sea will be addressed including selected ecosystem components, oceanographic features and seabed habitats. The work will be based on available data, literature studies and results from recent investigations. Furthermore, ecologically valuable – "hot-spots" – and areas of economic value are to be identified.

The network of ecologically valuable areas will be analyzed based on data, distribution mapping, weighting of data and connectivity consideration using several types of software. Areas of economic value inside and outside the Natura2000 network will be identified based on existing data collected by the partners and located at the partner’s database. Finally, areas of economic importance will be combined to suggest marine protected areas.

The project is coordinated by DTU Aqua.

The project is funded by Danish Agrifish Agency.

National Institute of Aquatic Resources
Section for Oceans and Arctic
DCE - Danish Centre for Environment and Energy
DHI Denmark
Geological Survey of Denmark and Greenland
Period: 01/01/2017 → 31/12/2017
Number of participants: 2
 Research area: Ecosystem Based Marine Management
Project participant:
Gislason, Henrik (Intern)
Project Coordinator:
Edelvang, Karen (Intern)

Mechanistic approach to ocean ecology (39427)
The overarching goal of the proposed research is to develop a mechanistically underpinned, trait-based model of marine plankton ecosystems ranging across multiple trophic levels from bacteria to zooplankton. The rationale and methods and rooted in the trait-based approach developed by the Centre for Ocean Life. Zooplankton has a key role in the model, and the themes guiding model design are trait biogeography (i.e., spatio-temporal distributions of traits) and vertical material fluxes and carbon sequestration.

The work will be organized in four interlinked work packages (WPs), each guided by a particular research question. All models will be implemented in a physical setting, and WPs 1-3 represent an increasing degree of complexity from unicellular plankton in a 0D environment toward a full size-based model in 2D environment. WP1 and 2 develop the unicellular and multicellular components, WP3 the full size based model, and WP4 sets up the model for the California Current system and tests the model against field observations collected by the Zooglider and through the CalCOFI monitoring program.

The project is coordinated by DTU Aqua.

The project is funded by Gordon and Betty Moore Foundation.
The invasive round goby in Danish waters: Investigations of depth distributions in relation to a targeted, efficient fishery after the species for human consumption (39402)

Round goby is an invasive benthic fish, native to the Ponto-Caspian region. It has on several occasions been introduced to the Baltic region, and is now wide spread here, with established populations in many areas. In some areas it dominates the local fish fauna, having out-competed native, and often commercially important, fish species.

Round goby is generally referred to as a coastal, shallow-water species. Yet, when temperatures drop at the onset of winter, the fish disappear from the shallow, cool waters, presumably to migrate to deeper, water waters. How deep they go, and how the onset of migration to deeper waters may relate to temperature (and hence season) however remains unknown. This information is nevertheless imperative in an evaluation of when, at what depths, and with what type of gear a potential targeted fishery after round goby should occur.

The present project will use all available national and international survey data throughout the Baltic region to map depths distributions of round goby, and analyze the correlations between depth distributions and temperature.

The project is coordinated by DTU Aqua.

The project is funded by Direktør J.P. A. Espersen og hustru fru Dagny Espersens Fond.

Genomic analysis of DNA from archived shark jaws

National Institute of Aquatic Resources

Period: 15/12/2016 → 14/12/2019
Number of participants: 5
Phd Student:
Manuzzi, Alice (Intern)
Supervisor:
Bekkevold, Dorte (Intern)
Bennett, Michael B. (Ekstern)
Ovenden, Jennifer (Ekstern)
Main Supervisor:
Eg Nielsen, Einar (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Investigating the effects of barriers on fish in European streams and rivers

National Institute of Aquatic Resources
Period: 15/12/2016 → 14/12/2019
Number of participants: 4
PhD Student:
Birmie-Gauvin, Kim (Ekstern)
Supervisor:
Jepsen, Niels (Intern)
Koed, Anders (Intern)
Main Supervisor:
Aarestrup, Kim (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Reproductive Physiology of Female European Eel

National Institute of Aquatic Resources
Period: 15/12/2016 → 14/12/2019
Number of participants: 4
PhD Student:
Jørgensen, Michelle Grace Pinto (Intern)
Supervisor:
Kjørsvik, Elin (Ekstern)
Eg Nielsen, Einar (Intern)
Main Supervisor:
Tomkiewicz, Jonna (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Bycatch of seabirds in Danish gillnet fisheries - assessing scale and testing mitigation

National Institute of Aquatic Resources
Period: 01/12/2016 → 30/11/2019
Number of participants: 3
Cultivation potential of brown and red macroalgae species integrated with open Salmond fish Aquaculture

National Institute of Aquatic Resources
Period: 01/12/2016 → 30/11/2020
Number of participants: 5
Phd Student:
Etter, Siv Anina (Ekstern)
Supervisor:
Håndå, Alexander (Ekstern)
Olsen, Yngvar (Ekstern)
Petersen, Jens Kjerulf (Intern)
Main Supervisor:
Petersen, Jens Kjerulf (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

Piscine orthoreovirus in salmonids: geographic distribution, molecular characterization, pathogenesis under experimental conditions

National Institute of Aquatic Resources
Period: 01/12/2016 → 30/11/2019
Number of participants: 3
Phd Student:
Vendramin, Niccolò (Intern)
Supervisor:
Rimstad, Espen (Ekstern)
Main Supervisor:
Design and operation optimization of constructed wetlands at rainbow trout farms (39430)

This project aims at improving the design and operation of constructed wetlands with respect to the removal of waste nutrients and organic matter deriving from model trout farm systems type I and III.

The project contains five work packages:
1. Selection of representative fish farms to be part of a user group and where testing and measurements will be carried out
2. Mapping and characterization of selected wetlands
3. Measuring the effects of flow velocity, water column depth, and hydraulic retention time on the removal of nutrients and organic matter
4. Data analysis
5. Project management, administration and dissemination of results.

The projects is coordinated by

The project is funded by Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF)

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Association

Period: 06/10/2016 → 11/01/2019
Number of participants: 3
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Dalsgaard, Anne Johanne Tang (Intern)
von Ahnen, Mathis (Intern)

Assessing cod growth and age by otolith microchemistry analysis

National Institute of Aquatic Resources

Period: 01/10/2016 → 28/02/2018
Number of participants: 3
Phd Student:
Nielsen, Kristian Ege (Intern)
Supervisor:
Mosegaard, Henrik (Intern)
Main Supervisor:
Hüssy, Karin (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Fonde
Project: PhD

Effects of seal-related liver worm on Baltic cod growth and mortality (39411)

The number of grey seals has increased markedly in the Baltic Sea within recent years. Grey seal is final host for the liver worm Contraceum osculatum, where cod is one of several transport hosts. Concurrent with the rise in number of grey seal, the prevalence (number of infected cod) and intensity of infection (number of liver worms per infected cod) with liver worm has increased, and up to 340 worms can now be found in single cod livers. Field studies have shown that intensity of infection correlates negatively with the condition of the fish, indicating that liver worm may have a negative effect on the health status of the fish. Yet, from field investigations it is difficult to separate potentially negative effects of liver worms from that of reduced food availability or poor oxygen conditions.
In the present study we will perform controlled laboratory experiments to i) determine the potential costs of housing liver worm, ii) estimate the effects of liver worm on cod growth and mortality, and iii) use data generated in i) and ii) in bioenergetic modeling to calculate the effect of liver worm on the maximal food consumption and growth of individual cod. This will subsequently be scaled to the level of the population.

The project is coordinated by University of Copenhagen.

The project is funded by Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
University of Copenhagen
Danish Fishermen's Association
Period: 08/09/2016 → 15/12/2018
Number of participants: 3
Research area: Marine Living Resources
Project participant:
Skov, Peter Vilhelm (Intern)
Andersen, Niels Gerner (Intern)
Project Manager, academic:
Behrens, Jane (Intern)

Marine Ecosystem Climate Services
National Institute of Aquatic Resources
Period: 01/09/2016 → 31/08/2020
Number of participants: 3
Phd Student:
Miesner, Anna Katharina (Intern)
Supervisor:
MacKenzie, Brian (Intern)
Main Supervisor:
Payne, Mark (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Reduktion af lakseinfektioner
National Institute of Aquatic Resources
Period: 01/09/2016 → 31/08/2019
Number of participants: 4
Phd Student:
Kragesteen, Tróndur Jónsson (Intern)
Supervisor:
Simonsen, Knud (Ekstern)
Visser, Andre (Intern)
Main Supervisor:
Andersen, Ken Haste (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Eastern Baltic cod - New knowledge of growth and mortality is the way to improved management advice (39366)
The aim of the project is to improve the knowledge and data basis for stock assessment and management for cod in the eastern Baltic Sea.
In later years, changes in growth and natural mortality of cod have presumably taken place and new knowledge on these parameters is essential for restoring analytical stock assessment for Eastern Baltic cod that is currently lacking. Improved knowledge on cod growth and mortality is therefore a prerequisite for being able to evaluate the stock status in relation to management targets and implement management plans that are built on quantitative stock assessment.

Ecological situation in the Baltic Sea has changed in later years, which requires updated biological information. This is done in the project using different approaches, bringing together expertise of different research areas. The approaches applied include molecular-genetic analyses of cod growth, bioenergetic modelling, and analyses of monitoring data on predation and condition/growth of cod. An important component of the project is cooperation with fishing industry to support tagging experiments of Baltic cod, to obtain updated estimates of cod growth.

Finally, the project combines the new knowledge on cod that becomes available from this and other relevant projects to ensure that the assessment of stocks status and management advice is based on best available scientific information.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
University of Copenhagen
Period: 15/08/2016 → 15/08/2018
Number of participants: 8
Research areas: Ecosystem based Marine Management & Fish Biology & Marine Populations and Ecosystem Dynamics & Population Genetics & Marine Living Resources & Fisheries Management
Project participant:
Storr-Paulsen, Marie (Intern)
Tomkiewicz, Jonna (Intern)
Hansen, Jakob Hemmer (Intern)
Neuenfeldt, Stefan (Intern)
Christensen, Asbjørn (Intern)
Kindt-Larsen, Lotte (Intern)
Berg, Casper Willestofte (Intern)
Project Coordinator:
Eero, Margit (Intern)

Investigations of hatchery techniques and cultivation systems for cost-effective production of valuable seaweeds

National Institute of Aquatic Resources
Period: 15/08/2016 → 14/08/2019
Number of participants: 4
Phd Student:
Schmedes, Peter Søndergaard (Intern)
Supervisor:
Nielsen, Mette Møller (Intern)
Canal-Vergés, Paula (Intern)
Main Supervisor:
Petersen, Jens Kjerulf (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

From science to innovation in the Nephrops fishery to comply with the Common Fisheries Policy: development of an optimal and flexible selection system for trawl by use of new technology and underutilized fish behaviour (39375)
The aim of the VISION-project is to develop a new generation of trawl designs towards a targeted and controllable species and size selection in the mixed fisheries targeting Nephrops by improving vertical separation of the catch and gear.
selectivity. This will contribute to an economic viable fishery and sustainable use of resources under a landing obligation.

The mixed fisheries targeting Nephrops is one of the most economically important Danish fisheries. It is characterized by high proportions of discards and will have a low capitalization of the vessels’ quotas under a landing obligation.

In the VISION-project, a horizontally divided codend developed in the FishValue-project (vaerdifisk.dk) will be refined to increase the vertical separation of cod, flatfish and small fish in general from Nephrops. The project will combine new technology and knowledge of fish behavior in an innovative way to develop new selection principles and thus gear designs with an increased species and size selectivity. Also, the project seeks to provide solutions for a highly flexible fishery so fishermen can change their gear to match the selective properties with the current fishing situation.

This project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Euronete Scandinavia A/S
Strandby Net A/S
Danish Fishermen’s Association
Period: 01/08/2016 → 08/08/2018
Number of participants: 4
Project participant:
Andersen, Niels Gerner (Intern)
Krag, Ludvig Ahm (Intern)
Melli, Valentina (Intern)
Project Coordinator:
Karlsen, Junita Diana (Intern)
Project

Integration of bycatch in mixed-fisheries management
National Institute of Aquatic Resources
Period: 01/08/2016 → 16/10/2019
Number of participants: 4
PhD Student:
Schreiber Plet-Hansen, Kristian (Intern)
Supervisor:
Mortensen, Lars O. (Intern)
Nielsen, J. Rasmus (Intern)
Main Supervisor:
Ulrich, Clara (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Resource efficiency in practice: from sugar beet waste to fish feed ingredient (Starfish) (39368)
Sugar beet is a commonly cultivated crop in Denmark and the waste pulp is primarily sold as cow feed. The pulp, however, contains a potential prebiotic compound (pectin) that, if added to fish feed at low concentrations is hypothesized to:
1) improve the feed utilisation by the fish allowing more fish to be produced per amount of feed applied
2) stabilize the structure of the faecal waste so that it may be easier collected and removed reducing the discharge of nitrogen- and phosphorous
3) improve the overall immunological system/health status of the fish whereby the use of medicine and therapeutics may be reduced.

The objective of the project is to test these potential, beneficial effects of pectin in rainbow trout (Oncorhynchus mykiss) and tilapia (Oreochromis niloticus) by adding different molecular sizes and concentrations to the feed and measuring the effects on feed utilisation, faecal structure and fish health.
The project is coordinated by DTU Aqua.
The project is funded by Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).
National Institute of Aquatic Resources
Section for Aquaculture
CP Kelco ApS
BioMar A/S
Period: 01/08/2016 → 31/07/2019
Number of participants: 4
Research area: Aquaculture
Project participant:
Larsen, Bodil Katrine (Intern)
Skov, Peter Vilhelm (Intern)
Phd Student:
de Jesus Gregersen, Joao (Intern)
Project Coordinator:
Dalsgaard, Anne Johanne Tang (Intern)

Project Identification of virulence markers in two Novirhabdoviruses causing serious diseases in fish
National Institute of Aquatic Resources
Period: 15/07/2016 → 14/07/2019
Number of participants: 4
Phd Student:
Alencar, Anna Luiza Farias (Intern)
Supervisor:
Bremont, Michel (Ekstern)
Rasmussen, Thomas Bruun (Intern)
Main Supervisor:
Olesen, Niels Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Forbedring af forvaltningsgrundlaget for bestande i det rekreative fiskeri (39370)
National Institute of Aquatic Resources
Section for Monitoring and Data
Section for Ecosystem based Marine Management
Section for Freshwater Fisheries Ecology
Institute Management
Period: 14/07/2016 → 14/07/2018
Number of participants: 16
Acronym: REKREA
Project participant:
Olesen, Hans Jakob (Intern)
Storr-Paulsen, Marie (Intern)
Stettrup, Josianne Gatt (Intern)
Skov, Christian (Intern)
Christoffersen, Mads (Intern)
Reeh, Line (Intern)
Stubgaard, Karin (Intern)
Svendsen, Jon Christian (Intern)
Pedersen, Stig (Intern)
Pedersen, Michael Ingemann (Intern)
Evaluation of Sustainable Exploitation of Major Baltic Fish Stocks under different Climate, Eutrophication and Fishing Pressures

National Institute of Aquatic Resources
Period: 01/07/2016 → 30/06/2019
Number of participants: 5
PhD Student: Bossier, Sieme (Intern)
Supervisor: Bastardie, Francois (Intern)
Christensen, Asbjørn (Intern)
Neuenfeldt, Stefan (Intern)
Main Supervisor: Nielsen, J. Rasmus (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Macroalgae biorefinery for value-added products (MAB4) (39372)
MAB4 will bridge the gap between research, innovation and market within the macroalgae (seaweed) sector. The goal is to establish seaweed cultivation as a Danish discipline for providing seaweed biomass for the business sectors of food and feed ingredients, and cosmetics. MAB4 will breed and mature sea-farmed crops of seaweed by improved and new cultivation methods in Danish and Faroese waters, with particular attention to seasonal development of algae bioactive substances and their conservation during harvesting and storage. The project will also develop sustainable enzymatic and Green Solvent extraction methods for development of new algae products i.e. antioxidants, fucoidan, laminarin, alginate, proteins, and minerals. The products will be tested as food and feed ingredients as well as in skincare products. Techno-economic feasibility and LCA will assess for the whole value chain from cultivation to final marketed seaweed products. MAB4 is a trans-disciplinary project running for 3½ years. The project consists of a strong consortium of national and international algae cultivators, biorefinery experts from universities, RTO's, SMEs and relevant industrial end-users. The results from MAB4 will provide guidelines for stakeholders from industry and for future seaweed cultivation.

This project is coordinated by Danish Technological Institute.
The project is funded by Innovation Fund Denmark.

National Institute of Aquatic Resources
Danish Shellfish Centre
Aarhus University
University of Copenhagen
Ocean Rainforest
FermentationExperts
At Sea Technology
DTU Food
DTU Department of Chemical Engineering
Morgenfruerne på Læsø
A trait-based approach for predicting fish community structure, function and services under climate change and exploitation

National Institute of Aquatic Resources
Period: 15/03/2016 → 14/03/2019
Number of participants: 3
Phd Student:
Beukhof, Esther (Intern)
Supervisor:
Andersen, Ken Haste (Intern)
Main Supervisor:
Lindegren, Martin (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Marie Curie (EU-stipendium)
Project: PhD

Ballast water - Tool for supporting the delimitation of a "same risk area" (39348)
A project financed by the Danish Maritime Fund via the Danish Nature Agency, to develop a decision support tool for authorities and consultants involved with the ballast water convention and measures preventing the spread of marine invasive species. The tool will support decision makers in member nations of the International Maritime Organisation (IMO) to identify and delimit marine areas with high connectivity considering hydrography and species biology. Identification of marine areas with high connectivity can provide a basis for granting exemptions in relation to the ballast water convention and the requirement for ships to treat ballast water before being discharged into the sea. The tool development is based on existing freeware including "IBM Lib" (DTU Aqua's own individual-based modeling system for linking individual-based models to hydrographical model data), Netlogo (a widely used IBM simulation system) and R (a statistical programming and data handling package).

This project is coordinated by DTU Aqua.

The project is funded by the Danish Maritime Fund via the Danish Nature Agency.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Meteorological Institute

Anchor-Lab
Period: 01/03/2016 → 01/12/2016
Number of participants: 9
Research areas: Marine Living Resources & Observation Technology
Project participant:
Mosegaard, Henrik (Intern)
Blue whiting (Micromesistius poutassou): behaviour and distribution in Greenland waters

National Institute of Aquatic Resources
Period: 01/03/2016 → 28/02/2020
Number of participants: 4
Phd Student:
Post, Søren Lorenzen (Intern)
Supervisor:
Balk, Helge (Ekstern)
Hedeholm, Rasmus Berg (Ekstern)
Main Supervisor:
Jansen, Teunis (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Bycatch of marine mammals and seabirds - Assessment and mitigation (39337)
The aim of the project is to develop innovative mitigation methods to reduce the unintended bycatch of marine mammals and seabirds in Danish gillnet fisheries.

The project includes the following components:
- determine the distribution in time and space of the bycatches;
- identify the factors that determine the occurrence of the bycatch and its distribution;
- identify behaviour that are correlated with bycatch;
- conduct pilot trials of mitigation methods;
- propose further mitigation methods to test in a continuation of the project.

The results of the project will contribute to a better management of protected species of marine mammals and seabirds, as well as placing Denmark in a better position with respect to its obligations in relation to the EU Habitats Directive, the EU Bird Directive, the EU Marine Strategy Framework Directive, the EU Council Resolution 812/2004 and the EU Action Plan for reduction of seabird bycatch.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Kolmården Wildlife Park
Period: 01/03/2016 → 28/02/2018
Number of participants: 5
Research areas: Ecosystem based Marine Management & Coastal Ecology
Project participant:
Sørensen, Thomas Kirk (Intern)
Climate Change and European Aquatic Resources (CERES) (39344)
CERES advances a cause-and-effect understanding of how climate change will influence Europe’s most important fish and shellfish resources and the economic activities depending on them. It will provide tools and develop adaptive strategies allowing fisheries and aquaculture sectors and their governance to anticipate and prepare for adverse changes or future benefits of climate change.

The project has 24 additional partners spread across Europe and is coordinated by University of Hamburg, Germany.

The project is funded by EU, Horizon 2020.

National Institute of Aquatic Resources
Section for Oceans and Arctic
University of Hamburg
Period: 01/03/2016 → 29/02/2020
Number of participants: 3
Research areas: Marine Populations and Ecosystem Dynamics & Oceanography & Shellfish and seaweed
Project participant:
Nielsen, J. Rasmus (Intern)
SauréL, Camille (Intern)

FishHab-II (39345)
The aim of the project is to map fish habitats to improve data and information for Maritime Spatial Planning. The project focuses on mapping the habitats for 9 commercially important fish species and one invertebrate species in the inner Danish waters. Within the project methods will be developed to map habitats in data-poor as well as data-rich areas. Data derived from different sources; surveys, fisheries, citizen science will be used and combined with information derived from fisher interviews. The mapping will include coastal habitats to provide the basis for advice on management of coastal fish nursery areas.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
University of Copenhagen
Period: 01/03/2016 → 28/02/2018
Number of participants: 7
Research areas: Coastal Ecology & Ecosystem based Marine Management
Project participant:
Wisz, Mary (Intern)
Sørensen, Thomas Kirk (Intern)
Vinther, Morten (Intern)
Egekvist, Josefine (Intern)
Svendsen, Jon Christian (Intern)
PhD Student:
Brown, Elliot John (Intern)
Project Manager, academic:
Støtrup, Josianne Gatt (Intern)

**Relations**
Press / Media items:
Bannerup og Grenaa: Små fisk – skal gerne blive større
Fintælling af bugtens fisk
Forskere undersøger fisk langs kysten
An Expedition covering covering the Danish Coast’s from the 18th July - 22nd August, 2016
Indslag i 24NORDJYSKE

**Genomic patterns and processes of population divergence in marine fishes**
National Institute of Aquatic Resources
Period: 01/03/2016 → 28/02/2019
Number of participants: 3
Phd Student:
Le Moan, Alan (Intern)
Supervisor:
Bekkevold, Dorte (Intern)
Main Supervisor:
Hansen, Jakob Hemmer (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**New methodologies for an ecosystem approach to spatial and temporal management of fisheries and aquaculture in coastal areas (ECOAST) (39339)**
ECOAST aims to identify, develop and test new methodologies for spatial and temporal management of fisheries and aquaculture in coastal areas. The overall approach will assess the impact of fisheries and aquaculture on coastal ecosystems, including essential fish habitats and conservation priority habitats, as well as synergies and conflicts between human activities.

Building on previous methodologies and experiences the project will evaluate marine spatial planning in seven coastal case study areas having different ecological and socio-economic characteristics: 1) Adriatic Sea (ADR), 2) Ionian Sea (ION), 3) Black Sea (BLK), 4) Tyrrhenian Sea (TYR), 5) Baltic Sea (BAL), 6) Norwegian Fjords (NOR) and 7) NE Atlantic Coasts (ATL).

The project outcomes will produce case specific evaluation of the ecological footprints of aquaculture and fisheries in coastal areas, maps of optimal areas for fisheries and aquaculture, evaluation of compatibility between fisheries, aquaculture and other human activities in coastal areas, as well as implementation of holistic methods and an operational modelling framework to evaluate and predict stakeholder responses to coastal spatial management options covering marine cross sector occupation of space. Several methodologies already exist to assess the impacts on the ecosystem and the socio-economic effects of some spatial management measures, as well as to spatially manage some cross sector marine activities, but none of them integrate all relevant management aspects for coastal areas. Therefore, the holistic methodology will cover in a single system different approaches and management aspects, identifying realistic spatial and temporal potentials and limitations for the integration of fisheries and aquaculture in coastal areas, in order to allow policy makers and stakeholders to evaluate management measures from different points of view and share decisions in a transparent manner on case specific basis. ECOAST results will support the EU and national policies through the provision of tools and data for an ecosystem based allocation of space and sustainable use of marine resources in coastal areas on case specific basis.

This project is coordinated by Institute of Marine Science of the National Research Council, Italy.

This project is funded by EU, COFASP, ERA-NET.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Extensive multispecies and ecosystem research has been done in the Baltic, North Sea, Barents Sea/Norwegian Sea, Bay of Biscay and the Black Sea in the past about 30 years. There has been invested substantially in the research on multispecies interactions, and ecosystem functioning.

In parallel, significant knowledge on the environmental impacts on recruitment processes, movements or migrations, and species interactions has been accumulated, but not yet consequently integrated in multispecies and ecosystem models and management concepts.

The major questions raised in PRIME TRADE OFFS are hence, (i) how the integration of environmentally-driven variability in population and ecosystem dynamics affects short- and long-term predictions of economically important fish species, and (ii) how the inclusion of environmental variability changes our perceptions of tradeoffs between utilization of different resources, including for example fuel cost due to changed resource distributions in space and effects on targeted species, as well as socio-economic efficiency.

There have been several initiatives to improve multispecies and ecosystem modelling in order to make it operational for both tactical and strategic assessment and ecosystem-based fisheries management. PRIME TRADEOFFS is the logical continuation of these initiatives and will make the concepts of multi-species maximum sustainable yield and environmental impact on biological key process such as distribution, growth and recruitment operational for ecosystem-based management of marine resources, as demanded in the Marine Strategy Framework Directive and the reformed Common Fisheries Policy.

This project is coordinated by DTU Aqua.

The project is funded the EU, COFASP, ERA-NET.

National Institute of Aquatic Resources

Section for Oceans and Arctic

IFREMER

Institute of Marine Research

AZTI Technalia

University of Hamburg

Period: 01/03/2016 → 28/02/2019

Number of participants: 4

Research areas: Marine Populations and Ecosystem Dynamics & Oceanography & Fisheries Management

Project participant:

Andersen, Niels Gerner (Intern)

Mariani, Patrizio (Intern)

Thygesen, Uffe Høgsbro (Intern)
**Sustainable management of Kattegat cod; Improved knowledge about stock components and migration (39346)**

The Kattegat cod has been categorized as a data limited stock, mainly due to a large unallocated mortality, which may be caused by migration between Kattegat and neighbouring areas. In this project, we aim to improve our understanding of migration patterns and mixing of different stock components within the Kattegat through a novel combination of genetic and micro-chemical signatures for individual fish. Results from the project will feed directly into the ICES advisory process, including a scheduled benchmark meeting in early 2017 where new procedures for stock assessment will be discussed.

As cod are also caught as bycatch in other fisheries, a more robust stock assessment for cod will also be important to fisheries for other species under the landing obligation, which is scheduled for implementation in the Kattegat in 2017.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
**Period:** 01/03/2016 → 28/02/2018
**Number of participants:** 7
**Research areas:** Population Genetics & Marine Living Resources & Fisheries Management
**Project participant:**
Hüssy, Karin (Intern)
Eero, Margit (Intern)
Thygesen, Uffe Høgsbro (Intern)
Storr-Paulsen, Marie (Intern)
Meldrup, Dorte (Intern)
Levinsky, Svend-Erik (Intern)
**Project Coordinator:**
Hansen, Jakob Hemmer (Intern)

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**Sustainable use of the invasive round goby in favour for the fishery and the environment (SORTMUND) (39336)**

The overarching aim of SORTMUND is to establish a profitable and environmentally sustainable fishery after the invasive round goby in inner Danish waters. Round goby was first seen in south-eastern Danish waters in 2008 and have since then increased rapidly in abundance along the coastline where it has severe negative effects on local biodiversity and the traditional coastal fishery. We aim to launch the fish as a high-quality Nordic product for human consumption, in addition to fur animal feed. The project covers the entire value chain, and has broad participation, ranging from local fishermen and their trade organization, the processing industry, university institutes and a Michelin restaurant. Specific activities will be estimations of stock sizes, investigations of seasonal migrations of the fish, development of seal-safe of gear to avoid damages to the catch, test of methods to fillet the fish for human consumption, documentation of nutritional quality of the fish, development of a fermented fish sauce to add umami to the food, and optimization of logistics in relation to collection, cooling and transportation of fish from small harbors to processing.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Marine Living Resources
National Food Institute
Danish Fishermen's Association
Gilleleje Fillet Factory
Enspire
NF340 Lasse III
Gemba Seafood Consulting
Period: 01/03/2016 → 28/02/2019
Number of participants: 4
Research areas: Fish Biology & Marine Living Resources
Project participant:
Christoffersen, Mads (Intern)
Kindt-Larsen, Lotte (Intern)
van Deurs, Mikael (Intern)
Project Manager, academic:
Behrens, Jane (Intern)

Reconfigurable Modular Robotic System for Aquatic Environment
Department of Electrical Engineering
Automation and Control
Centre for Playware
National Institute of Aquatic Resources
Section for Oceans and Arctic
Department of Mechanical Engineering
Engineering Design and Product Development
Fluid Mechanics, Coastal and Maritime Engineering
Period: 01/02/2016 → 31/01/2018
Number of participants: 6
Acronym: REMORA
Project participant:
Christensen, David Johan (Intern)
Mariani, Patrizio (Intern)
Visser, Andre (Intern)
Özkil, Ali Gürcan (Intern)
Nielsen, Ulrik Dam (Intern)
Project Manager, academic:
Galeazzi, Roberto (Intern)

Development of an electrochemical method to remove nitrate in RAS (Electro-nitrate) (39327)
This project is done in collaboration with two industrial partners, testing the nitrate removal potential of an innovative technique applied to aquaculture.

Nitrate is a dissolved N-waste product from fish production in recirculating aquaculture systems (RAS). The amount and concentration of nitrate in the effluent are determined by the daily feeding, biological filtration and the feed loading (kg feed pr. m3 water exchange) among others.

Discharged nitrate is a main factor affecting the recipient hence important to reduce in order to obtain sustainable production in RAS.

As an alternative to denitrification, electrochemical reduction of nitrate to N2 is considered in this project. Electrochemical water treatment rely on physio-chemically controlled redox processes that includes a flow cell with two electrodes connected to an external current source This aim of this project is preliminary test and screening of different types of electrode material and combinations and investigate factors affecting removal capacity. The effect of current density, flow rates, substrate concentrations and pH on nitrate removal will be tested and removal capacity will be evaluated.

This project is coordinated by DHI.

The project is funded by Innovation Network for Environmental Technologies (Inno-MT), Danish Agency for Science, Technology and Innovation.
Efficient and innovative fish production via best available technology (RAS2020) (39328)
This project includes a full scale test and development of a conceptual recirculating aquaculture system (RAS) for king fish production. The innovative aspect of this modular RAS2020 concept regards the design—a one unit circular module designed to have a 1200 MT/Y capacity.

The aim of this project is to build and develop a RAS unit with small footprint, low cost and reduced construction time. The RAS2020 unit includes state of the art treatment units (Hydrotech drumfilters, Krüeger biofilters—nitrification and denitrification) and is built with flexible interconnected rearing sections. When the RAS2020 is built and stocked with kingfish, an extended sampling and monitoring program will be performed in order to assess system performance in particular N, P and organic matter removal.

This project is coordinated by Sashimi Royal.

The project is funded by the Danish Environmental Protection Agency.

Management of mussel fishery in Horsens Fjord and Lillebælt (39338)
It is the main aim of the project to the scientific basis for managing mussel fishery in two Natura 2000 areas: H52 Horsens Fjord and H96 Lillebælt with focus on the key ecosystem components eelgrass and macro algae. Based on detailed mapping of eelgrass beds, occurrence of macro algae and composition sampled using video transects, sampling by diver of macro algae and sediment sampling maps of eelgrass and macro algae are created. The data will also serve as input to a GIS model of potential recovery of eelgrass based on several different layers of information, e.g. sediment characteristics, shear stress (from hydro dynamic modelling), presence of eelgrass etc. Maps and models will serve as input to management in relation to permits to dredging for mussels in Natura 2000 areas according to guidelines in the Danish mussel policy. As a specific, additional activity it will be tested if drones can be used to map eelgrass beds. This will be performed in collaboration with DTU Space.

This project is coordinated by DTU Aqua.
The project is funded by the Ministry of Environment and Food of Denmark and the European Marine and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Danish Shellfish Centre

National Space Institute
Period: 26/01/2016 → 14/07/2018
Number of participants: 4
Research areas: Coastal Ecology & Shellfish and Seaweed
Project participant:
Canal-Vergés, Paula (Intern)
Nielsen, Mette Møller (Intern)
Nielsen, Pernille (Intern)

Project Coordinator:
Petersen, Jens Kjerulf (Intern)

**Development of new tools to assess the environmental effects of fishing (TASSEEF) (39371)**
The project aims to develop new knowledge about the indirect effects on the marine environment of fishing dredgers, in particular to develop new tools and methods at the level of entire basins to establish new knowledge about fishing effects.

The primary outcome of the project will be new tools for the management of shellfish fisheries in the Limfjorden.

Specifically, it will be possible to establish:
- protection zones around eelgrass.
- ecosystem services that mussel fishing supplies in very nutrient-enriched regions.
- development of the scientific basis for the management of fisheries in coastal areas – mussel translocation/relaying.
- perennity of the tools.

The project is coordinated by DTU Aqua.

The project is funded by Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Danish Shellfish Centre
Aarhus University
Danish Meteorological Institute
Association of Mussel Producers
Limfjorden Fishermen Organization
Period: 18/01/2016 → 04/08/2018
Number of participants: 6
Research area: Shellfish and seaweed
Project participant:
Møller, Lene Friis (Intern)
Barreau, Pascal David Alain (Intern)
Bak, Finn (Intern)
Veicherts, Martin (Intern)

Project Manager, academic:
Saurel, Camille (Intern)
Project Coordinator:
Petersen, Jens Kjerulf (Intern)

**Management plan for development of sustainable fisheries for blue mussels, cockles and oysters in the Danish Wadden Sea (39357)**
The aim of this project is to develop options for a sustainable fishery for blue mussels, oysters and cockles in the Wadden Sea both within and outside the Natura 2000 site. This is achieved by estimation of stock sizes of blue mussels, cockles and Pacific oysters within the Natura 2000 site as well as cockles and razor clams in relevant fishing areas outside Natura 2000 site. Furthermore, new and more cost-effective methods for monitoring each target species will be developed and tested. Finally, a management plan for sustainable fishing for mussels, cockles and oysters in the Wadden Sea will be provided.

The effect of the project will be that within 3 years, one or more sustainable fisheries for mussels, cockles and oysters will be initiated in the Wadden Sea, as well as a scientific documentation of important fishing grounds for shellfish is provided to counter potential closures of significant areas for shellfish fishing due to spoil dumping. In addition, new and more cost-effective methods for stock assessments will be developed. In conclusion, this will result in a scientific based management of the shellfish fishery in the Wadden Sea, which will be beneficial for the shellfish fishery.

The project is coordinated by DTU Aqua.

The project is funded by Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Danish Shellfish Centre
National Space Institute
Fiskeriselskabet Cardium

Period: 11/01/2016 → 14/07/2018
Number of participants: 3
Research area: Shellfish and seaweed

Project participant:
Petersen, Jens Kjerulf (Intern)
Nielsen, Mette Møller (Intern)

Project Coordinator:
Nielsen, Pernille (Intern)

Effects of dispersed oil droplets and produced water components on growth, development and reproduction of Arctic pelagic copepods (PWC-Arctic) (39297)

As the Oil & Gas industry moves north towards the Arctic, it is crucial to understand and be able to predict the potential for detrimental effects of regular (produced water) and accidental oil spills on Arctic organisms, which often are characterized by high lipid content. Organisms with high lipid content are susceptible to accumulation of lipophilic organic components like produced water components (PWC) including oil droplets. Limited data exist on accumulation of oil components in Arctic lipid-rich species which are parameterized so they can be applied as input to models predicting bioaccumulation and body residues as a function of exposure time/concentration. Even less data exist where body residues of oil components are explicitly linked to sub-lethal and delayed effects (e.g. on offspring). Finally, the potential contribution of oil droplets to bioaccumulation has never been studied in Arctic species.

The present project aims at:
- providing parameterized data on uptake/elimination kinetics and internal administration (partitioning coefficients between lipids and body fluids) for PW components in the Arctic lipid-rich copepods Calanus glacialis and C.hyperboreus:
- determine effect concentrations for PW components on early life stages of these copepods; and finally
- assess the potential for maternal transfer of PW components to eggs by exposing females prior to egg-laying and determine potential developmental effects in early stages developing in clean sea water.

The parameterized data collected in this project will provide direct input to numerical models aimed at predicting impact of PW on Arctic organisms. The approaches and methodologies used are based on extensive experience from previous toxicological studies on the two Arctic species and in particular the related boreal species Calanus finnarchicus. The main objective of the current proposal is to increase the knowledge of the potential effects of dispersed oil and other produced water components on growth and reproduction in lipid-rich Arctic planktonic crustaceans.

This project is coordinated by SINTEF, Norway.
The project is funded by the Research Council of Norway.

National Institute of Aquatic Resources
Section for Oceans and Arctic
Genetic adaptations underlying population structure in herring, *Clupea harengus* (GENSINC) (39355)

The objective is to document genetic differentiation and local adaptations in Atlantic herring populations spanning the majority of the species’ distribution in the Northeast Atlantic, thereby strengthening the scientific basis for management of herring stocks. This will be done by using new genomic analyses and by taking advantage of unique multi-generational experimental populations under controlled environmental conditions. Whole genome resequencing of 19 populations of herring from East Atlantic (including the North Sea, Skagerrak, Kattegat, and the Baltic Sea revealed low genetic differentiation at the great majority of examined genes. This supports earlier genetic studies suggesting that genetic drift at selectively neutral loci is extremely low in these populations. However, highly significant differentiation at a limited number of loci (<5%) was detected between Atlantic and Baltic herring, as well as between spring- and autumn-spawning herring irrespective of the geographic origin of the fish. The results showed that alleles underlying ecological adaptation in herring provide a wealth of information about population subdivisions. An aim of the project is to sequence DNA from a much broader spectrum of herring populations, to assess evolutionary processes acting on the distribution and dynamics of herring populations exhibiting different ecological and phenotypic traits (e.g. spawning time). Concurrently the activities will aim to identify population specific markers that could be used in genetic monitoring of herring stocks.

In order to further study the biological significance of the genetic variants underlying ecological adaptation in the Atlantic herring University of Bergen has established world-unique experimental populations by crossing Atlantic herring (adapted to a salinity of 35 psu) and Baltic herring (adapted to 6 psu). These fish will be used to generate a highly informative F2 intercross that will segregate at the loci responsible for ecological adaptation. Another experimental population consisting of hybrids between spring and autumn spawning herring is planned within this project, allowing novel studies on the genetic basis of reproduction timing in herring. Such multigenerational experiments are considered essential to understand evolutionary and population genetic responses to environmental change.

This project is coordinated by the University of Bergen, Norway.
This project is funded by the Research Council of Norway.

HPLC – Implementation of new analytical methods (39227)

This is an internally funded project with the purpose of developing and implementing new analytical methods aimed at determining indicators for growth i.e. protein metabolism and synthesis, and includes amino acids and ATP, ADP, AMP in tissue. It is investigated whether a developed technique can be implemented. We will investigate, whether we can use a western blotting technique to enable us to estimate to which degree protein synthesis is stimulated, more specifically by measuring the degree of phosphorylation of certain markers within the mTOR signaling pathway. In addition, selected marker(s) of protein degradation is included. This will enable us to obtain an in-depth knowledge regarding protein synthesis/turnover and protein utilization in fish. We thereby presume to be able to investigate and document which/how nutritional factors (e.g. new protein sources & specific amino acids) and rearing conditions (e.g. feeding strategy, water quality, exercise, stress etc.) affect protein turnover (and thereby growth) in fish. The relationship between growth/protein utilization and mTOR response needs to be investigated further, but potentially this technique may e.g. allow us to
compare a large number of diets and very quickly determine the response in muscle tissue. This means that a large number of diets can be screened without the cost of large and long-lasting growth trials, and it may become faster/easier to select the most optimal diets based on the response. As growth and growth efficiency are vital factors in aquaculture, the method might have great potential under a variety of circumstances. This project is coordinated by DTU Aqua. The project is internally funded.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2016 → …
Number of participants: 1
Research area: Aquaculture
Project participant:
Larsen, Bodil Katrine (Intern)

Investigations of the potential "nitrogen effect" of stone reefs, and contribution to the re-establishment of a stone reef in the Natura 2000 area "Løgstør Broad, Vejerne and Bulbjerg" (The Stone Reef Project I & II) (39354 & 39450)
As well as many inner Danish waters, Limfjorden is highly eutrophied due to land-based nutrients runoff, and some areas in the fjord often suffer from anoxia events. The current project evaluates the effect of stone reefs as a possible complementary tool in water planning related to the water framework directive (2000/60/EF) to reduce the negative outcome of such events. For this purpose, the project involves the establishment of a stone reef in Løgstør Broad in 2017 as well as comprehensive analysis of the potential "nitrogen effect" of already existing stone reefs in the broad.

The outcome of the project will help to assess whether stone reefs can be a future use as an instrument of retaining nitrogen in water management plans.

The project is coordinated by Limfjordsrådet, Aalborg Municipality
National Institute of Aquatic Resources
Danish Shellfish Centre
Limfjordsrådet
Aarhus University
Geological Survey of Denmark and Greenland
NIVA Denmark Water Research
DHI
Period: 01/01/2016 → 31/12/2020
Number of participants: 2
Research areas: Marine Habitats & Ecosystem based Marine Management
Project participant:
Petersen, Jens Kjerulf (Intern)
Nielsen, Mette Møller (Intern)

Sound herding system for sustainable fisheries (GUDP-SHS) (39365)
The purpose of the project is to develop a new type of fishing gear, Sound Herding System (SHS), which applies sound to influence fish swimming direction and thereby herding them into a trawl. The sounders are mounted on the trawl boards, so as to create a wall of sound on both sides of the trawl opening. This increases the effective width and height of the trawl opening, resulting in higher catch rates. The frequency of the sounders is selected to be 4 kHz, which can be used to affect the clupeoid species herring, sprat and anchovy. Most other relevant species are not sound sensitive at this frequency.

The system can be used to avoid by-catches of herring in the mackerel fishery by closing trawl opening for herring with sound. Customers receive economic gains from higher catch rates and smaller by catch. The gain for the environment is a reduction in CO2 emissions and improved resource utilization.

The central work in the project is the development of trawl doors equipped with sounders as tested by exploratory scare effect measurements and mapping of sound fields. Fish response to sound is studied experimentally and finally the sounders’ impact on the environment is examined.

This project is coordinated by Sonus Aqua Aps, Denmark.
The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Marine Living Resources
Sonus Aqua Aps
Aalborg University
Period: 01/01/2016 → 31/12/2018
Number of participants: 3
Research areas: Observation Technology & Marine Living Resources
Project participant:
Mosegaard, Henrik (Intern)
Pedersen, Eva Maria (Intern)
Project Manager, academic:
Stage, Bjarne (Intern)
Project

Strengthening the Danish populations of Atlantic salmon – Increasing populations, genetic resources and recreational fishing (39340)
In the beginning of the 1980’ies indigenous Danish salmon populations were close to extinction due to habitat degradation and stocking with non-native strains. Conservation efforts, led to a resurge of the populations in western Jutland. However, following the initial increases, Danish salmon populations have stagnated in recent years. Whether this is a response to limiting local factors or a correlated response across population (e.g. to climate change), is unknown. A profitable recreational fishery has developed on the Danish salmon. If the productivity of Danish salmon populations can be improved, this fishery and the related economical gain have the potential to increase correspondingly.

Atlantic salmon has a highly complex and specialized life cycle where the weakest link(s) determines the productivity of the salmon population. Accordingly, there is a need for a multifaceted research project The main objectives of this project will be reached through six work packages aiming to: 1. Identify key local and global bottlenecks production of salmon across four life-stages, 2. Determine genetic characteristics (‘quality’) of local populations and identify how measures of ‘quality’ should be implemented into stocking programmes and 3. Communicate and implement insights on optimal management and exploitation to stakeholders.

The overarching aim of the project is to provide research based knowledge that can be directly implemented into a self-sustainable management framework that maximizes salmon population sizes, and hereby vastly increases local income from a recreational fishery with a high economic potential.

This project is coordinated by Danish Center for Wild Salmon.

The project is funded by Innovation Fund Denmark.

Section for Freshwater Fisheries Ecology
National Institute of Aquatic Resources
Danish Center for Wild Salmon
Period: 01/01/2016 → 31/12/2019
Number of participants: 5
Research areas: Freshwater Fisheries and Ecology & Population Genetics
Project participant:
Mena, Belén Jiménez (Intern)
Project Manager, academic:
Koed, Anders (Intern)
Eg Nielsen, Einar (Intern)
Bekkevold, Dorte (Intern)
Aarestrup, Kim (Intern)
Project

Study on approaches to management for data-poor stocks in mixed fisheries (MIXDLS) (39342)
The tender requires advancement of methods for advice on the status and management of data-poor stocks in mixed fisheries. In order to meet this requirement, we will undertake a detailed review of assessment and management approaches for data-poor stocks and identify relevant approaches for application in the case studies and wider EU
fisheries.
The approaches should be compatible with the Common Fisheries Policy (CFP; EU 2013) in terms of (i) fishing mortality ranges compatible with Maximum Sustainable Yield (MSY), (ii) fish caught to be landed, and (iii) addressing uncertainty in significant components of the marine fish ecosystem.
The most promising methods will be tested through simulation to ensure robustness to uncertainties and to deliver confidence in methods for future operational use. The suite of identified, assured methods will then be used to develop an objective framework to apply the most relevant assessment or management methods to each stock in each of the case study areas. Based on the output of these assessments of data-poor stocks, and where relevant, the existing assessments of data rich stocks, a mixed fisheries simulation framework will be developed to assess the performance of candidate management strategies.
Adaptation of the existing mixed fisheries tools will be required in order to incorporate data-poor stocks in the simulation framework.
This project is coordinated by DTU Aqua & IMARES, Netherlands.
The project is funded by EU, Calls for proposals/tenders (EU DG Mare).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
IMARES
Centre for Environment Fisheries and Aquaculture Science
Thünen Institute
French Research Institute for Exploitation of the Sea
Galway - Mayo Institute of Technology
AZTI-Tecnalia
National Research Council of Italy
Hellenic Centre for Marine Research
Period: 01/01/2016 → 31/12/2017
Number of participants: 3
Research areas: Fisheries Management & Marine Living Resources
Contact person:
Worsøe Clausen, Lotte (Intern)
Project participant:
Nielsen, J. Rasmus (Intern)
Project Coordinator:
Ulrich, Clara (Intern)

Tagging Baltic cod (TABACOD) (39333)
The aim of this project is to improve the management of eastern Baltic cod by 1) providing new information on growth and mortality patterns, and 2) develop a validated method for deriving this information from historic and future samples.

In recent years, the traditional age-based stock assessment had to be abandoned owing to extensive uncertainties in stock trends. These uncertainties were to a large extent attributable to inconsistencies in age estimation. As a consequence thereof, the current stock status is unknown.

Estimates of growth and mortality rely on unbiased age information. TABACOD will provide this information through a large scale tagging experiment, where 20,000 cod are tagged with and externally visible tag as well as with an internal tag on their otoliths. This experiment will also provide the samples for the development and validation of a new age estimation method based on the chemical composition of the cod’s otoliths.

The knowledge gained will be incorporated in length-based assessment models and their performance compared to the traditional methods evaluated in order to provide the ICES stock assessment group with the relevant tools to provide a reliable advice and to improve stock exploitation.

This project is coordinated by DTU Aqua.
The project is funded by BalticSea2020.
National Institute of Aquatic Resources
Collaborative modular underwater robotic system for long-term autonomous operations (REMORA) (39341)

In this project we aim to bootstrap new high-impact underwater robotics activities at DTU. We propose to develop a novel robotic platform, the REMORA1 system, for research, education and innovation. The objectives of the project are to develop the necessary infrastructure, i.e., underwater robotic system, test facilities, educational framework and external collaboration, to perform world-class research and innovation in the area of offshore underwater robotic technology.

With this project we aim to eventually strengthen the Danish maritime sector in dealing with the high cost and technical challenges of inspections and maintenance in increasing amount of offshore installations. The project is a collaboration between DTU Electrical Engineering, DTU Mechanical Engineering and DTU Aqua who have complementary expertise within development and innovation of robotic technology and applications of underwater robotics.

This project is coordinated by DTU Electrical Engineering.

The project is funded by A/S Dampskibsselskabet Orients Fond.

Effects on benthic habitats of fishing activities

National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography

Technical University of Denmark

Period: 21/12/2015 → 21/12/2017
Number of participants: 2

Research areas: Oceanography & Observation Technology & Marine Populations and Ecosystem Dynamics

Project participant:
Mariani, Patrizio (Intern)
Visser, Andre (Intern)

Project
Egg quality and Offspring Performance in European Eel

National Institute of Aquatic Resources
Period: 15/12/2015 → 14/07/2019
Number of participants: 3
PhD Student:
Kottmann, Johanna Sarah (Intern)
Supervisor:
Butts, Ian (Intern)
Main Supervisor:
Tomkiewicz, Jonna (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Identifying simple and cost effective gear solutions which can lead to an effective implementation of the new EU common Fisheries Policy (CFP)

National Institute of Aquatic Resources
Period: 15/12/2015 → 14/12/2018
Number of participants: 4
PhD Student:
Melli, Valentina (Intern)
Supervisor:
Gislason, Henrik (Intern)
Karlsen, Junita Diana (Intern)
Main Supervisor:
Krag, Ludvig Ahm (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Grundforskningsfonden
Project: PhD

Industry lead gear selectivity improvements, its strenghts and weakness in the new CFP

National Institute of Aquatic Resources
Period: 15/12/2015 → 29/03/2019
Number of participants: 4
PhD Student:
Malta, Tiago Alexandre Matias da Veiga (Intern)
Supervisor:
Feekings, Jordan P. (Intern)
Gislason, Henrik (Intern)
Main Supervisor:
Krag, Ludvig Ahm (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Marine migration behaviour of salmonids and gadoids assessed using biotelemetry and genetic stock identification

National Institute of Aquatic Resources
Sustainable, cost effective and responsive gear solutions under the landing obligation (FAST-TRACK) (39323)

With the reform of the Common Fisheries Policy and the introduction of a Landing Obligation the ability of fishers to adjust the selectivity of their gears to suit the quotas which are available to them will be an important factor in determining the revenue and profitability in the fishery. As the combination of gear, fishing practice and quota shares will differ between vessels, changes to the selectivity of the gears will need to be implemented at the vessel level and based on the quotas which are available to the vessel at a given time. For this to be realized, simple and cost effective solutions which can be quickly coupled with existing gears will be in demand. These solutions will need to be implemented quickly in order for them to solve the issues at hand without losing substantial income. Furthermore, these solutions will need to be scientifically tested to document their effect before being considered for implementation into the legislation.

Fast-Track aims to increase flexibility and ownership over the gears used while ensuring an effective introduction of the new EU Common Fisheries Policy. To achieve this, Fast-Track aims to facilitate the development of more selective gears by providing the industry with the possibility to take a more proactive role in the development and testing of new ideas. Here we try to facilitate a more bottom-up approach where the industry are responsible for coming up with the ideas they feel applicable for their fishery, as well as having an important role in the testing of the gear and the collection of the data. Furthermore, it aims to speed up the testing process and diversity of gears being tested by initially having the industry to define the idea and carry out a development/pre-test to refine the gears performance before proceeding to a more rigorous scientific test.

The expected effects of the project are 1) the establishment of a permanent platform comprised of stakeholders (fishermen, net makers producer organizations, managers and scientists) which can facilitate the development of ideas and solutions originating from the industry, 2) that the industry becomes more proactive role in the development and testing of solutions for the effective implementation of the landing obligation, 3) that the close cooperation between industry and researchers leads to greater ownership of the solutions developed, and 4) the speed with which innovative tools are developed, tested and approved is reduced while profitability and sustainability are increased.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Aalborg University
Danish Fishermen's Association
SINTEF

Period: 15/12/2015 → 15/12/2018
Number of participants: 5
Research areas: Fisheries Technology & Fisheries Management
Project participant:
Krag, Ludvig Ahm (Intern)
Ulrich, Clara (Intern)
Mortensen, Lars O. (Intern)
Phd Student:
Malta, Tiago Alexandre Matias da Veiga (Intern)
Project Coordinator:
Seekings, Jordan P. (Intern)
**Assessment and management of linked stocks (39325)**

The purpose of this project is to develop operational models for linked stocks.

Fish stocks are not isolated units. Fish eat, and are eaten, by fish from other stocks. The definition of fish stocks is often arbitrary or determined by management considerations. The bottom line is that some linkage must be expected between the defined stocks. For some stocks these effects are essential to give reliable assessment and management.

Single species assessment and management does not include effects from linked stocks.

Ecosystem and multi-species assessment models are not practically operational for assessment and management. These models are designed to describe all interactions between all important species in an ecosystem. These models often attempt to estimate detailed effects between all length- or age groups. These models often require data, which are not routinely available.

This project will develop models, which are directly applicable in the scientific advice. The aim is not to describe all interactions, but simply to harvest the main benefits of considering two or more stocks in a joint model. The aim is to identify few links between the stocks, which describes the main part of the interaction, and to base the models only on standard data sources.

The models will be developed to be generally applicable, but applied to two important cases (Cod EB and WB, and Cod stocks around Kattegat).

Final tool will be available via stockassessment.org, so it can easily be applied to any stocks defined there.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources

Section for Marine Living Resources

Period: 14/12/2015 → 13/12/2017

Number of participants: 5

Research area: Marine Living Resources

Project participant:

Berg, Casper Willestofte (Intern)

Kristensen, Kasper (Intern)

Thygesen, Uffe Høgsbro (Intern)

Phd Student:

Albertsen, Christoffer Moesgaard (Intern)

Project Coordinator:

Nielsen, Anders (Intern)

**Density-dependent processes in marine fish stocks**

National Institute of Aquatic Resources

Period: 15/11/2015 → 14/11/2018

Number of participants: 3

Phd Student:

van Gemert, Rob (Intern)

Supervisor:

Lindegren, Martin (Intern)

Main Supervisor:

Andersen, Ken Haste (Intern)

**Financing sources**

Source: Internal funding (public)

Name of research programme: Marie Curie (EU-stipendium)

Project: PhD
**Forward management of sandeel in the North Sea (39316)**

The project will define and align the management of sandeel considering the goals and desires of the fishing industry, administration and science while taking the biology and importance of the sandeel in the ecosystem into account.

The project is structured by several work-packages, each dealing with specific aspects of sandeel biology and/or fishery relevant for management. Among these will the sandeel population structure and its influence on stock assessment, CPUE and counselling be discussed. Analyses of fisheries development and sandeel availability over the fishing season will enable a more accurate calculation of fishing mortality. Furthermore, it is examined whether the increasing concentration of fishing effort on certain banks potentially causes an error in the stock assessment in relation to recruitment from unfished banks. The project will perform a statistical evaluation of fisheries-independent data for sandeel in the North Sea and evaluate existing and alternative methods of stock assessment for sandeel in the North Sea with current and alternative management areas, including implementing an analytical stock assessment of sandeel in sandeel area 4. Finally, the project will evaluate existing biological and management reference points, and discuss these in relation to ecosystem reference points.

Throughout the project period, a series of workshops and meetings will be held in order to discuss possible management strategies for sandeel in the North Sea. These discussions will imply a number of fundamental prerequisites defined in collaboration between management, fisheries and science in order to form the basis for an optimal management of sandeel.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Pelagic Producers Organisation
Danish Fishermen's Association
Marine Ingredients Denmark

**Danish Fisher-Researcher Network (39315)**

The project aims to bring the active Danish fishing sector and operational fisheries research closer together through “fisher-researcher” networking activities. The project will contribute to the collection and exchange of information and knowledge on fisheries and research herein across sectors and generations. This knowledge exchange will take place at several levels of education (secondary schools, university studies and training of working fishermen).

The project will support innovation and development of sustainable fisheries through collation of ideas as well as preparation and planning of project cooperation for the solution of current and future challenges about fisheries, fish stocks and management. Bringing the primary fishing industries in direct contact with research and management in a network will support local skills in fishing ports to serve the development and succession in the coastal communities.

Workshops and demonstrations of novel development are intended to direct technology transfer, innovative collaborative proliferation of businesses and recruitment of newly qualified academic staff. In addition, Danish fishing industry participation at the international level will be strengthened through increased technical scientific support from DTU Aqua.
before and under meetings in e.g. Thematic and Regional Advisory Councils.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
Danish Pelagic Producer Organization
Period: 06/11/2015 → 06/11/2017
Number of participants: 2
Research areas: Marine Living Resources & Observation Technology & Population Genetics
Project Manager, organisational:
Pedersen, Eva Maria (Intern)
Project Coordinator:
Mosegaard, Henrik (Intern)

Benefits, cost, and trade-off of defense mechanisms in marine phytoplankton
National Institute of Aquatic Resources
Period: 01/11/2015 → 28/01/2019
Number of participants: 3
Phd Student:
Pancic, Marina (Intern)
Supervisor:
Visser, Andre (Intern)
Main Supervisor:
Kiørboe, Thomas (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Value of the landing obligation – Former discard fraction (39347)
The aim of the project is to increase the value of those fish species that are landed due to the new regulation of the fisheries policy in EU – the landing obligation. This creates challenges both on board the fishing vessels and in the harbours. It is necessary to have smooth and efficient procedures to solve the challenges and to have a suitable both environmental and economic for both the fishermen and the fishing harbours.

This project is coordinated by Hanstholm Harbour, Denmark.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Gemba Seafood Consulting
Boatech
HM 120 "Astoria"
Period: 27/10/2015 → 27/10/2017
Number of participants: 1
Research area: Fisheries Management
Project Manager, academic:
Larsen, Erling (Intern)
An icean of : Assessing environmental DNA to monitor aquatic organisms in marine environments

National Institute of Aquatic Resources
Period: 01/10/2015 → 01/12/2018
Number of participants: 3
PhD Student:
Hansen, Brian Klitgaard (Intern)
Supervisor:
Bekkevold, Dorte (Intern)
Main Supervisor:
Eg Nielsen, Einar (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Marine management of ecosystem dynamics under climate change (MARmaED) (39300)
MARmaED is an EU Initial Training Network that unifies specific and complementary competences in marine sciences from Norway, Finland, Denmark, the Netherlands, Germany and France to investigate how the cumulative stress from biodiversity loss, climate change and harvesting will affect Europe's complex marine systems and the consequences for optimal resource management. MARmaED incorporates feedbacks between the socioeconomic and the ecological systems that give rise to critical transitions.

This project is coordinated by University of Oslo, Norway.
The project is funded by EU, Marie Curie.
National Institute of Aquatic Resources
Centre for Ocean Life
University of Oslo
University of Hamburg
Åbo Academy University
Wageningen University
University of Helsinki
University of Bergen
Météo-France
Period: 01/10/2015 → 01/10/2019
Number of participants: 4
Research area: Marine Populations and Ecosystem Dynamics
Project participant:
Lindegren, Martin (Intern)
PhD Student:
van Gemert, Rob (Intern)
Beukhof, Esther (Intern)
Project Manager, academic:
Andersen, Ken Haste (Intern)

Baltic Sea Check Point (BSCP) (39294)
The overall aim of this project is to examine the current data collection, observation, surveying, sampling and data assembly programs in the Baltic Sea basin, assess and demonstrate how they can fit into purpose in the 11 challenge areas in terms of data uncertainty, availability, accessibility and adequacy, and deliver the findings to stakeholders through an internet portal with dynamic mapping features and a stakeholder workshop. The Baltic Sea region is as defined by the Marine Strategy Framework Directive, i.e., the semi-enclose sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.43’. This project is coordinated by the Danish Meteorological Institute. The project is funded by the EU Executive Agency for Small and Medium-sized Enterprises (EASME) & the Ministry of Environment and Food of Denmark and the
European Maritime and Fisheries Fund (EMFF).
National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Meteorological Institute
Klaipeda University
European Global Ocean Observing System
Finnish Meteorological Institute
ETT S.p.A
Swedish Maritime Administration
Tshwane University of Technology
Grontmij A/S

Period: 17/09/2015 → 16/06/2018
Number of participants: 3
Research areas: Marine Living Resources & Coastal Ecology & Ecosystem based Marine Management

Project participant:
Dinesen, Grete E. (Intern)
Eero, Margit (Intern)

Project Coordinator:
Christensen, Asbjørn (Intern)

Project

**BONUS BIO-C3 Cruise (39117-DCH)**
The multidisciplinary research cruise (16-30 September 2015) was aiming to investigate the distribution, abundance, biomass, production, nutritional condition and genetic diversity of several, trophically interlinked Baltic key species, ranging from zoo-, and ichthyoplankton over gelatinous organisms to adult fish, including non-indigenous species. The collected samples and data are used in the BONUS project Biodiversity changes—causes, consequences and management implications (BIO-C3), aiming to significantly advance our knowledge base towards the importance and management of the Baltic Sea biodiversity in an ecosystem perspective.

Using the contrasting environments of the Arkona, Bornholm, Gdansk and Gotland Basin, the major scientific goals of the cruise have been to resolve:
- Physiological preferences and tolerances of key meso-zooplankton species (*Pseudocalanus acuspes, Temora longicornis, Centropages hamatus* and *Acartia* spp), through controlled experiments on board with specimens caught in different areas of the central Baltic in contrasting environments, including a verification of species based on genetics,
- Abundance, distribution, nutritional condition and phenology of key zooplankton (see above) and their life stages as well as gelatinous plankton species (*Aurelia aurita, Cyanea capillata, Mertensia ovum, Mnemiopsis leidyi*) in different areas of the central Baltic, through net-sampling and deploying hydroacoustics and optics, as well as biochemical analyses,
- Individual condition, abundance and distribution of spawning herring and cod based on trawl sampling and hydroacoustics including biochemical investigations on the quality of spawning products,
- Abundance and survival of herring and cod ichthyoplankton, through net-sampling based stage specific production estimates, including age determination, nutritional condition and growth in relation to abundance, phenology and composition of zooplankton prey,
- Predation pressure on copepods and fish early life stages by herring and sprat as well as gelatinous plankton (see above) through resolving the spatial overlap between predator and prey at relevant scales as well as diet composition analyses,
- Distribution (vertical and horizontal) of sprat and herring through trawl sampling and hydroacoustics in relation to hydrography, zooplankton prey and predator (cod) abundance, with specific focus on growth, condition and survival of young of the year sprat in different areas of the central Baltic.

This project was coordinated by DTU Aqua.
The project was funded by Danish Center for Marine Research.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Arctic Section
Baltic Sea project to boost regional coherence of marine strategies through improved data flow, assessments, and knowledge Base for development of measures (BalticBOOST) (39312)

General objectives

The general objective of the project is to enhance regional coherence in the accomplishment of the 2018 reporting under the EU MSFD by developing joint tools, defining data needs and to set up data arrangements to support indicator-based assessments of the state of and pressures on the Baltic Sea. The project take steps towards development of joint environmental targets for pressures affecting seabed habitats by developing a knowledge base and principles for defining such targets. The project addresses in particular MSFD Descriptors 1, 6, 8 and 11.

BalticBOOST is based on five themes with one or several work packages: Theme 1 (Biodiversity), Theme 2 (Hazardous substances), Theme 3 (Physical loss and damage to seabed habitats), Theme 4 (Noise), and Theme 5 (Joint documentation of Programmes of Measures).

DTU Aqua is involved in themes 3 and 5:
- Theme 3, Physical loss and damage to seabed habitats, develops joint principles for defining environmental targets for pressures affecting seabed habitats (WP 3.1). The development of such environmental targets is challenging and as a starting point the WP explores ways to determine how much disturbance from different activities that specific seabed habitats can tolerate while remaining in Good Environmental Status (GES). Under this Theme, a tool for assessing the impacts of fishing gear on specific habitat types and species is also developed (WP 3.2). Finally, an arrangement for regular collection of data and information on pressures and activities that affect the Baltic Sea is piloted, to provide support to this Theme as well as future assessment of pressures impacting the Baltic Sea (WP 3.3). A shared component across Themes 1-3 is improving access to high quality data to carry out future assessments feeding into the MSFD reporting. This involves alignment of the formats of reported data to relevant international or European data format and making the resultant spatial data products (indicator maps) available as INSPIRE compliant (OGC WMS/WFS) web map services.
- Theme 5, Joint documentation of Programmes of Measures (PoMs), provides support for HELCOM GEAR, the working group responsible for regional coordination in the implementation of the HELCOM BSAP and the MSFD. Support is provided to the agreed development of a joint document on regional coordinated PoMs and a system to follow-up actions agreed by HELCOM.

Tasks and Deliverables

DTU Aqua is involved in Theme 3, WP3.1 and especially WP3.2, where we will develop methods for assessing and apply fishing intensity maps according to fishing gear (footprint), explore benthic sensitivity indicators of fishery, and evaluate fishing impact according to MSFD indicators, all with focus on the Femern Belt Case Study. DTU Aqua is responsible for and coordinating the Technical WP3.2 (coordinator Prof. J. Rasmus Nielsen).

This project is coordinated by DTU Aqua.

The project is funded by EU, Calls for proposals/tenders (DG ENV/MSFD Action Plans/2014).
Marine pelagic secondary production under environmental stress - impacts of climate change and oil exposure
In this project, we used copepods as key species to assess the secondary production in marine ecosystems from Arctic to tropical regions under changing environment. We experimentally test the vulnerability of both generalist and specialist copepods to crude oil components in a warmer environment.

Functional diversity in marine ecosystems - linking biodiversity to ecosystem integrity
In this project, we used copepods as key species to assess the secondary production in marine ecosystems from Arctic to tropical regions under changing environment. We experimentally test the vulnerability of both generalist and specialist copepods to crude oil components in a warmer environment.
Environmental neutral aquaculture water treatment (MIVANAK) (39295)

Despite a transition from flow-through systems to more advanced open water reuse aquaculture systems (e.g. model trout farms), the need for water treatment still exists. In brackish and saltwater reuse systems, blooms of toxic microalgae in an example of a recently new challenge.

The purpose of this project is to further develop current aquaculture water treatment practice and reduce the total amount of disinfectants used.

The project includes 3 different work packages, investigating

- ecological consequences of continuous application of peroxyacetid acid.
- toxicological effects of easy degradable disinfectants.
- alternative biological methods to control / avoid blooms of toxic heterotrophic dinoflagellates.

Trials will include mesocosmos experiments where disinfectants are added continuously or by daily pulses over a prolonged period of time where phyto- and zoo-plankton abundance and compositions will be investigated. Other trials will be made in batch experiments with pure algae cultures, as will prolonged continuous peroxyacid application experiments be made.

This project is coordinated by DTU Aqua.

The project is funded by the Environmental Protection Agency's Programme for Pesticide Research.

National Institute of Aquatic Resources

Section for Aquaculture

Period: 01/08/2015 → 31/12/2017
Number of participants: 9
Research areas: Aquaculture & Marine Populations and Ecosystem Dynamics

Project participant:

Pedersen, Per Bovbjerg (Intern)
Koski, Marja (Intern)
Sproegel, Ulla (Intern)
Frandsen, Dorthe (Intern)
Møller, Brian (Intern)
Larsen, Ole Madvig (Intern)
Jensen, Rasmus Frydenlund (Intern)

Project Manager, organisational:

Pedersen, Lars-Flemming (Intern)

Phd Student:

Rojas-Tirado, Paula Andrea (Intern)

Expertise in marine and aquatic ecology and genomics for sustainable management of fish and shellfish in Skagerrak-Kattegat-Øresund (MarGen) (39301)

The marine and freshwater regions encompassing Skagerrak, Kattegat, Øresund and the North Sea are biologically highly productive and contain plentiful living aquatic resources that are important for the region. At the same time the coastal areas are densely populated and industrialized, fish and shellfish resources are heavily harvested, and waters are subject to pollution and eutrophication. The region is also markedly affected by the ongoing global warming, with sea temperature rising nearly 2 degrees C during the last 40 years. These environmental pressures call for investigations into the consequences for aquatic organisms, their potential for adapting to environmental changes, and for identifying management strategies that could mitigate deteriorating environmental conditions, using state-of-the-art methodology. Here, we will capitalize on the revolutionizing developments in genomics, electronic tagging and computer modelling to obtain insights on the ecology, evolution and management of aquatic biodiversity in the region.

The ØKS region harbours leading scientific environments within the aquatic, marine and genomic sciences that are complementary with respect to research and education and that would strongly benefit from better integration and networking. This proposal also aims to establish a research cluster and expand the number of active PhDs, postdocs and
senior researchers within the region, thereby fostering an innovative research and educational network in the ØKS region.

This project is coordinated by DTU Aqua.

The project is funded by EU, InterReg (regional collaboration).

National Institute of Aquatic Resources
Section for Marine Living Resources
Institute of Marine Research
University of Gothenburg
Aarhus University
University of Oslo
Norwegian Institute for Water Research
University of Agder

Period: 01/07/2015 → 30/06/2018
Number of participants: 8
Research areas: Population Genetics & Freshwater Fisheries and Ecology

Project participant:
Bekkevold, Dorte (Intern)
Aarestrup, Kim (Intern)
Mensberg, Karen-Lise Dons (Intern)
Meldrup, Dorte (Intern)
Mikkelsen, Jørgen Skole (Intern)
PhD Student:
Kristensen, Martin Lykke (Intern)
Le Moan, Alan (Intern)
Project Manager, academic:
Hansen, Jakob Hemmer (Intern)

Implementing robot and drone technology in fisheries (39303)
The project aims to provide proof of concept for the use of robots in the fishery, focusing on three specific types for three different implementations. One will be used to determine the species and size composition of fish in the catch to prevent discards, the other to search for fish optically with a drone (capelin in Greenland) and the third a sailing robot to search for fish using sonar. The robots/drones to be employed are available on the marked. A development project must subsequently design software etc. to produce marketable products. It is estimated that there is a great potential in Denmark and a huge world market for these technologies that presently are not employed in fishery.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Arctic Section
Danish Pelagic Producers Organisation
Blue Ocean Robotics
Partrederiet M/S Isaold HG 333
AquaMind

Period: 01/07/2015 → 01/12/2016
Number of participants: 2
Research areas: Marine Living Resources & Observation Technology

Project participant:
Stage, Bjarne (Intern)
Mosegaard, Henrik (Intern)
Improvement of the foundation for stock assessment for data limited stocks with importance for Danish fishery (39310)

**Objectives**
The aim of this project is to improve the knowledge basis, data, and methodology for providing robust stock assessment and short term forecast according to MSY for data limited fish stocks with importance for Danish commercial fishery.

**Background**
A number of fish stocks in the Baltic, Skagerrak-Kattegat and North Sea area with importance for Danish commercial fishery either as target species, commercially important by-catch species, or as unintended by-catch species are data limited stocks with no analytical stock assessment. More than 60% of fish stocks that ICES gives advice on are category 3 and 4. These categories include stocks for which the data and knowledge are insufficient to conduct a full analytical assessment of their state and exploitation. Until now, ICES has not been able to assess their state relative to the objective of achieving MSY (Maximum Sustainable Yield) sustainability. A major task of fisheries management is broadening from the narrow analysis of few main commercial species toward accounting for by-catches, i.e. the great range of species and sizes of lesser importance caught at the same time in non-selective fisheries (mixed-fisheries). This unwanted part of catches is becoming politically important because it may trigger restrictive management decisions for the commercial fisheries, both as part of the ecosystem-based marine management (EU MSFD), and because of the potential of these species to become limiting for some fleets in the frame of the landing obligation (=discard ban) of the EU CFP, i.e. when a fishery can be closed because it has reached the authorized catch quantity (quota) of a low-value species even though it still has some quota left for more valuable commercial species (so-called “choke species” effect).

**Tasks and Deliverables**
- Develop assessment and forecast models and methods for stocks in the categories 3-4 and integrate them as standard models and software in the ICES advisory framework in relation to method development and assessing data poor stocks in special working groups (ICES WKLIFE V-VI, ICES WKPROXY) and in standard stock assessment working groups covering the Skagerrak-Kattegat, Baltic Sea and North Sea areas (ICES WGNSSK, ICES WGBFAS).
- Apply the models to selected fish stocks with importance for Danish fishery with the aim of promoting analytical and benchmark assessments to assess stock status relative to MSY objectives. Application of these methods mean that the status of those category 3 and 4 stocks can be classified as desirable or undesirable in relation to MSY objectives, and the stocks can be lifted to category 2 or 1 stocks with analytical assessments. The stocks are selected in close collaboration and agreement with the Ministry of Environment and Food (several directorates), the fishing industry and associations (DF), NGO environmental stakeholders and Science (DTU Aqua).
- The work includes estimation of fish stock growth parameters, performing yield per recruit analyses, and conducting stock assessments with application of a stochastic stock production model and/or a length based stochastic assessment model, as well as where possible a stochastic age based VPA stochastic assessment model.
- Management Strategy Evaluation (MSE) for selected stocks: Establishment of biological (biomass- or fishing mortality based) reference points for each of the selected stocks involving growth models and logistic models (ogives). MSE for establishing output-based harvest control rules according to short to medium term forecasts for the selected stocks. This includes provision and further development of model software to carry out MSE of the selected stocks.

This project is coordinated by DTU Aqua.
The project is funded by the Danish Ministry og Environment and Food (under Framwork Contract with DTU).

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Welfare, health and individuality in farmed fish (WIN-FISH) (39236)

In modern aquaculture, production costs are the major driver. This has resulted in culture practices and rearing environments aimed at maximizing production capacity. Consequently, fish are exposed to unavoidable stressors, which
can be detrimental to animal health and welfare. Moreover, it is increasingly clear that individuality in stress reactions have to be included in the concept of animal welfare. Such differences often take the form of suites of traits, or stress coping styles (SCS), where traits like sympathetic reactivity, aggression and the tendency follow and develop routines show positive relationships. In addition, these traits show a negative relationship with plasma cortisol levels and are also associated with differences in immune function. The project will validate behavioural and physiological welfare indicators for selected fish species at the individual and rearing unit level. This will generate new information about responses to environmental factors, knowledge that can be applied to improve husbandry and management practices. Recirculating aquaculture systems (RAS) have been developed as a sustainable alternative with low ecological consequences compared to traditional flow through systems. However, in RAS factors such as higher rearing densities and water quality parameters may challenge the welfare of fish. In WIN-FISH, health, welfare and production related effects of RAS rearing of species at different densities will be monitored. In order to account for individual variation, these studies will be performed on fish screened for SCS. Similarly, in flow through systems, health, welfare and production related effects of rearing densities will be further investigated in sea bream differing in SCS. Generally, environmental enrichment has positive effects on animal welfare. WIN-FISH will investigate effects of environmental enrichment on rainbow trout with contrasting SCS. In an attempt to generate genetic markers for selective breeding to optimize performance and welfare of farmed Atlantic salmon, a genome-wide association analysis will be performed on salmon with divergent SCS, focusing on proactive fish differing in aggressive behaviour. In addition, zebrafish will be used as a model to gain additional knowledge on mechanisms underlying SCS and aggressive behaviour.

This project is coordinated by DTU Aqua.

The project is funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Aquaculture
IFREMER
Universidad Politècnica de Madrid
Instituto Zooprofylattico Sperimentale delle Venezie
Institute of Agri-food Research and Technology
Uppsala University
Period: 18/05/2015 → 17/05/2018
Number of participants: 2
Research area: Aquaculture
Project participant:
Skov, Peter Vilhelm (Intern)
Project Coordinator:
Gesto, Manuel (Intern)
Project

Supporting the national monitoring of Marine Strategy Framework Indicators (39304)
In support of the national implementation of EUs Marine Framework Strategy Directive, the project assembles a one-off monitoring of indicators of the following aspects:

- Quality of sandeel habitat
- Proportion of large top predatory fish
- Biomass of planktonic secondary producers
- Pressure on the sea bed from towed fishing gear
- Marine macro-litter
- Marine micro-litter in the food chain

The quality of sandeel habitat is measured as the fraction of sampling sites in known sandeel habitat which are unsuitable for sandeel due to excessive silt content. The proportion of large top predatory fish describes the proportion of large cod and saithe in Danish waters, and biomass of secondary producers is measured as the annual average biomass of zooplankton of three size categories in Skagerrak/Kattegat in summer.

Pressure on the seabed is measured from VMS data and the minimum area which sustains 90 % of all pressure estimated together with the effectively unfished area. Macro-litter is measured as the average catch of litter in fish trawl surveys, whereas micro-litter in the food chain is monitored as the amount and occurrence of microplastic particles in stomachs from pelagic and demersal fish.

This project was coordinated by DTU Aqua.
The project was funded by the Danish Nature Agency.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Danish Fishermen's Association
Period: 15/05/2015 → 31/12/2015
Number of participants: 4
Research areas: Ecosystem based Marine Management & Oceanography
Project participant:
Stedmon, Colin (Intern)
Mortensen, Lars O. (Intern)
Egekvist, Josefine (Intern)
Project Coordinator:
Rindorf, Anna (Intern)

**Ocean Literacy capacity for DK**
The workshop builds on previous TOL efforts, but with a more specific focus. The overarching goal is to draft recommendations on how Ocean Literacy can serve marine research projects for greater societal impact, and contribute to Blue Growth objectives (What is Blue Growth? A short, and a long version) through more effective knowledge exchange and engagement with non-academic stakeholders and the public.

The recommendations should assist transatlantic marine research consortia supporting the Galway Statement on Atlantic Ocean Cooperation to capitalize on citizen science, promote a science-literate citizenry, and increase public awareness on Societal Challenges issues (e.g., ocean health, responsible ocean stewardship, food security, climate mitigation).

National Institute of Aquatic Resources
Research Secretariat
Centre for Ocean Life
Danish Shellfish Centre
National Oceanographic and Atmospheric Administration
European Environment Agency
College of Exploration
University of Rhode Island
University of Maine
University of Gothenburg
IOC-UNESCO
Period: 01/05/2015 → 30/09/2015
Number of participants: 3
Ocean literacy
Acronym: Ocean Literacy
Project participant:
Grigorov, Ivo (Intern)
Canal-Vergés, Paula (Intern)
Project applicant:
Kiørboe, Thomas (Intern)

**Relations**
Related projects:
SeaChange (39237)

**Tender for scientific support to the Saudi Arabian fisheries sector (SaudiTender I) (39153)**

**Objective**
The general aim of the Fisheries Program at the Marine Studies Section, Center for Environment and Water, Research Institute, King Fahd University of Petroleum and Minerals (KFUMP/RI), is to establish a modern system of data collection,
biological and ecological assessment, stock assessment modelling, and government management, in order to evaluate the exploitation status and enhance the sustainability of finfish and invertebrate stocks of Saudi Arabia (SA) Exclusive Economic Zone in the Arabian Gulf. The overall principle underlying this effort is the food security of SA, and the duty to carry out the best efforts to guarantee sustainable exploitation of fishery resources and ensure economic viable fisheries. The Program is organized in four main branches, or Work Packages: Population Dynamics and Stock Assessment, Essential Fish Habitats, Environmental Impacts of Fishing Methods, and Management Strategy Framework.

**Background**
The KFUPM/RI of Saudi Arabia and AZTI-Tecnalia, Marine and Food Research Institute of the Basque Country, Spain, in partnership with DTU-Aqua, runs this project with an extensive collaboration program in fisheries monitoring, research, and management advice. A service contract according has been signed between KFUPM/RI and AZTI. A sub-contract to this service contract has been made between AZTI and DTU Aqua where parts of the service contract forms an integral part of the subcontract and where DTU Aqua is co-responsible for the below listed specific tasks and deliverables.

**Tasks and Deliverables**
Population Dynamics and Stock Assessment: Provision and further development of suitable model software to carry out stock assessment for data limited fish stocks. Stock assessment models suitable to data-poor fisheries are applied to historical catch and effort data (2002-2012) and to data from the new Data Collection Framework (2013- ) for major stocks. DTU Aqua is responsible for provision of model software to carry out assessments and application of this to 5 major finfish stocks out of the appointed 13 major stocks exploited by SA in the area. The work include estimation of fish stock growth parameters, performing yield per recruit analyses, and conducting stock assessments with application of a stochastic stock production model using the above data to estimate MSY (Maximum Sustainable Yield) sustainability reference levels according to exploitation. Templates for assessment and advice are developed on the basis of the data and knowledge available in cooperation with AZTI which includes a Stock Summary Sheet for each of the stocks.

Management Strategy Evaluation (MSE) for Major Stocks: Conducting and reporting MSE for data-poor fisheries considering several prospective harvest control rules in the short to medium term according to MSY. This involves identification of biological reference points (biomass- and fishing mortality based reference points) and identification of input or output based harvest control rules according to short term forecast for the 5 major fish stocks. Also, this involves provision and further development of model software to carry out MSE according to MSY in the short to medium term.

Management Strategy Framework: Provision of formal considerations, evaluations, recommendations and reporting of relevant and appropriate management regimes and systems of data collection and stock assessments for scientifically-based advice to the SA Ministry of Agriculture on basis of current fishery system and exploitation of the 13 major stocks. This addresses needs for data, methods, institutional set-up, provision of advice, and possible management systems. This project is coordinated by AZTI Technalia, Spain.

The project is funded by AZTI Technalia, Spain as to KFUPM University Saudi Arabia.

**National Institute of Aquatic Resources**
Section for Ecosystem based Marine Management
AZTI-Tecnalia
King Fahd University of Petroleum and Minerals
Period: 01/05/2015 → 30/06/2017
Number of participants: 5
Research area: Fisheries Management
Project participant:
Pedersen, Martin Wæver (Intern)
Berg, Casper Willestofte (Intern)
Degel, Henrik (Intern)
Bastardie, Francois (Intern)
Project Coordinator:
Nielsen, J. Rasmus (Intern)
Project

**Mussel season prolongation (FOMUS) (39273)**
The overall objective of FOMUS is to increase the production of longline farmed mussels and ensure that a larger proportion of the increase in value of the primary product takes place in Danish companies.

This is achieved through the development of new production methods with a focus on changing production cycle in order to extend the harvest season. Sales only cover a short period of time from June to August and the goal is to extend the season for 6-8 months.
FOMUS covers the entire value chain and supports the development of sustainable mussel production.

The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

This project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Danish Shellfish Centre
Seafood Limfjord

Vilsund Blue
Period: 01/04/2015 → 01/06/2018
Number of participants: 8
Research area: Shellfish and Seaweed
Project participant:
Nielsen, Carsten Fomsgaard (Intern)
Boesen, Helge (Intern)
Barreau, Pascal David Alain (Intern)
Bak, Finn (Intern)
Andersen, Lars Kyed (Intern)
Nielsen, Pernille (Intern)
Project Manager, academic:
Saurel, Camille (Intern)
Project Coordinator:
Petersen, Jens Kjerulf (Intern)

A systems approach framework for coastal research and management in the Baltic (BaltCoast) (39201)

The ultimate objective of this project is a coherent and systematic management approach that encompasses multiple impacts in a spatially heterogeneous context.

In BaltCoast we tackle this complex task using the Systems Approach Framework (SAF). The SAF is an issue oriented investigation and methodology that applies a holistic perspective. It investigates and quantifies the functions of systems in order to simulate specific questions concerning their functions or policies. It comprises the process from issue identification through system analyses to policy implementation.

This Systems Approach can, hence, competently address implementation of international directives (e.g. Water Framework Directive (WFD), Marine Strategy Framework Directive (MSFD)). In BaltCoast we address multiple issues through case studies that reflect current regional management challenges and develop a generic tool for integrated system assessment.

This project is coordinated by Leibniz-Institute for Baltic Sea Research (IOW).

The project is funded by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Leibniz-Institute for Baltic Sea Research
Klaipeda University
Tallinn University
University of Latvia
Polish Academy of Sciences
Swedish University of Agricultural Sciences
Period: 01/04/2015 → 31/03/2018
Number of participants: 8
Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics & Marine Living Resources & Ecosystem based Marine Management
Intelligent oceangraphically-based short-term fishery forecasting applications (GOFORIT) (39270)

Fisheries for short lived species are highly variable because they primarily target a low number of age groups within stocks as well as irregularly recruiting year-classes. As a result, environmental fluctuations (e.g., temperature, food abundance), which cause major changes in fish productivity, can lead to rapid fluctuations in fishing opportunities and stock declines if fishing effort is not reduced accordingly. Such fluctuations are not foreseen or accommodated by management advisory frameworks for short-lived species, which generally assume environmental stability and constant productivity. The GOFORIT project will use climatic and oceanographic process knowledge with the goal to improve short-term fishery forecasts.

The project is coordinated by DTU Aqua.

Funding
The project is funded by EU, COFASP, ERA-NET.

National Institute of Aquatic Resources
Section for Oceans and Arctic
Marine Research Institute
National Institute for Marine Research and Development
Central Fisheries Research Institute
Institute of Marine Sciences

Period: 01/04/2015 → 01/04/2018
Number of participants: 3
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics & Marine Living Resources

Optimising and enhancing the integrated Atlantic Ocean Observing Systems (AtlantOS) (39243)

The vision of AtlantOS is to improve and innovate Atlantic observing by using the Framework of Ocean Observing to obtain an international, more sustainable, more efficient, more integrated, and fit-for-purpose system. Hence, the AtlantOS initiative will have a long-lasting and sustainable contribution to the societal, economic and scientific benefit arising from this integrated approach. This will be achieved by improving the value for money, extent, completeness, quality and ease of access to Atlantic Ocean data required by industries, product supplying agencies, scientist and citizens. The overarching target of the AtlantOS initiative is to deliver an advanced framework for the development of an integrated Atlantic Ocean Observing System that goes beyond the state-of–the-art, and leaves a legacy of sustainability after the life of the project.

The specific task of DTU Aqua is to conduct analysis of environmental DNA (e-DNA) using an Environmental Sample Processor (ESP). All living organisms secrete DNA to the surrounding environment. Recently it has been shown that such "e-DNA" can be extracted from seawater and used to identify the organisms present within a designated sea area. The "ESP" is a moored automated DNA laboratory, which can be deployed for up to three months for in-situ analysis and at the same time send back real-time analytical results. Hitherto it has been used for identification of marine bacteria, phyto- and zooplankton with very good results. We will modify the ESP to allow its use for e-DNA analysis. The aim is to conduct unprecedented “proof of concept” of e-DNA sensors for monitoring of important species in a number of sea areas and time periods.
The project is funded by EU, Horizon 2020.

This project is coordinated by DTU Aqua and has 54 additional partners across Europe

National Institute of Aquatic Resources
Section for Marine Living Resources
GEOMAR - Helmholtz Centre for Ocean Research Kiel
Natural Environment Research Council
Marine Institute
National Center for Scientific Research
International Council for the Exploration of the Sea
Institute of Marine Research
Scottish Association for Marine Science

Period: 01/04/2015 → 31/03/2019
Number of participants: 2
Research area: Population Genetics

Phd Student:
Hansen, Brian Klitgaard (Intern)

Project Coordinator:
Eg Nielsen, Einar (Intern)

Project

**SeaChange (39237)**

Sea Change is an EU H2020 funded project that aims to establish a fundamental "Sea Change" in the way European citizens view their relationship with the sea, by empowering them, as Ocean Literate citizens, to take direct and sustainable action towards a healthy ocean and seas, healthy communities and ultimately a healthy planet.

The project is funded by EU, Horizon2020.

National Institute of Aquatic Resources
Danish Shellfish Centre
University of Connecticut

Period: 01/03/2015 → 28/02/2018
Number of participants: 5
Ocean literacy
Acronym: SeaChange

Project participant:
Nielsen, Carsten Fomsgaard (Intern)
Møller, Lene Friis (Intern)
Grigorov, Ivo (Intern)

Working partner:
Canal-Vergés, Paula (Intern)
Nielsen, Carsten Nymark (Intern)

**Relations**
Activities:
TOL2015: Transatlantic Ocean Literacy in support of Galway Declaration
LEARN-TEACH: a pilot to boost Ocean Literacy in High Schools

Project

**CodStory (39308)**
The main objective of this project is to examine spatiotemporal genetic and trophic change of North Atlantic cod populations over the last millennium, a period of significant temperature fluctuations. This project addresses several important issues in current conservation and resource management, for example, population size fluctuations, migrations and distribution shifts of Atlantic cod in relation to climate change. The project will provide long term data (approximately 1100 years) on the genetic population structure, adaptive genetic change and trophic ecology of a single species, the Atlantic cod, expanding the application of cod as a model species in historical eco-genetics.
Specific research questions include:
- How have climate fluctuations effected migration, gene flow, distributional shifts and interactions of Atlantic cod populations in the North Atlantic?
- How have climate fluctuations affected the trophic niche of Atlantic cod through ecological regime shifts and change in Atlantic cod feeding migrations?
- How have climate fluctuations affected the trophic niche and trophic position of seabirds and do directional changes in seabird isotope values, together with isotope values from Atlantic cod, indicate specific ecosystem effects?
- How has climate change affected the adaptive evolution of Atlantic cod at centennial scales as revealed by spatiotemporal SNP analysis with broad genomic coverage?

This project is coordinated by the University of Iceland.

The project is funded by the Icelandic Research Council.

National Institute of Aquatic Resources
Section for Marine Living Resources
University of Iceland

University of Saskatchewan

City University of New York

National Museum of the Faroe Islands

Period: 01/03/2015 → 28/01/2018
Number of participants: 2
Research area: Population Genetics
Project participant:
Hansen, Jakob Hemmer (Intern)
Project Manager, academic:
Eg Nielsen, Einar (Intern)

**COLUMBUS (39239)**

COLUMBUS overarching objective is to ensure that applicable knowledge generated through EC-funded science and technology research can be transferred effectively to advance the governance of the marine and maritime sectors while improving competitiveness of European companies and unlocking the potential of the oceans to create future jobs and economic growth in Europe (Blue Growth).

This project is coordinated by AquaTT UETP Ltd.

The project is funded by EU, Horizon2020.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

EurOcean Consortium

AquaTT

EurOcean Consortium

Marine South East

Panagiotis Christofilogiannis - Iona Tavla

SmartBay Ireland Ltd

The Oceanic Platform of the Canary Islands

Sociedad Para el Fomento de la Innovacion Tecnologica S.L.

Flanders Marine Institute

Cefas

EuroGOOS

Centro Tecnológico del Mar – Fundación CETMAR
Aquatera Ltd
Seascape Consultants Ltd
European Council for Maritime Applied R&D Association
The Commission on the Protection of the Black Sea Against Pollution
European Aquaculture Society (ESA)
Pierre and Marie Curie University - University of Paris VI
Natural Environmental Research Council
Maritime Development Centre of Europe
Société d'Exploitation du Centre National de la Mer
Norwegian University of Science and Technology
Irish Sea Fisheries Board
The Executive Agency for Higher Education, Research, Development and Innovation Funding
Center of Maritime Technologies e.V.
International Council for the Exploration of the Sea
Research Centre Julich (FZJ)
Period: 01/03/2015 → 28/02/2018
Number of participants: 3
Research areas: Oceanography & Observation Technology
Project participant:
Mariani, Patrizio (Intern)
Thøgersen, Thomas Lindberg (Intern)
Larsen, Erling (Intern)

**Relations**
Activities:
EGU2017-18355 Passive vs Active Knowledge Transfer: boosting grant proposal impact

**Effects of the newly established lake on migrating juvenile salmonids (smolts)**
National Institute of Aquatic Resources
Period: 01/03/2015 → 28/02/2018
Number of participants: 7
PhD Student:
Schwinn, Michael (Intern)
Supervisor:
Baktoft, Henrik (Intern)
Main Supervisor:
Aarestrup, Kim (Intern)
Koed, Anders (Intern)
Examiner:
Jepsen, Niels (Intern)
Moore, Andy (Ekstern)
Thorstad, Eva B. (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

**Strategies for the gradual elimination of discards in European fisheries (DiscardLess) (39238)**
DiscardLess will help provide the knowledge, tools and technologies as well as the involvement of the stakeholders to achieve the gradual elimination of discarding. These will be integrated into Discard Mitigation Strategies (DMS) proposing
cost-effective solutions at all stages of the seafood supply chain.

This project is coordinated by DTU Aqua.

The project is funded by EU, Horizon2020.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

IFREMER
Instituto Español de Oceanografía
University of Bergen
Strathclyde University
University of Copenhagen
Université de Bretagne Occidentale
Sea Fish Industry Authority
Marine Scotland Science
FAO
Simrad Spain SLU
Hampiðjan hf
SafetyNet Technologies LTD
Marine Institute
NAYS Ltd
Pôle AQUIMER
University of the Azores
Cefas
Matís Ltd.
MAREL
ShipCon
TRACE Wildlife Forensics Network Limited
AZTI-Tecnalia
BARNA
NUSCIENCE
University of Tromsø
Marine Natural Resources Governance
FishFix
Agrocampus Ouest
AlphaFilm

Marine Institute of Memorial University
Period: 01/03/2015 → 28/02/2019
Number of participants: 7
Research areas: Fisheries Management & Population Genetics & Fisheries Technology & Ecosystem based Marine Management
Project participant:
Rindorf, Anna (Intern)
Larsen, Erling (Intern)
Feekings, Jordan P. (Intern)
Eg Nielsen, Einar (Intern)
Mortensen, Lars O. (Intern)
Bekkevold, Dorte (Intern)

Project Coordinator:
Ulrich, Clara (Intern)

Documents:
DiscardLess - An overview of the project
DiscardLess - What can science do to help with the landing obligation? Presentation from Sinaval, Bilbao, Spain 22 April 2015
DiscardLess - Poster from ICES Annual Science Conference 2015
DiscardLess - Newsletter no. 1 2015

Upgrading pangas and tilapia value chains in Bangladesh (39244)
Growth in aquaculture is important because it can help alleviate poverty by providing food and creating jobs in Bangladesh. The purpose is to promote green growth in freshwater pangas/tilapia aquaculture by providing knowledge on how to improve water quality and farm management and exploit the market potential for farmed fish through value chains functioning. Focus is on water quality since pangas/tilapia might include contaminants, offflavors and be a bit yellow, not white, as preferred by the consumers at export markets.

Farm management, governance of value chains, knowledge on domestic/international markets and on fish quality can improve the basis for sustainable growth, increase value added and prepare the sector for export, thereby providing livelihood for locals and foreign exchange. Knowledge is increased through senior research cooperation and by educating PhDs.

Research questions are: To what extent are fish-depleting microorganisms, arsenic, lead and pesticides of economic importance? Can they be reduced? Do water quality initiatives pay? Who are the main actors in the value chain? What are the major bottlenecks? How are prices formed? How much are consumers willing to pay for improved quality of fish? Can chains be upgraded through governance, water and fish quality and export focus?

The foundation is value chain analysis, economic optimization, applied economics and environmental science. The knowledge provided forms basis for assessing governance and firm management. It will be disseminated to actors in the chains.

This project is coordinated by Department of Food and Resource Economics, University of Copenhagen, Denmark.

The project is funded by DANIDA, Ministry of Foreign Affairs of Denmark.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
University of Southern Denmark
Patuakhali Science and Technology University
Bangladesh Agricultural University
Norwegian University of Life Sciences
University of Kiel

Period: 01/03/2015 → 28/02/2019
Number of participants: 1
Research area: Fisheries Management
Project participant:
Larsen, Erling (Intern)

Water treatment technology for microbial stabilization in landbased aquaculture systems (MicStaTech) (39277)
MicStaTech is a transnational research project (COFASP) between Norwegian, German and Danish research groups. The paradigm of this project is that a stable, elevated microbial abundance in the water phase of land based aquaculture systems can be beneficial for fish health and economically profitable. A common challenge in land based systems, and shown across species, is the loss of fish due to unfavourable conditions and disease outbreaks that may be linked to
opportunist bacteria. A popular approach to prevent this is to attempt to reduce the load of bacteria in the systems by the use of UV, ozone or chemical disinfection. This is however not possible or sufficient in the majority of systems, because disinfection has a non-lasting effect on the numbers and a destabilising effect on the composition of bacteria. In most systems, the water exchange rates and organic loading applied for biological reasons allow for microbial regrowth in the rearing tanks. Hence, alternative approaches to reduce the chances of disease outbreaks are needed. This project pursues the concept of establishing and maintaining stable microbial systems.

Water treatment technology for promoting K-selection, which is a selective pressure disfavouring the r-selected opportunists, has shown very promising results for several marine species in small scale experiments, but the up-scaling and optimization for flow through systems (FTS) and recirculating aquaculture systems (RAS) remains. The paradigm favouring a stable and elevated bacterial abundance is foreseen to reduce fish mortality and also reduce water treatment costs. This project will investigate fish health and microbial carrying capacity in experiments performed at three locations – NTNU, DTU Aqua and University of Applied Sciences, Saarlandes, Germany.

This project is coordinated by Norwegian University of Science and Technology, Norway.

The project is funded by EU, COFASP, ERA-NET.

National Institute of Aquatic Resources
Section for Aquaculture
Norwegian University of Science and Technology
Hochschule für Technik und Wirtschaft des Saarlandes University of Applied Sciences
Period: 01/03/2015 → 31/12/2017
Number of participants: 7
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Rojas-Tirado, Paula Andrea (Intern)
Sproegel, Ulla (Intern)
Frandsen, Dorthe (Intern)
Møller, Brian (Intern)
Nielsen, Sara Møller (Intern)
Project Manager, academic:
Pedersen, Lars-Flemming (Intern)

Underwater time of flight image acquisition system (UTOFIA) (39240)
This project offers a compact and cost-effective underwater imaging system for turbid environments and will fill the current gap between short-range, high-resolution conventional video and long-range low-resolution sonar systems. The camera system utilizes high frequency laser pulses synchronized with rapid shutter operations on nano second time scales to radically reduce the interference of back scatter on visual images. Using this range-gated imaging technology, the system will extend the imaging range by factor 2 to 3 over conventional video systems. At the same time, the system will provide video-rate 3D information. UTOFIA offers a new modus operandi for the main targeted domains of application: marine life monitoring, harbour and ocean litter detection, fisheries stock assessment and aquaculture, seabed mapping, offshore industry and civil security.

The project is a collaborative effort between engineering companies producing the laser components, the camera systems, the software control and processing systems as well as the deployment platforms. The project also involves companies charged with integrating the system and its commercialization into the market place. The role of DTU Aqua is twofold; it is responsible for a series of field and laboratory trials to demonstrate the proof-of-concept and to feed back into the engineering design process, and it is responsible for the exploitation and dissemination dimension of the project, particularly with respect to marine science, fisheries and aquaculture applications.

The consortium is coordinated by SINTEF, Norway.

The project is funded by EU, Horizon2020.

National Institute of Aquatic Resources
Section for Oceans and Arctic
SINTEF
Proteins of the future in feed for recirculating aquaculture systems (ProffAqua) (39274)

There is an increasing shortage of available high quality proteins for feed. More than half of all aquatic species is now produced by aquaculture. Aquaculture production will double in the next 15 years and so will the need for protein into aquafeed. As substantial amount of worldwide wild fish catch is processed into fishmeal and fish oil for feed production, raising concerns regarding the sustainability of this arrangement. The industry's growing need for feed therefore requires new approaches. This project focuses on turning waste streams into valuable products. Organic chemicals found in pulp mills' steams for cellulose fibre production can be used to grow fungi and turned into Single Cell Proteins (SCP), suitable as protein-rich components in fish feed. Due to the low protein content of waste materials from agriculture and fish processing, this raw material is not suitable for direct use in fish feed. The black soldier fly larvae (BSF) are very efficient in transforming such waste streams into high quality protein and oil ingredients. Based on the available waste streams, several thousand tonnes of both SCP and BSF can be produced at a very favourable price compared to the current price and quality of fish meal.

The role of DTU Aqua in the project is to evaluate BSF and SCP as protein sources in fish feeds by performing digestibility and growth trials using the two types of protein sources at several inclusion levels in the diets. DTU Aqua participates in the project by performing feeding trials using contaminated feed for Atlantic salmon and seabass respectively. Furthermore, the project also investigates potential effects of microplastic incorporated into feed pellets, on accumulation and elimination of the selected priority contaminants. The feeding trials consist of a 12 week to 15 week accumulation period for seabass and salmon respectively and a 8 week depuration period where all groups are fed control feed. The results obtained from the trial will be used to develop mathematical models estimating accumulation and elimination of priority contaminants in filet.

This project is coordinated by Matís ltd., Icelandic Food and Biotech R&D. This project is funded by Nordforsk, Nordic Council of Ministers.
Anglers Mobile App: A mutual service platform between research and citizens (39122)

Recreational fishing is an extremely popular pastime in Denmark, with as many as 400.000-500.000 regularly engaging in the activity. In order to secure that fish are available for the anglers and at the same time understand how fish stocks interact with biotic and abiotic factors, knowledge about the fish stocks in Danish lakes, rivers and coastal areas is crucial. However, data gathering on national scale, and at regular intervals is expensive and logistically prohibitive. This lack of data limits scientific understanding as well as sustainable management. Consequently, DTU Aqua has developed an electronic platform where anglers can report their catch in a standardized way for their own pleasure as well as for the benefits of angler clubs and national research on fisheries management. The "Fangstjournalen" platform consists of a browser version as well as a native mobile app (Iphone and Android). The platform allow anglers to record the details of their fishing trips and catches, but is also used as a vehicle for gaining human dimension information, i.e information about angler distribution as well as aspects of angler motivation and satisfaction.

Angler apps for mobile devices are not new, but the existing market (e.g. FishBrains; iAngler; iFish App) focus on aspects such as "socializing" "curiosity" and "entertainment" more that on gathering the minimum necessary data for use for research, and centralizing it to underpin stock management. The angler app developed by DTU Aqua has several novelty aspects and integrates both catch statistics and human dimension aspects. During the two years it has taken to develop the platform there has a strong focus on optimizing the scientific value of the data that is sampled, and at the same time recognizing opportunities as well challenges associated with angler mobile apps as a source of recreational fisheries data. For example, catch efficiency of anglers depend on human dimension factors such as skills, gear and experience. The angler should provide this information during registration so researchers can calibrate data. Likewise, in case of blank fishing trips with "no catch", the anglers should also report to strengthen data quality. To secure such compliance from the anglers, we focus on strong and clear communication from researcher to angler.

The platform was released for the public at the end of 2015, so the outcome of this citizen science project is still in its infancy and uncertain. However the omnipresence and wide use of mobile internet devices offers a unique opportunity to use a citizen science approach to bridge the gap between the lack of knowledge, research and impact of recreational fishermen in a mutually beneficial way. In that perspective DTU Aqua are first movers. Moreover, in time, the platform has the potential to instill responsible stewardship among recreational fishermen i.e. to engage and educate as much as 5 % of Denmark’s population on a regular basis.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.
Biochemical assessment of larval fish feeding ecology and the importance of protozoans (39271)

Growth and survival of early life stages of fish result from complex bio-physical processes. Availability of suitable prey is especially crucial during the early life where fish are most vulnerable to starvation and predation. However, the feeding ecology and importance of unicellular protozooplankton in the diet larval fish is still poorly understood.

This project will provide new insight into the trophic ecology of the ecologically and economically important Pacific sardine and Northern anchovy. To estimate trophic level, cutting edge biochemical tools such as Compound Specific Isotopic Analysis on Amino Acids will be applied. The observed differences in larval trophy relative to growth and to environmental conditions will help to determine their trophic flexibility.

Moreover, changes in larval trophy related to inter-annual and decadal changes in environmental conditions may explain the relationship between larval feeding opportunities and fluctuations in recruitment to the adult population. Therefore, the expected results will contribute to improved predictions of fish population size and changes in marine ecosystem structures.

This project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of California, San Diego
National Oceanographic and Atmospheric Administration
Period: 01/01/2015 → 31/12/2016
Number of participants: 1
Research area: Oceanography and Climate
Project Coordinator:
Swalethorp, Rasmus (Intern)

Development of a by-catch excluder for the Danish and European trawl fisheries (39265)

The project aims to develop and test a widely usable gear that effectively sorts out unwanted species and sizes of fish during trawling. This objective should be seen in light of a future discard ban for the EU—a ban which, in Denmark and in other European countries, will result in a growing demand for technical solutions that can increase the sorting of fish in the gear during fishing.

The development work of the project is based on a so-called "Excluder system" that can be integrated into most standard trawl gears. The "Excluder system" is developed for the North American market by Tor-Mo Trawl in Hirtshals in collaboration with the Green Line Fishing Gear. The Excluder is used today on a voluntary basis by approximately 15 large fishing vessels in Alaska, but is not directly applicable in Danish and European fisheries because the species composition, trawl size and type of vessel is significantly different in fisheries in Alaska.

The project's main result will be the development, testing and documentation of an Excluder system, which is targeted the Danish and European trawl fisheries.

In light of the political development in EU, a very large market potential is expected to appear for such an Excluder and the redemption of this market potential will result in 1) more successful implementation of the discard ban, 2) more selective and sustainable fisheries, and 3) increased growth and revenue for companies in the project.

This project is coordinated by Denmark's Pelagic Producer Organisation.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Denmark's Pelagic Producer Organisation
Dynamic user-driven marine e-maps for the advancement of Danish industrial fisheries (GUPD-VIND) (39246)

This project aims at strengthening Danish industrial fisheries development in order to (i) reduce the search time and fuel consumption per. ton of fish caught (revenues: 16 million DKK/year), (ii) make better use of the sprat quota (revenues: 15 million DKK/year, by a full quota uptake), (iii) pave the way for sustainable self-management of resources in the industrial fisheries sector and (iv) contribute to creating and maintaining jobs in the local fishing community.

The specific objectives of the project: Development of an IT tool that will contain (i) a platform to improve sharing of knowledge and registration of observable and derived variables (data), and (ii) user-defined and user-controlled digital Marine Maps with those specific data that fishermen consider important as background information in the planning and implementation of fishing trips. These marine data include (but are not limited to) a portfolio of Marine Maps spanning from the North Sea hydrography and bottom conditions over distribution of plankton and fish to water-DNA.

The needs for a technological development of this fishery comes from increasing average vessel size, while the number of large vessels is reduced to about 1/8 of what it was in the past. The immediate consequence is a reduction in the collective search performance and knowledge sharing. In addition, the area based management of the sandeel fishery introduced in 2011 has contributed to a reduction of fishermen’s opportunities to diversify fishing and explore a wider variety of fishing grounds. Finally, the sprat fishery is uncertain because of by-catch limits and a very variable CPUE driven by wind and weather. This has led to an underutilization of the sprat quota by around 100,000 tons per year. Fisherman knowledge of good fishing opportunities is based on the correspondence between historical catches and observable variables at the time of capture, such as the seasons, wind, waves and tides, and it is precisely this kind of knowledge that the project wants to combine with a technological solution, so that all relevant data is made widely available to the fishermen by developing user-controlled dynamic digital Marine Maps. The project includes a business plan for the IT company Anchor Lab, which develops the user-controlled Marine Maps, and plans for derived effects in terms of better utilization of the sprat quota and fuel savings through the use of the Marine Maps. Besides the economic effects, the project contributes to CO2 reduction, and supports the technological development of a modern industrial fishery sector, based on a natural resource to be managed by the EU in accordance with ICES’ advice.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).
Grow mussels and oysters - Sea Gardens in Limjorden (39249)
The aim for this project is to create a focus on healthy and sustainable exploitation of Limfjordens potential and bring life back into the harbour areas.
- Better utilization of Limfjorden's resources.
- Increased focus on seafood and seaweed as exciting, healthy and delicious produce on the dinner table.
- More readily available social activities for the general public.
- Development of sustainable activities on empty harbors.
- Better links between water and city.
- Participate in social activities with sustainability in focus.

The project will give ordinary citizen the opportunity to "grow" mussels, oysters and seaweed in a social community without needing separate skills and without having to invest in an area.

This project is coordinated by Limfjordsrådet.
National Institute of Aquatic Resources
Danish Shellfish Centre
Limfjordsrådet
Orbicon
Limfordsmuseet
Løgstør municipality
Nykøbing Mors Municipality
Lemvig municipality
Aalborg municipality
Period: 01/01/2015 → 31/12/2017
Number of participants: 4
Research area: Shellfish and seaweed: Biology, production and management
Project participant:
Bak, Finn (Intern)
Barreau, Pascal David Alain (Intern)
Project Manager, academic:
Nielsen, Carsten Fomsgaard (Intern)
Petersen, Jens Kjerulf (Intern)

Starfish as a new source of marine protein (STARPRO) (39272)
The amount of starfish (Asterias rubens) is increasing in Danish coastal waters – especially in the Limfjorden. They consume large amounts of mussels thus creating a big problem for the mussel fishery. STARPRO will try to establish a sustainable fishery of starfish in order to transform them into feed ingredient thereby reducing predation and at the same time create a new source of valuable protein.

The purpose of STARPRO is to establish a sustainable fishery for starfish in preparation for producing a 100% organic feed ingredient for monogastric livestock. The project includes the whole value chain with the concrete goal to develop cost-effective methods for production of starfish flour and within a few years establish a fishery of 10,000 t of starfish a year amounting a production of 2,500 t of flour a year. Activities in STARPRO will be stock assessment of starfish, testing of methods for the production of starfish flour from pretreatment to the grinding of dried starfish, development of feed blend for poultry and pigs.
Expected results:
- Organic feed with a large protein content
- Frame work for sustainable fishery for starfish in Denmark

Expected effects of the project:
- Establishing a new profession in fabrication of starfish flour
- Increase employment through the establishment of starfish fishery and Danish production of starfish
- Removal of nutrients from the fjords and coastal waters through fishing of starfish.
- Reduced the discharge of nutrients from organic animal husbandry due to increased feed efficiency.
- Increased sustainability and profitability of mussel fishery as a result of reduced predation on mussels.

This project is coordinated by DTU Aqua.
The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Danish Shellfish Centre
Foreningen Muslinge erhvervet
Aarhus University
Agro Kom A/S
Period: 01/01/2015 → 30/04/2018
Number of participants: 7
Research areas: Shellfish and Seaweed & Coastal Ecology
Project participant:
Nielsen, Carsten Fomsgaard (Intern)
Saurel, Camille (Intern)
Barreau, Pascal David Alain (Intern)
Andersen, Lars Kyed (Intern)
Bak, Finn (Intern)
Project Manager, academic:
Møller, Lene Friis (Intern)
Project Coordinator:
Petersen, Jens Kjerulf (Intern)

Understanding and predicting size selectivity and escape mortality in commercial zooplankton fisheries: Case study on Antarctic krill (SILF) (39245)

Antarctic krill is an important fisheries resource, regarded as one of the most under-exploited fisheries in the world. Concern is expressed regarding the future sustainability of harvesting and the impact this may have on dependent predators. This is associated with the cumulative pressure from ongoing environmental changes, which modify abundance, distribution and life cycle of krill.

Due to large gaps in knowledge about this marine ecosystem and potential negative effects caused by fishery activities, both the Commission and Scientific Committee of CCAMLR strongly request knowledge about the effects of different fishing gear on krill escape and the indirect mortality on the krill stock. Indirect fishing mortalities include organisms that die after escaping from fishing gear due to injury.

CCAMLR is currently improving their management system, by establishing feedback management procedures and Small Scale management Units. They recommend members to have scientific observers on board to enhance control measures and Marine Protected Areas around the continent is established with various degrees of allowing for exploratory fishing and rational use. It is highly uncertain to establish such a management regime without scientific knowledge about the impact of fishing on the ecosystem. There is an urgent need to address these questions, also for the sake of the development of other new and exploratory fisheries.

A pilot study (NEAT) using both mathematical modeling techniques and practical experiments on size selection of krill shows that escape occurs even from some of the smallest commercial meshes used in the fishery. In this study, we will assess different trawl designs sizes selectivity and establish predictions of sizes selectivity of krill in any given trawl design.

We will also perform experiments to examine the rate of escape mortality of krill in trawls and couple this to full gear sizes selectivity to allow evaluation and optimization of trawls in the commercial krill fishery.

The developed methods are directly transferable to similar fisheries e.g. fisheries targeting species lower in the food chain.
This project is coordinated by the Institute of Marine Research, Norway.
The project is funded by the Research Council of Norway.
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Institute of Marine Research
SINTEF
Aker BioMarine ASA
Olympic Seafood AS
Period: 01/01/2015 → 31/12/2017
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Krag, Ludvig Ahm (Intern)
Project

Resolving the chemical structures responsible for the UV-visible spectroscopic properties of dissolved organic matter in aquatic environments
National Institute of Aquatic Resources
Period: 15/12/2014 → 28/02/2018
Number of participants: 7
Phd Student:
Wünsch, Urban (Intern)
Supervisor:
Koch, Boris (Ekstern)
Murphy, Kathleen R. (Ekstern)
Main Supervisor:
Stedmon, Colin (Intern)
Examiner:
Jonasdottir, Sigrun (Intern)
Christensen, Jan H (Ekstern)
Osburn, Christopher Lee (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Trait Ecology of Plankton in a Changing Marine Environment
National Institute of Aquatic Resources
Period: 15/12/2014 → 10/10/2018
Number of participants: 3
Phd Student:
Hansen, Agnethe Nøhr (Intern)
Supervisor:
Andersen, Ken Haste (Intern)
Main Supervisor:
Visser, Andre (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD
Mapping of fish habitats with Øresund as a case study (FISKEHAB) (39206)

Mapping of fish habitats in the Danish part of Øresund, based on existing data on fish and habitats, interviews with gillnet fishermen, anglers and workshop participants. The project was commissioned as a response to widespread protest over sand extraction activity in several designated sites in the area. Øresund is a relatively data poor sea area that is fished primarily by fishermen with vessels below 12 meters, i.e. vessels without satellite location data. The project succeeded in creating maps indicating the distributions of 7 key commercial fish species within Øresund with direct association to benthic habitats.

This project was coordinated by DTU Aqua.

The project was commissioned directly by the Danish Ministry of Food, Agriculture and Fisheries.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

University of Copenhagen
Period: 03/12/2014 → 31/08/2015
Number of participants: 6
Research area: Ecosystem based Marine Management & Coastal Ecology
Project participant:
Egekvist, Josefine (Intern)
Støttrup, Josianne Gatt (Intern)
Vinther, Morten (Intern)
Dinesen, Grete E. (Intern)
Phd Student:
Brown, Elliot John (Intern)
Project Coordinator:
Sørensen, Thomas Kirk (Intern)

Ecology and evolution of a notorious invader: Is invasion success influenced by rapid adaptation to global change? (39175)

Marine invasive species have globally increasing biological and economic impacts. However, evolutionary mechanisms favoring range expansion and invasiveness remain poorly understood. This project will describe the environmental envelope of the comb jelly Mnemiopsis leidyi, one of the most notorious marine invasive species, and experimentally investigate the potential for rapid adaptive evolution, which might enable the species to overcome current physiological constraints on the range of its distribution. This includes the possible role of intra-specific hybridization for accelerating adaptive evolution. The results will have implications for the assessment of future invasion risks by M. leidyi in a global change perspective.

The project is coordinated by DTU Aqua.

Section for Marine Ecology and Oceanography
GEOMAR - Helmholtz Centre for Ocean Research Kiel
Period: 01/12/2014 → 30/11/2016
Number of participants: 1
Project Manager, academic:
Jaspers, Cornelia (Intern)

Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters

National Institute of Aquatic Resources
Period: 01/12/2014 → 30/11/2018
Number of participants: 3
Phd Student:
Brown, Elliot John (Intern)
Supervisor:
Stenberg, Claus (Intern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)

Financing sources
Relations
Press / Media items:
Tilstandsrapport fra havbunden
Bannerup og Grenaa: Små fisk – skal gerne blive større
Fintælling af bugtens fisk
Forskere undersøger fisk langs kysten
An Expedition covering covering the Danish Coast’s from the 18th July - 22nd August, 2016
Indslag i 24NORDJYSKE
Project: PhD

Microbial Water Quality within Aquaculture Recirculation Systems
National Institute of Aquatic Resources
Period: 01/12/2014 → 21/03/2018
Number of participants: 6
Phd Student:
Rojas-Tirado, Paula Andrea (Intern)
Supervisor:
Pedersen, Per Bovbjerg (Intern)
Main Supervisor:
Pedersen, Lars-Flemming (Intern)
Examiner:
Dalsgaard, Anne Johanne Tang (Intern)
Attramadal, Kari (Ekstern)
Verdegem, Marc (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Prey selection and behaviour of copepods fed on toxic and nontoxic algae
National Institute of Aquatic Resources
Period: 01/12/2014 → 28/02/2018
Number of participants: 6
Phd Student:
Xu, Jiayi (Intern)
Supervisor:
Hansen, Per Juel (Ekstern)
Main Supervisor:
Kiørboe, Thomas (Intern)
Examiner:
Jonasdottir, Sigrun (Intern)
Saiz, Enric (Ekstern)
Selander, Erik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD

State-Space Modelling in Marine Science
National Institute of Aquatic Resources
Period: 01/12/2014 → 28/02/2018
Number of participants: 6
Ecophysiology of great feasts in nature
The project investigated the ecophysiology of the great feasts in nature, exemplified by cod in the sound that feasts on migrating herring in fall.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Independent Research.

National Institute of Aquatic Resources
Section for Marine Living Resources
Lund University
University of Bergen
Period: 01/10/2014 → 31/03/2016
Number of participants: 1
Research area: Marine Populations and Ecosystem Dynamics
Project Coordinator:
van Deurs, Mikael (Intern)

Effects of oil spill and spill response technologies on ecosystems in ice-covered arctic oceans
National Institute of Aquatic Resources
Period: 01/10/2014 → 25/06/2018
Number of participants: 3
Phd Student:
Toxværd, Kirstine Underbjerg (Intern)
Supervisor:
Hjorth, Morten (Ekstern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

New physicochemical and technological approach for high quality and sustainable fish feed production (Exipro) (39189)
Aquaculture is the globally fastest growing food producing sector, and extruded fish feed is the largest expenditure in the production of carnivorous fish.

The quality of the different protein raw materials used in fish feed varies considerably, and even small differences in the nutritional quality can have large effects on fish performance, their degree of feed utilization and consequently the environment.

The production of high quality, nutrient-dense fish feed requires that the dietary matrix is extruded into pellets. However,
the extrusion process can alter and deteriorate the nutritional quality of proteins. Currently, the extrusion process is based entirely on empirical learning, and little is known about the chemical reactions and physical processes that take place inside the extruder, i.e., the extruder is largely a 'Black Box'. In addition, little is known about concomitant effects on feed utilization.

The aim of Exipro is to optimize the extrusion process by clarifying the changes and damages on different protein ingredients that happen in the extruder, and to use the knowledge to improve the quality of fish feed. Hence, the objectives of the project are to:
- Determine the effects of extrusion on the physicochemical and chemical properties of proteins in fish feed
- Determine the effects of these changes on fish growth performance, metabolism, protein retention, and nitrogen excretion
- Develop a generic extrusion optimization tool for different protein ingredients.

The project is coordinated by University of Copenhagen.

The project is funded by Innovation Fund Denmark.

National Institute of Aquatic Resources
Section for Aquaculture
University of Copenhagen
Aarhus University
BioMar A/S
Period: 01/09/2014 → 31/12/2017
Number of participants: 3
Research area: Aquaculture
Project participant:
Larsen, Bodil Katrine (Intern)
Vega, Victoria Valdenegro (Intern)
Project Manager, academic:
Dalsgaard, Anne Johanne Tang (Intern)

**Benchmarking and extending models of real estate price prediction, under financial regulation requirements**

Department of Applied Mathematics and Computer Science
Cognitive Systems
National Institute of Aquatic Resources
Section for Marine Living Resources
Period: 01/09/2014 → 01/10/2017
Number of participants: 4
Project participant:
Katossky, Arthur (Intern)
Thygesen, Uffe Høgsbro (Intern)
Dalsgaard, Anne Johanne Tang (Intern)

**Cost efficient solutions for reducing the waste discharged in land-based marine recirculating aquaculture systems (WASTE-TREAT) (39190)**

Growth in aquaculture production demands a high degree of environmental engineering to minimize nutrient discharge thereby reducing the environmental impact. This industrial collaboration project aims at finding the cost-efficient treatment methods for reducing the waste discharged from large-scale land-based marine recirculating aquaculture systems. End-of-pipe solutions for minimizing the N, P, and organic matter waste discharge from seawater RAS are to be developed, demonstrated and evaluated.

The project is coordinated by AKVA Group Denmark A/S.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).
**Modelling the role of competition between fish and jellyfish in marine pelagic ecosystems**

National Institute of Aquatic Resources  
Period: 01/08/2014 → 05/12/2017  
Number of participants: 6  
PhD Student:  
Schnedler-Meyer, Nicolas Azaña (Intern)  
Supervisor:  
Kiørboe, Thomas (Intern)  
Main Supervisor:  
Mariani, Patrizio (Intern)  
Examiner:  
Christensen, Asbjørn (Intern)  
Huse, Geir (Ekstern)  
Tiselius, Peter (Ekstern)

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Samfinansieret - Andet  
Project: PhD

**Fluorescence analysis and monitoring of recirculating aquaculture systems (FAMoRAS) (39177)**  
FAMoRAS aimed to investigate fluorescence spectroscopy for potential utilization within 3 main areas of recirculating aquaculture system operation:  
(1) system "health" monitoring  
(2) treatment performance  
(3) feed utilization.

Using sensitive lab-scale spectroscopic analysis and mathematical modeling, the project aimed to identify single wavelengths for future use as online, in-situ aquaculture system sensors.

This project was coordinated by DTU Aqua.

The project is funded by EU, Marie Curie.

**Fluorescence analysis and monitoring of recirculating aquaculture systems (FAMoRAS) (39177)**

**Section for Marine Ecology and Oceanography**

National Institute of Aquatic Resources  
Period: 16/06/2014 → 16/06/2016  
Number of participants: 4  
Research areas: Oceanography & Aquaculture  
Project participant:  
Pedersen, Per Bovbjerg (Intern)  
Pedersen, Lars-Flemming (Intern)  
Project Coordinator:  
Hambly, Adam (Intern)
Stedmon, Colin (Intern)
Project

**Baltic zooplankton; eco-physiology and adaptation**
National Institute of Aquatic Resources
Period: 01/06/2014 → 20/12/2017
Number of participants: 6
Phd Student:
Christensen, Anette Maria (Intern)
Supervisor:
Dutz, Jörg (Intern)
Main Supervisor:
Koski, Marja (Intern)
Examiner:
Jonasdottir, Sigrun (Intern)
Guerrero, Han G. Dam (Ekstern)
Tiselius, Peter (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Grundforskningsfonden
Project: PhD

**Development of seal-safe fishing gear (Seal-Safe II) (39188)**
Increasing numbers of seals in Danish waters have in recent years made it difficult to conduct a economically sustainable coastal fishery with gillnets and hooks/lines. The objective of Seal-Safe is to improve the viability of these fisheries by developing efficient, environmentally friendly and seal-safe pots for catching cod. The pots will make it possible for the coastal fishermen to conduct a sustainable fishery without damages inflicted by seals.

The specific goal of Seal-Safe is to increase the catch rate to at least 4 kg cod per pot per day. Seal-Safe will attain this through a combination of fishing trials on board commercial fishing vessels and research into the behaviour of fish and seals around the pots.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Aarhus University
Sveriges Lantbruksuniversitet

Neksø Vodbinderi
Period: 01/06/2014 → 31/07/2016
Number of participants: 4
Research areas: Ecosystem based Marine Management & Fish Biology & Fisheries Technology
Project participant:
Sørensen, Thomas Kirk (Intern)
Behrens, Jane (Intern)
Project Manager, academic:
Kindt-Larsen, Lotte (Intern)
Project Coordinator:
Larsen, Finn (Intern)

**Round goby – need for collaborative science and management in Nordic and Baltic countries (39171)**
Originating from the Ponto-Caspian region, the round goby *Neogobius melanostomus* has within recent years proliferated in several Nordic and Baltic coastal waters. Round goby is now not only posing a threat to native goby species occupying similar habitats, but also to the traditional coastal fishery through competition for food resources with commercially and
recreationally important costal species, and consumption of their fry and eggs. Furthermore, fishermen report on declined shrimp catches, one of the preferred prey items of adult round goby.

The overarching aim of this project is to have a common Nordic and Baltic workshop on round goby. This will enable knowledge transfer across borders, identification of knowledge gaps and creating wide research projects on issues related to round goby invasion. Equally important, it would provide an opportunity to inform relevant authorities on the challenges of managing the species and to develop instruments to mitigate the impact on native costal species and fisheries. Outcome of the workshop will be a report on the current distribution and status of round goby in the Nordic/Baltic countries that could be used for future risk analyses and basis for management decisions, indicating future needs.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Finnish Environment Institute
Lund University
University of Tartu

**Period:** 01/05/2014 → 31/05/2014
**Number of participants:** 2
**Research area:** Marine Populations and Ecosystem Dynamics
**Project participant:**
van Deurs, Mikael (Intern)
**Project Coordinator:**
Behrens, Jane (Intern)

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**Copepo traits and trade-offs: characterizing gender and feeding type specific behavior**

National Institute of Aquatic Resources

**Period:** 01/05/2014 → 30/08/2017
**Number of participants:** 6
**PhD Student:**
van Someren Gréve, Hans (Intern)
**Supervisor:**
Almeda, Rodrigo (Intern)
**Main Supervisor:**
Kiørboe, Thomas (Intern)
**Examiner:**
MacKenzie, Brian (Intern)
Fiksen, Øyvind (Ekstern)
Mazzocchi, Maria Grazia (Ekstern)

**Financing sources**
**Source:** Internal funding (public)
**Name of research programme:** Samfinansieret - Andet
**Project:** PhD

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**The effect of bottom trawling on marine bottom fauna and eelgrass (ØB Bundfauna) (39192)**
The project provided input to the analysis of the impact of fishing on the ecological quality of the Danish marine environment to the Danish Nature Agency in relation to the water plans needed in connection with the implementation of the Water Framework Directive.

It contained three subprojects:
- Quantifying the area of seabed swept by Danish bottom trawl fisheries.
- Quantifying the impact of bottom trawling on marine benthos.
- Quantifying the possible interaction between bottom trawling and the depth distribution of eelgrass (*Zostera marina*).

This project was coordinated by DTU Aqua.

The Project was funded by the Danish Nature Agency.
The shrimp fisheries in the Skagerrak area of Sweden, Norway and Denmark analyzed using a systems perspective (39191)

In recent years the Shrimp stock in the Skagerrak has been drastically reduced. The three countries, who fish on the stock, differ substantially in terms of fleet structure, national quota management, fishing patterns and market. The market situation combined with the quota being fished has led to incentives for discarding of smaller shrimps (high-grading), mainly in the Swedish fishery. Discard of shrimp has been banned in Europe for a few years, and in 2016 more general EU discard ban will be implemented. Therefore the development of more size selective gear is being pushed in several countries.

The development in the stock, the differences in the three countries’ resource utilization and the coming management changes makes it very interesting to map and compare environmental and socio-economic aspects of the three countries’ shrimp fishing in the Skagerrak. Life Cycle Assessment (LCA) is an ISO-standardized methodology that maps resource consumption and environmental impact of products from a systems perspective. There are now a number of case studies where you look at the role of management in the impact of the product. In these cases the product is mostly followed only during fishing until landing (not during processing, packaging and distribution after landing). A Canadian study compared Canadian and American fishing on the same stock of lobster using LCA and demonstrated significant differences in environmental impacts that mainly depended on the countries' management.

The aim of this study was to quantify a set of indicators that together give a broad picture of the sustainability of the three fisheries to provide an objective basis for a discussion on needed measures. The different indicators concerned environmental, economic or social aspects of sustainability and were quantified per tonne of shrimp landed by each country in 2012. The Danish fishery was most efficient in terms of environmental and economic indicators, while the Swedish fishery provided most employment per tonne of shrimp landed. Fuel use in all fisheries was high, also when compared with other shrimp fisheries. Interesting patterns emerged, with smaller vessels being more fuel efficient than larger ones in Sweden and Norway, with the opposite trend in Denmark. The study also demonstrated major data gaps and differences between the countries in how data are collected and made available. Various improvement options in the areas data collection and publication, allocation of quotas and enforcement of regulations resulted and are described in more detail in a scientific paper in ICES Journal of Marine Science in 2016.

This project was coordinated by SIK-SP Food and Bioscience.

The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
SIK-SP Food and Bioscience

Swedish University of Agricultural Sciences
Period: 01/05/2014 → 30/04/2015
Number of participants: 3
Research area: Fisheries Management
Project participant:
New possibilities for growth and robustness in organic aquaculture (ROBUSTFISH) (39159)
Main aim:
To support the credibility, growth and robustness in the production of healthy and stress resilient Danish organic rainbow trout, considering environmental, ethical as well as economic aspects.

Sub goals:
1) Develop methods for selecting robust fry.
2) Investigating how sustainable non-fish based feed given early in the development affect the robustness of the fry.
3) Include welfare and environmental aspects in relation to water treatment procedures.
4) Improve economic competiveness of Danish organic aquaculture.

The project is coordinated by DTU Aqua.

This project is funded by Organic RDD 2 Programme, which is coordinated by the International Centre for Research in Organic Food Systems (ICROFS). It has received grants from the Danish Ministry of Food, Agriculture and Fisheries through the Green Growth and Development Programme (GUDP).

Eel hatchery technology for a sustainable aquaculture (EEL-HATCH) (39181)

Hatchery and rearing technology for commercial production of glass eels is fundamental to sustainable and profitable eel aquaculture. The vision is to enhance existing technology to rear European eel larvae to the glass eel stage, thereby closing the lifecycle in captivity. Pioneering research of the consortium has raised eel breeding from a state of reproductive failure to stable production of viable larvae.

Objectives include: Design “state of the art” hatchery facilities, optimize broodstock feeds, enhance assisted reproductive technology, and develop larval culture systems and diets. The main success criterion is achievement of large scale culture of larvae throughout the larval stage, leading to glass eel production. The establishment of sustainable aquaculture of this endangered species, presently relying on captive glass eel will rebuild the highly profitable market for eel aquaculture and suppliers as well as assist in conservation and stock management plans.

Results obtained during the half of the project period include the design and establishment of a dedicated research facility in relation to DTU Aqua in Hirtshals, involving several partners. The facility applies recirculation aquaculture systems with emphasis on matured water technology and microbial control. Scientific highlights include successful production of recombinant European eel gonadotropic hormones; enhanced reproduction, fertilization and incubation procedures; and optimized larval culture conditions, including e.g. temperature, salinity, and light regime. Larval diets have been developed and tested in first feeding and behavioral experiments, leading to the first published work on larval feeding for this species.
Experiments on improved diets and optimized rearing tanks for larval growth are ongoing.

This project is coordinated by DTU Aqua.

The project is funded by Innovation Fund Denmark.

National Institute of Aquatic Resources
Section for Marine Living Resources
Billund Aquaculture Service Aps
BioMar A/S
North Sea Science Park
Bioneer A/S

STMI
Danish Aquaculture Association
Period: 01/04/2014 → 30/09/2017
Number of participants: 9
Research areas: Fish Biology & Aquaculture & Coastal Ecology
Project participant:
Butts, Ian (Intern)
Støttrup, Josianne Gatt (Intern)
Lund, Ivar (Intern)
Krüger-Johnsen, Maria (Intern)
Sørensen, Sune Riis (Intern)
Kottmann, Johanna Sarah (Intern)

Project Manager, organisational:
Haslund, Ole Henrik (Intern)
Phd Student:
Politis, Sebastian Nikitas (Intern)
Project Coordinator:
Tomkiewicz, Jonna (Intern)

European eel larval ontogeny and physiology
National Institute of Aquatic Resources
Period: 01/04/2014 → 12/03/2018
Number of participants: 7
Phd Student:
Politis, Sebastian Nikitas (Intern)
Supervisor:
Butts, Ian (Intern)
Eg Nielsen, Einar (Intern)
Main Supervisor:
Tomkiewicz, Jonna (Intern)
Examiner:
Eg Nielsen, Einar (Intern)
Engrola, Sofia Alexandra Dias (Ekstern)
Tsukamoto, Katsumi (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD

Sustainable fish feed development in Ghana (Susfeed) (39158)
The overall objective of the project is to enable Kwame Nkrumah University of Science and Technology (KNUST) to serve as a centre of excellence for sustainable development of aquaculture and to take a scientific approach to the continued improvement of fish feed formulation using local raw materials, through controlled experiments and in collaboration with
the private sector in Ghana. The immediate objectives of the project are to formulate cost effective tilapia feeds assessed for digestibility, nutritional value and amino acid profiles based on local feed ingredients; to facilitate the growth of the tilapia aquaculture industry in Ghana through promoting the production and application of locally developed high quality feeds; to achieve a zero change in nutrient discharge to the environment through the application of balanced feed and efficient feeding strategies; and to improve the methodological and scientific capacity at KNUST to provide a platform of excellence in research and teaching.

The project is funded by DANIDA, Ministry of Foreign Affairs of Denmark.

National Institute of Aquatic Resources
Section for Aquaculture
Kwame Nkrumah University of Science and Technology
Period: 01/04/2014 → 31/03/2017
Number of participants: 3
Research area: Aquaculture
Project participant:
Lund, Ivar (Intern)
Larsen, Bodil Katrine (Intern)
Project Manager, academic:
Skov, Peter Vilhelm (Intern)

Biodiversity changes - causes, consequences and management implications (BIO-C3) (39117)
BIO-C3 will investigate the dynamics of biodiversity in the Baltic Sea, their causes and the consequences for the function of food webs, including implications for biodiversity management policies.

Baltic biodiversity is historically dynamic responding to various drivers operating at different time and space scales. Species diversity is generally low and contains many recent immigrants and glacial relict species because of low salinity and relatively young age. Nevertheless, Baltic food webs sustain many goods and services valued by society.

We focus on functional consequences of ongoing and projected distributional and compositional changes of benthic and pelagic communities with a focus on invasive and resident key species. Using spatial and temporal projections of abiotic/biotic drivers including their interaction (climate change, eutrophication, species invasions, fisheries), we will assess how biodiversity (e.g., of species, traits, habitats) responds in time, space and along gradients of human impact and hydrography. We will investigate the potential and genetic basis for colonisation, acclimatisation and adaptation of species and populations to the Baltic Sea, and how compositional and adaptive changes of Baltic biodiversity affect ecosystem functions with an emphasis on trophic linkage and food web dynamics.

Results will feed into impact assessments that guide management policies including improved operationalization of status indicators, and guidelines for MPAs.

The project is coordinated by Helmholtz Centre for Ocean Research, Kiel (GEOMAR). DTU Aqua is co-coordinator.

The project is funded equally by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
GEOMAR - Helmholtz Centre for Ocean Research Kiel
University of Hamburg
Stockholm University
National Marine Fisheries Research Institute
University of Tartu
Finnish Environment Institute
Klaipeda University
DHI Denmark
University of Gothenburg
Discard survival (DISCO) (39152)

This project has developed methods and accumulated competencies and facilities, to be able to estimate discard survival and generate knowledge about the factors that affect this. The focus was on two commercially important species, plaice and Norway lobster. These species are relevant because there is a likelihood of a substantial survival.

The first trial was conducted from November to March from a less commercial trawler with Hirtshals as port. There was fishing for plaice with a consumption trawls and towed time was 3 hours. Test plaice were collected at four different time periods exposed to air on the deck, with a half-hour intervals up to one and a half hour. Furthermore, control plaice were collected from hauls with short duration. Plaice was stored in tanks on the vessel and transported to storage tanks on land at the North Sea Science Park in Hirtshals. Here, they were observed for 10 days. On the vessel were also carried out tests of reflexes and damage. The overall mortality rate increased by residence time on the deck of 0% and up to 24% after one and a half hours on the deck. The total mortality was estimated to 11%. Most plaice was above the minimum landing size. Reflexes decreased with increased time on the deck. There was no mortality in the control group. There were also carried out measurements of physiological stress indicators comparing with a reference group.

Another plaice study was conducted in Norway lobster fishing from Skagen in June and July from the same vessel. The plaice was stored in the same way at the vessel as the first experiment, and was transported in a pickup from Skagen to observation side in Hirtshals. Most plaice was below the minimum size. Mortality was totally 86% for test plaice and 0 % to 16 % for the control groups.

A final test was conducted to determine the mortality of lobsters. It was estimated to be from 100 % to 52 % of the individual hauls. Overall the mortality was 84% after 8 days here except experiments where there the refrigerated container was not functioning. Had these individuals been included, the mortality would have been lower. However, there were also deaths in the control group (total 18%) and generating more uncertainty for the estimates.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
Landbased aquaculture of European lobster (39156)
The aim of the project is to solve remaining biological and technical challenges concerning commercial farming of European lobster. These include optimizing reproduction and broodstock production, improving larval survival and examining nutritional requirements and metabolism in the first life stages. Furthermore, the technical system set-up will be improved.

The work during the first two years have been focusing on survival and growth tests, comparison of diets, respiration tests and novel cage design for European Lobster farming.

Furthermore, active collaboration and exchange of knowledge have taken part in the established European Lobster Centre of Excellence (ELCE) group that now includes partners from seven countries (Norway, Denmark, Iceland, Sweden, United Kingdom, Italy and Spain).

The project is coordinated by Svinna-verkfrædi ehf, Iceland.

The project is funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Aquaculture
Svinna-verkfrædi ehf

Norwegian Lobster Farm AS
Period: 01/03/2014 → 28/02/2017
Number of participants: 1
Research area: Aquaculture
Project Manager, academic: Lund, Ivar (Intern)

Developing seal-safe fishing gear (Seal-Safe I) (39163)
Developing seal-safe fishing gear will primarily be focused on fish pots, which have the best potential for protection against seal attacks. Other advantages of pots includes being size selective, that the catch can swim freely inside the pot and is alive when the pot is emptied resulting in a higher quality and thus a higher price, high survival for discards, low bycatch of small cetaceans and seabirds, and that the pot does not have to be tended every day. Disadvantages include low catch rates compared to gillnets, and that they are not good at catching flatfish.

DTU Aqua will carry out a development project that includes the following components:
- Review of fishing gear as alternatives to gillnets.
- Optimizing existing pots to Danish conditions in collaboration with the fisheries.
- Fishing trials for cod with the optimized pots.
- Experiments with bait types.
- Studies of fish and seal behavior around pots.
- Dissemination of results to the Danish fishery.

DTU Aqua has established a collaboration with Swedish scientists, who have extensive experience with development of seal-safe fish pots.

The main challenge will be to increase the catch rates of the fish pots, so that seal-safe fish pots can be an economically viable alternative to set gillnets. If this is successful, changing from gillnets to fish pots can ensure the continued survival of the small-scale coastal fishery and at the same time reduce bycatch of e.g. marine mammals and seabirds.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries (“Bæredygtighedspuljen”).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Facilitating open science to European research (FOSTER, GA 612 425)(39146)

FOSTER is a coordination initiative that aims to support the full range of stakeholders in the research lifecycle, but especially young researchers, in adopting Open Science principles (Open Access, Open Data, Open Note Book, Open Educational Resources, Social Media for dissemination of research results) in the context of the European Research Area (ERA) and in complying with the open access policies and rules of participation set out for Horizon 2020 (H2020).

FOSTER will focus on integrating Open Science principles and practice in the current research workflow by targeting the young researchers training environment. In addition, FOSTER will strengthen the institutional training capacity to maintain compliance with the open access policies in the ERA and H2020, and will facilitate the adoption, reinforcement and implementation of open access policies from other European funders, in line with the European Commission’s recommendation.

The project is coordinated by University of Minho.

The project is funded by EU, Horizon 2020.

Department of Civil Engineering
National Institute of Aquatic Resources
Research Secretariat
Office for Innovation & Sector Services
University of Minho
Georg-August-Universität Göttingen
Stichting Eifl.Net
Stichting Sparc Europe
Stichting Liber
University of Glasgow
Delft University of Technology
The Open University
Uniwersytet Warszawski
Consortium Universitaire de Publications Numeriques (COUPERIN)
Consejo Superior de Investigaciones Científicas

University of Edinburgh
Period: 01/02/2014 → 31/07/2016
Number of participants: 4
open science , visibility, citations, reuse of research, impact, open access, open data, open notebook science, open code
Acronym: FOSTER
Project participant:
Grigorov, Ivo (Intern)
Elbæk, Mikael Karstensen (Intern)
Thomsen, Kirsten (Intern)
Qvistgaard, Nina (Intern)

**Relations**

Activities:
- Euroscience Open Forum 2014
- TOL2015: Transatlantic Ocean Literacy in Support of Galway Declaration
- 40th CIESM Mediterranean Science Commission Congress: Mediterranean Science Commission, Annual Congress
- LEARN-TEACH: a pilot to boost Ocean Literacy in High Schools
- EGU2017-18355 Passive vs Active Knowledge Transfer: Boosting Grant Proposal Impact
- Winning Horizon2020 with Open Science: How to Incorporate Open Science in Competitive Grant Proposals

**Publications:**

- An open science peer review oath
- Open Marine Science
- Data Science Training for Librarians

Press / Media items:

- The journal of proposals, ideas, data and more: New journal aims to publish from ‘all stages of the research cycle’.
- Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.

**Project**

**Integrating spatial processes into ecosystem models for sustainable utilization of fish resources (INSPIRE) (39118)**

The BONUS INSPIRE Project conducts pilot ecosystem field surveys that help resolving the habitat requirements of different life-stages of the focal species by combined use of traditional methods and application of modern advanced analysis and modelling techniques.

The research is conducted in a matrix approach with four species specific case (cod, herring, sprat and flounder) and five research work-packages. The work packages deal with (i) habitat requirements and survival probability for different life stages, (ii) connectivity between habitat occupied in successive life stages, (iii) spatial scaling from local events to regional population dynamics, (iv) spatially explicit analytical stock assessments (including a comprehensive flatfish programme), and (v) ecosystem-based management and Marine Strategy Framework Directive indicators.

The overarching questions of the BONUS INSPIRE Project are:
- What habitat (both pelagic and benthic) conditions characterize the spatial distributions of cod, herring, sprat and flounder?
- To what extent do fishing and species interaction affect the local and basin-scale distribution of exploited stocks?
- What drives spatial connectivity and migrations of different fish species/populations?
- How does stock structure and separation of natural populations impact stock assessment outcomes?

This project is coordinated by University of Tartu, Estonia.

The project is funded by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

**National Institute of Aquatic Resources**

Section for Oceans and Arctic

University of Tartu

National Marine Fisheries Research Institute

Stockholm University

Swedish University of Agricultural Sciences

Institute of Food Safety, Animal Health and Environment

Thünen Institut für Ostseefischerei

University of Hamburg

National Resources Institute Finland

GEOMAR - Helmholtz Centre for Ocean Research Kiel
Towards stable water quality in RAS by use of a new rapid microbial test (Biostable water) (39154)

Water quality control is central for successful management of recirculating aquaculture systems. Most common and important chemical parameters (i.e. pH, TAN, nitrite, alkalinity) are measurable, whereas microbial water quality (abundance and activity) is more complicated to measure. Microbial water quality measurements are important for several reasons: it can be used to ensure safe and stable conditions (baseline), to identify sudden changes (deviations from baseline) and potentially contribute to improve system performance by identifying suboptimal treatment component or practices.

The aim of this project is to test a rapid microbial methods developed by Mycometer; a test that quantifies the microbial activity in different types of water samples within 30 minutes from sampling to measurement. The Bactiquant® method is expected to provide new insight of microbial succession within RAS and will be used to monitor microbial water quality in commercial recirculating aquaculture systems.

The project includes controlled batch experiments where disinfection efficiency and regrowth potentials can be estimated. The new knowledge can be applied in RAS management, and the project also includes method verification under commercial RAS conditions. The equipment has been introduced and implemented on a large model trout 3 farm with mixed effect and valuable experiences. The method is also being introduced to a huge smolt RAS facility build by Billund Aqua; here daily monitoring as well as intensive campaigns including diurnal measurements will be performed.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Aquaculture
Mycometer A/S

Billund Aquaculture Service Aps
Period: 01/02/2014 → 01/07/2016
Number of participants: 9
Research area: Aquaculture
Project participant:
Rojas-Tirado, Paula Andrea (Intern)
Pedersen, Per Bovbjerg (Intern)
Sproegel, Ulla (Intern)
Møller, Brian (Intern)
Nielsen, Sara Møller (Intern)
Frandsen, Dorthe (Intern)
Larsen, Ole Madvig (Intern)
Jensen, Rasmus Frydenlund (Intern)
Project Coordinator:
Pedersen, Lars-Flemming (Intern)
Evaluations of tagging effects (39124)

Much of the science-based management of fish and fisheries are based on results from various electronic tagging methods be it radio-, acoustic-, Data Storage- or PIT tags. This project aims to investigate and document possible effects of commonly used tagging methods and improve these methods to ensure that results from tagging studies are representative and unbiased. Hand in hand with this goes animal welfare issues, where we try to reduce the impact on each fish as well as refine the methods used for capture, handling and tagging, according to the 3R’s. In field-based research post-treatment evaluations are difficult and thus rare, however needed. Within this project we will focus on evaluation of sub-lethal effects of surgical implantation, identify size thresholds for PIT-tagging small fish and testing new suture materials.

The project is coordinated by DTU Aqua.

The project is funded by Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Freshwater Fisheries Ecology
Period: 01/01/2014 → 31/12/2016
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project participant:
Skov, Christian (Intern)
Project Manager, academic:
Jepsen, Niels (Intern)

OrAqua will suggest improvements for the current EU regulatory framework for organic aquaculture based on
- a review of the relevant available scientific knowledge
- a review of organic aquaculture production and economics
- consumer perceptions of organic aquaculture.

The project will focus on aquaculture production of relevant European species of finfish, molluscs, crustaceans and seaweed.

To ensure interaction with all relevant stakeholders throughout the project a multi stakeholder platform will be established. The project will assess and review existing knowledge on fish health and welfare, veterinary treatments, nutrition, feeding, seeds (sourcing of juveniles), production systems, including closed recirculation aquaculture systems (RAS), environmental impacts, socio-economic and aquaculture economic interactions, consumer aspects, legislations and private standards for organic aquaculture. The results will be communicated using a range of media and techniques tailored to involve all stakeholder groups. Further, Multi Criteria Decision Analysis (MCDA) and SWOT analysis will be used to generate relevant and robust recommendations.

A wide range of actors from several countries will participate and interact through a participatory approach. The 13 OrAqua project partners form a highly qualified and multidisciplinary consortium that includes four universities, five aquaculture research institutes, three research groups in social science, a fish farmer organisation, a fish farmer and two organic certification/control bodies.

The main outcomes of the project will be recommendations on how to improve the EU regulation, executive dossiers and a Policy Implementation Plan (PIP). Further the project will deliver recommendations on how to enhance economic development of the European organic aquaculture sector.

The project is coordinated by NOFIMA, Norway.

The project is funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Aquaculture

NOFIMA
Enhancing the European aquaculture production by removing production bottlenecks of emerging species, producing new products and accessing new markets (DIVERSIFY) (39132)

Following the objectives of this Call, DIVERSIFY identified a number of new/emerging, large and/or fast growing finfish species, which are believed to be excellent candidates for the expansion of the aquaculture industry of Europe. The emphasis is on the Mediterranean or warm-water cage culture industry, but also addressed is pond/extensive culture, fresh water recirculation systems and cold-water species. These new/emerging species are marketed at a large size and can be processed easily into a range of products to provide the consumer with both greater diversity of fish species and new processed products. In collaboration with a number of SMEs, DIVERSIFY will build on recent/current national initiatives for species diversification in aquaculture, in order to overcome the documented bottlenecks in the aquaculture production of these selected species.

DIVERSIFY will provide knowledge where needed to solve bottlenecks in juvenile production, grow-out, nutrition and feeding husbandry, new product development and marketing. The programme will also provide tools for genetic improvement and disease control. This will provide improved efficiency in production and reduced costs, and identify markets for the new products.

The expertise in the consortium and lessons learned, could provide in a 5 year period what took the Atlantic salmon industry 20 years of development. DIVERSIFY focuses on meagre (Argyrosomus regius) and greater amberjack (Seriola dumerili) for marine warm-water cage culture, wreckfish (Polyprion americanus) for warm- and cool-water marine cage culture, Atlantic halibut (Hippoglossus hippoglossus) for marine cold-water culture, grey mullet (Mugil cephalus) a euryhaline herbivore for warm-water pond, extensive and integrated culture, and pikeperch (Sander lucioperca) for freshwater intensive culture using Recirculation Aquaculture Systems (RAS).

The project is coordinated by the Hellenic Center for Marine Research. 31 research institutions etc. are involved in the project.

The project is funded by EU, Framework Programme 7.

Coastal mussel banks: The importance for the fish fauna and possibilities for habitat restoration (MusFisk) (39133)

Coastal mussel banks are commonly assumed to be good areas for recreational fishing, but few quantitative studies have investigated how fish abundance and diversity covary with mussel coverage. In many Danish coastal waters, mussel
coverage is reduced compared to historic records, but the impact of the reduction on coastal fisheries remains largely unknown.

This project investigates fish abundance and diversity in various coastal habitats to predict possible effects of mussel bank restoration projects. Because it is increasingly recognized that restoration of coastal habitats support both pelagic and benthic fisheries, this study hypothesized that mussel banks may provide important shelter and foraging habitats for various trophic levels of fish. Covering different habitats, catch per unit effort (CPUE) was quantified using fyke nets, and fish abundance and behaviours were measured using stationary underwater video cameras. These studies revealed that blue mussel (Mytilus edulis) banks support fish abundance and diversity comparable to areas covered by eel grass (Zostera marina), indicating that mussel bank restoration projects could benefit fisheries in a fashion similar to eel grass habitats. Moreover, fish abundance, but not diversity, differed between mussel banks exposed to different current velocity regimes, suggesting that mussel banks exposed to higher current velocities support higher fish abundances. These findings indicate that mussel bank restoration carried out in high current velocity regimes may provide the most favorable habitats for fish. Surprisingly, fish behaviours were similar in different current velocity regimes, suggesting comparable ecological function of the habitats.

Planned data collection in 2016 includes experimental manipulations of mussel coverage in laboratory studies where habitat preferences and stress levels (cortisol) will be examined in a number of fish species. These findings will be useful to test findings from the field studies and help predicting the effects of mussel bank restoration in coastal areas.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Period: 01/01/2014 → 31/12/2016

Number of participants: 4

Research areas: Coastal Ecology & Oceanography

Project participant:
Støttrup, Josianne Gatt (Intern)
Mariani, Patrizio (Intern)

Project Coordinator:

Svendsen, Jon Christian (Intern)
Stenberg, Claus (Intern)

Project Development of sustainable mussel production (Idékataloget) (39250)

It is the overall objective of the project to develop sustainable methods of mussel production involving mussel fisheries, on-bottom culture and off-bottom long-line culture. With regard to mussel fisheries, a GIS-based model of eelgrass habitats and their potential recovery was developed and has been reported. Further, macro algae were mapped in selected estuaries. In relation to on-bottom culture, focus has been on testing whether moving mussels from deeper to shallower areas during oxygen depletion was tested. Results showed that this can be a good strategy to move mussels that grew rapidly after relay in contrast to mussels not moved that died due to oxygen depletion. It is however important that careful monitoring of the relayed mussels are carried out by the fishermen as mussels otherwise risk to be eaten by starfish. Experiments with relay of mussel spat from water column spat collectors are currently being carried out.

In relation to long-line farming, DTU Aqua provided basic information and numbers to an economic analysis of the industry carried out by Copenhagen University, Department of Food and Resource Economy.

This project is coordinated by DTU Aqua.

The project was funded by the Ministry of Food, Agriculture and Fisheries through a special governmental funding for sustainable fisheries (“Bæredygtighedspluljen”).

National Institute of Aquatic Resources

Danish Shellfish Centre

Period: 01/01/2014 → 31/12/2016

Number of participants: 7

Research areas: Shellfish and Seaweed & Coastal Ecology

Project participant:
Canal-Vergés, Paula (Intern)
Nielsen, Pernille (Intern)
Environmentally friendly fisheries (Skånfisk) (39161)
The project consists of two sub-projects:

Ecosystem Approach to Danish gill- and trammel nets
Although the fleet has reduced since the mid-1990s, Danish gill- and trammel nets are still of importance and are likely to gain increasing interest as environmentally friendly practices. However, such a development may only happen if the ecosystem approach is guaranteed. There is limited knowledge about ecosystem impacts, such as for example physical damage to habitats or discards, and their minimization may require development of alternative practices. With regard to the upcoming challenges of an Ecosystem Approach to Fisheries, the project aims at (1) studying the sweeping behavior of nets and their effect on the seabed; (2) quantifying invertebrates and fish discards and understanding how the capture process can influence discard behavior; (3) developing technical innovation that could improve catch quality and therefore maximize the production. Trials are conducted on gill- and trammel nets within the Danish coastal waters.

Danish seine - ecosystem effects of fishing
The amount of scientific studies on Danish seining is rather low. Therefore, the current study "Danish seine – Ecosystem effects of fishing" investigates various topics to increase the knowledge of impacts, Danish seines have on the environment and further to give advices to potentially improve selectivity characteristics and efficiency of the gear. We compared catch profiles of Danish seines and bottom trawls based on a perennial observer dataset. Furthermore, we carried out two sets of experimental trials on commercial vessels. The first set in 2014 looked at codend selectivity as well as direct interactions the gear has on the benthic and demersal fauna. The second set of trials in 2015 allowed us to create detailed descriptions of the fishing process in terms of geometry and forces acting between net and ropes and furthermore, to evaluate the behavior of fish in relation to the gear and to evaluate impacts of the gear on the sea bottom.

This project is coordinated by DTU Aqua.
The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries ("Bæredygtighedspuljen").

EUROMARINE Consortium (39185)
EuroMarine is a European, marine science network launched in 2014. It represents the scientific communities of three former European Networks of Excellence: EUR-OCEANS, Marine Genomics Europe, and MarBEF. It was designed by the EuroMarine FP7 preparatory project (2011-13) as a bottom-up organization and meant to be a voice for the European marine scientific community. It is intended as a durable structure and was established as a consortium for an initial duration of 10 years. A legal entity will be established in 2016 as a support structure under the control of the consortium. As of 2016 EuroMarine counts 72 member organisations (MOs), 57 of which are 'full voting' members contributing to the budget.

Two primary goals of EuroMarine are:
- to support the identification and initial development of important emerging scientific topics and methodologies in marine sciences
- to foster new services relevant to the marine scientific community.
EuroMarine will achieve these goals through internal competitive calls for proposals, within the available budget. It is expected that support for these activities and their outcomes will help to leverage larger projects under European, national or joint research funding programmes. EuroMarine also intends to advocate for marine science and to contribute to improving the science-governance interface, providing expertise and transferring knowledge.

This project is coordinated by French Research Institute for Exploitation of the Sea & The National Center for Scientific Research, France. The project is self-funded.

National Institute of Aquatic Resources
Centre for Ocean Life
Section for Marine Ecology and Oceanography
IFREMER
National Center for Scientific Research
Period: 01/01/2014 → 31/12/2017
Number of participants: 1
Research area: Oceanography
Project participant:
Mariani, Patrizio (Intern)
Project

**Investigation of causes for declines in fish abundance in coastal areas (Kystfisk II) (39164)**
The project aims to describe changes in distribution of different age groups of cod and plaice in coastal areas. Changes in the distribution of plaice off the Danish west coast were documented and correlated to changes in nutrient loadings. These results were submitted for peer review. Potential changes in the distribution of cod of different size classes in inner Danish waters are being modelled to see if there are any consistent patterns. Datamining has been undertaken to provide environmental data to conduct analyses of potential causes for changes observed.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries ("Bæredygtighedspuljen").

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2014 → 31/12/2016
Number of participants: 4
Research areas: Coastal Ecology & Marine Living Resources & Oceanography
Project participant:
Munk, Peter (Intern)
Stedmon, Colin (Intern)
Stenberg, Claus (Intern)
Project Coordinator:
Støttrup, Josianne Gatt (Intern)
Project

**Minimising discards in Danish fisheries (MINIDISC) (39020)**
The landings obligation, currently being implemented in the new CFP, puts major constraints on fishers, by making the landing of unwanted catch mandatory. Less restrictive technical rules (TR) in a results-based management frame under Catch Quota Management (CQM) have been suggested as a mechanism to release some of these constraints. To investigate the effects of the existing TR, some fishers were relaxed from TR during the trial and could freely choose and develop alternative gears, aiming to optimize annual catch value, while reducing discards. The study included 14 demersal fishing vessels, operating in the North Sea, Skagerrak and the Baltic Sea.

Fishers used test and control gears interchangeably or in pairs during up to 6 months and were required to sort and weigh all discard of seven common target species on a haul by haul basis. All vessels were equipped for Fully Documented Fisheries (FDF), including cameras. Collected data were analyzed to investigate differences in landings, discards, discard ratio, CPUE, VPUE and DPUE, between conventional (control) and new gears (test). The results showed a varying degree of success, depending both on area and on choices made by the individual fisher. The best results were observed in the Baltic Sea, where relaxing technical rules led to major improvements in fishing patterns. But gear changes did not
contribute much in fisheries where initial discard rates were already low. Interviews realized with the skippers around the
end of the trial were performed and analyzed to investigate (i) their experiences with "free" choice of gear, (ii) the
processes that they followed for developing their gears and (iii) their tools for evaluating the efficiency and selectivity of
their trial.

In addition to the trial, a number of other activities were performed under the MINIDISC project, including (i) the publishing
of a catalogue (in Danish) of the selectivity devices experimented in Danish fisheries, (ii) a scientific selectivity trial on
Danish seines fisheries in Skagerrak and (iii) a review of international experiences in the uptake of selective devices.

The project has been disseminated through several meetings and conferences. A number of scientific publications are in
review or close to submission.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and the Fisheries and the European Fisheries Fund
(EFF).

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Danish Fishermen's Producers' Organization

Period: 01/01/2014 → 15/07/2015
Number of participants: 8
Research areas: Fisheries Management & Fisheries Technology & Marine Living Resources

Project participant:
Mortensen, Lars O. (Intern)
Olesen, Hans Jakob (Intern)
Krag, Ludvig Ahm (Intern)
Seekings, Jordan P. (Intern)
Dalskov, Jørgen (Intern)
Storr-Paulsen, Marie (Intern)
Qvist Eliasen, Søren (Intern)

Project Coordinator:
Ulrich, Clara (Intern)

New methods and models for population estimates of mussels with the use of GPS data (39088)

Based on the new management requirements from authorities and industry, the access to new data collection and the
desire for more mussel fishing areas, there is a need for the development of new tools for monitoring and managing
shellfish stocks.

The aim of the project was to develop new methods and models for estimating shellfish stocks in Denmark that may
include several types of information to the management. The project worked with stratified extensive sampling strategies
such as sidescan sonar, video recordings, data from automated GPS loggers from industry's own data and classical
biomass collection.

Based on the data collected different types modeling tools was developed. The project has resulted in a new management
tools for population estimation with different degrees of detail and types of information.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources

Danish Shellfish Centre

Orbicon

Foreningen Muslingeerhvervet

Period: 01/01/2014 → 30/06/2015
Number of participants: 8
Research areas: Coastal Ecology & Observation Technology & Marine Living Resources

Project participant:
Canal-Vergés, Paula (Intern)
Nutrient cocktails in coastal zones of the Baltic Sea (COCOA) (39145)
The overall objective of COCOA is to identify the major pathways of nutrients and organic material (simply referred to as nutrients in the following) across the diversity of coastal ecosystems and assess management implications. Specifically, COCOA will investigate four different types of coastal ecosystems: 1) river-dominated estuaries, 2) lagoons, 3) archipelagos, and 4) embayments with restricted water exchange to:
- Understand the changing nutrient (C/N/P/Si) cocktail across the land-sea continuum.
- Quantify processes that transform and accumulate nutrients.
- Estimate nutrient retention across coastal ecosystems.
- Investigate potential feed-back processes sustaining alternative stable states.
- Analyse how these process rates may have changed over time.
- Evaluate consequences of altered nutrient pathways on ecosystem services
- Identify possible management responses for present and future projections.
The project is coordinated by Aarhus University, Denmark.
The project was funded EU; BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

National Institute of Aquatic Resources
Section for Oceans and Arctic
Aarhus University
Lund University
Åbo Academy University
Stockholm University
University of Gdansk
Russian Academy of Sciences
Swedish Meteorological and Hydrological Institute
Klaipeda University
University of Helsinki
Finnish Environment Institute
Utrecht University
University of Gothenburg
Leibniz-Institute for Baltic Sea Research
Period: 01/01/2014 → 31/07/2017
Number of participants: 1
Research area: Oceanography
Project participant:
Stedmon, Colin (Intern)
concentrations and compositions.

A particular aim is also to maintain hatchery knowledge at Danish Shellfish Centre, DTU Aqua for research purpose and dissemination centre as well as to ensure the base for the establishment of a real full-scale hatchery with capacity for both research/development and production in partnership with private companies. Moreover produces spat for other projects, restoration and further breeding at Danish Shellfish Centre.

This project is coordinated by DTU Aqua.

The project is funded by the fund "Fonden Limfjordens Skaldyrcenter".

National Institute of Aquatic Resources

Danish Shellfish Centre
Period: 01/01/2014 → 31/12/2016
Number of participants: 5
Research area: Shellfish and Seaweed
Project participant:
Barreau, Pascal David Alain (Intern)
Hansen, Anita (Intern)
Project Manager, academic:
Petersen, Jens Kjerulf (Intern)
Nielsen, Carsten Fomsgaard (Intern)
Møller, Lene Friis (Intern)

Starfish - power and management (Søstjerner) (39087)
The overall objective of the project was to provide the scientific basis for management that can lead to the establishment of a commercial fishery of starfish (Asterias rubens) in primarily the Limfjorden, including Natura 2000 areas. The project background was the increasing prevalence of starfish that is both a threat to the mussel fishing and a potential source of income for fishing. In the project, the population of starfish and production was determined and analyzed and based on population stock estimates and stock modeling a total allowable quota of 10,000 tonnes annually was estimated as a conservative annual catch, which is considered sufficient to maintain a potential starfish meal industry. Effect of fishing was determined both for the population of starfish, the stock of mussels and benthic components like infauna and macroalgae. It was shown that using the starfish purse seine will have no or negligible effects on infauna and blue mussels. In terms of biodiversity and biomass of macro algae, no significant effects of the purse seine, including a load of 300 tonnes of starfish in the net, could be detected. Torn of macro algae leafs were however detected in the purse seine after fishery over macro algae habitats and this was included in management advise on effects of starfish fisheries. A guide for management including recommendations on environmental impact and starfish populations were developed.

This project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources

Danish Shellfish Centre
Department of Applied Mathematics and Computer Science
Foreningen Muslingeerhvervet
Centralforeningen for Limfjorden
Period: 01/01/2014 → 30/06/2015
Number of participants: 6
Research areas: Shellfish and seaweed & Coastal Ecology & Marine Living Resources & Ecosystem based Marine Management
Project participant:
Nielsen, Carsten Fomsgaard (Intern)
Fitridge, Isla (Intern)
Saurel, Camille (Intern)
Thygesen, Uffe Høgsbro (Intern)
A trait-based approach towards understanding benthic-pelagic pathways in marine ecosystems

National Institute of Aquatic Resources
Period: 15/12/2013 → 06/06/2017
Number of participants: 7
Phd Student: Pécuchet, Lauréne (Intern)
Supervisor: Andersen, Ken Haste (Intern)
Payne, Mark (Intern)
Main Supervisor: Lindegren, Martin (Intern)
Examiner: MacKenzie, Brian (Intern)
Nordström, Marie C. (Ekstern)
Primicerio, Raul (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Danish seine - Ecosystem effects of fishing

National Institute of Aquatic Resources
Period: 15/12/2013 → 05/04/2017
Number of participants: 6
Phd Student: Noack, Thomas (Intern)
Supervisor: Wieland, Kai (Intern)
Main Supervisor: Krag, Ludvig Ahm (Intern)
Examiner: Eigaard, Ole Ritzau (Intern)
Hammer, Cornelius (Ekstern)
Ingólfsson, Ólafur Arnar (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Using commercial gears to sample ecosystem effects

National Institute of Aquatic Resources
Period: 15/12/2013 → 30/09/2017
Number of participants: 6
Phd Student: Savina, Esther (Intern)
Supervisor: Larsen, Finn (Intern)
Main Supervisor: Krag, Ludvig Ahm (Intern)
Examiner:
Eigaard, Ole Ritzau (Intern)
O’Neill, F.G. (Ekstern)
Rochet, Marie-Joëlle (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Boulder reefs as spawning and nursery areas for fish (RevFisk) (39144)
The project aimed to build knowledge about marine boulder reefs and their biological function for fish as spawning and nursery areas.

The field work was conducted on a stone reef, Hatter Barn at two depths 6-12 m and 13-17 m. These two depths were chosen to provide information on fauna and flora in the upper photic zone and a deeper zone. The dominant fish were labrids, which also spawned in the area and juvenile cod. Acoustic tagged cod provided information on their presence around the reef. Many exhibited a diurnal rhythm, concentrating on the reef during nighttime, although some cod were stationary on the reef the whole time. The deeper reef was more frequently visited (fourfold) by cod than the shallower reef.

Experimental work conducted at the Blue Planet aquarium revealed that cokwing wrasse are highly territorial and able to prevent juvenile cod from occupying their crevices. Goldsinny wrasse showed little interaction with cod and generally utilized very small crevices. Both labrids and cod utilized shelter from current flows provided by the structures and cod were often seen in high concentrations near the bottom where the current flows were laminar.

The results are useful for further developing models that quantify boulder reefs impact on fish (larvae, juvenile, adult) as a function of the reefs condition, size and depth location. The results are useful in helping plan and design the restoration of destroyed boulder reefs but also to manage existing boulder reefs.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
DHI Denmark

Aarhus University
Period: 01/12/2013 → 01/02/2015
Number of participants: 7
Research areas: Coastal Ecology & Marine Living Resources & Oceanography
Project participant:
Mariani, Patrizio (Intern)
Dinesen, Grete E. (Intern)
Project Manager, academic:
Christoffersen, Mads (Intern)
vandeurs, Mikael (Intern)
Nielsen, Anders (Intern)
Project Coordinator:
Stenberg, Claus (Intern)
Stattrup, Josianne Gatt (Intern)

Network towards phasing out formalin in aquaculture (39140)
Formalin is still used in large quantities in aquaculture systems despite unwanted side-effects and efforts to reduce the amount used. Apparently the need for water treatment increases with shift from flow-through to RAS. This project established a network of fish farmers (8 persons representing different systems), three national fish-vets covering >95% of Danish fish farms, DTU Aqua researchers and Danish Aquaculture organization. The common goal was to identify methods to cease the aquaculture related use of formalin. Recent knowledge, new techniques and practical experience with alternative disinfectants (e.g. hydrogen peroxide or peracetic acid) were applied and tested. In particular, distribution, degradation and automatic dosage of Peracetic acid by digital pumps was analytically verified. The project tested and developed better water treatment protocols for different types of rearing systems (hatcheries and grow out production systems, flow-through, model trout farms to fully recirculated systems) in close collaboration between fish-vets, fish
farmers and DTU Aqua. Results from monitoring on a number of fish farms and experience over 2 seasons were obtained and the new practically applied knowledge/information was presented at workshops/seminars with the aquaculture industry as well as reported in a Danish report (Danish Aquaculture 2015-10). A number of veterinarians and fish farms were partners in the project. The project was coordinated by Danish Aquaculture Association. The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/12/2013 → 01/05/2015
Number of participants: 4
Research area: Aquaculture
Project participant:
Pedersen, Lars-Flemming (Intern)
Pedersen, Per Bovbjerg (Intern)
Sproegel, Ulla (Intern)
Møller, Brian (Intern)

A trait-based approach to Plankton Biogeography
National Institute of Aquatic Resources
Period: 01/12/2013 → 08/02/2017
Number of participants: 6
Phd Student:
Brun, Philipp Georg (Intern)
Supervisor:
Kiørboe, Thomas (Intern)
Main Supervisor:
Payne, Mark (Intern)
Examiner:
Wisz, Mary (Intern)
Borregaard, Michael K. (Ekstern)
Record, Nicholas R. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Tracing the dynamics of mixed stocks in a transition area: Herring in Skagerrak-Kattegat and Western Baltic
National Institute of Aquatic Resources
Period: 01/12/2013 → 04/06/2014
Number of participants: 6
Phd Student:
Worsøe Clausen, Lotte (Intern)
Supervisor:
Bekkevold, Dorte (Intern)
Main Supervisor:
Mosegaard, Henrik (Intern)
Examiner:
Hansen, Jakob Hemmer (Intern)
Grønkjær, Peter (Ekstern)
Hammer, Cornelius (Ekstern)

Financing sources
Adaptive differences between wild and farmed trout: linking traits with genomic variation

National Institute of Aquatic Resources
Period: 01/11/2013 → 22/01/2018
Number of participants: 6
Phd Student:
Frank-Gopolos, Thomas (Intern)
Supervisor:
Eg Nielsen, Einar (Intern)
Main Supervisor:
Bekkevold, Dorte (Intern)
Examiner:
Hansen, Jakob Hemmer (Intern)
Helyar, Sarah J. (Ekstern)
Jensen, Lasse Fast (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Development of filtering technologies for microalgae and sustainable high quality feed for fry (FiMAFY) (39115)
There is an urgent need for alternative resources to fishmeal and fish oil for the production of fish feed to the aquaculture industry. The resource problem is due to a combination of the rapid growth of the aquaculture, and the fact that catches of fish for the feed industry is stagnating.

The idea to use microalgae as fish feed originated from an on-going EU-project, which aims at demonstrating that algae can be grown on process water from the industry.

The partners in the project will develop, test and demonstrate new technologies for harvesting and refining microalgae. The project will develop a technology to open the cell walls of the microalgae in order to make it possible to extract micro- and macronutrients for use as an alternative resource to fish oil and fishmeal in the production of fish feed for the aquaculture industry.

The project is coordinated by the National Food Institute, Technical University of Denmark.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Aquaculture
BioMar A/S
LiqTech International A/S
IFAU
Ecolipids A/S
Period: 01/10/2013 → 31/03/2017
Number of participants: 2
Research area: Aquaculture
Project participant:
Höglund, Erik (Intern)
Project Manager, organisational:
Lund, Ivar (Intern)
Development of educational opportunities for Danish aquaculture (39157)

Danish aquaculture systems have faced substantial changes during the recent years, which have necessitated further education and practical implementation of new knowledge.

This project was initiated by Danish Aquaculture Organization (DAO). Based on an increasing demand for improved and updated education/training to people in the aquaculture industry, DAO identified various initiatives to develop educational for Danish aquaculture. Key players within the aquaculture sector were identified to support these initiatives.

The outcome of the project was
- Initiation and implementation of a new education at Hansenberg in Kolding, (www.hansenberg.dk) ,
- Participation in developing the courses for aquaculture trainees (practical/theoretical exercises),
- Production of advertising material (posters, pamphlets) promoting the education and aquaculture in general,
- Production of the first public available E-book ("Aquaculture": 14 chapters, 360 pp.) (http://www.danskakvakultur.dk/uddannelse/e-bog/)

This project was coordinated by the Danish Aquaculture Organization.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Organisation
University of Copenhagen
Aarhus University
Seges Knowledge Centre for Agriculture
Hansenberg Technical College
Period: 07/08/2013 → 01/08/2015
Number of participants: 3
Research area: Aquaculture
Project participant:
Pedersen, Lars-Flemming (Intern)
Jokumsen, Alfred (Intern)
Pedersen, Per Bovbjerg (Intern)

Environmental effects on the availability of shallow and deep water hake to the demersal trawl survey in the Namibian waters

National Institute of Aquatic Resources
Period: 01/08/2013 → 05/12/2017
Number of participants: 7
Phd Student:
Kainge, Paulus Inekela (Intern)
Supervisor:
Andersen, Niels Gerner (Intern)
Hamukuaya, Hashali (Ekstern)
Main Supervisor:
Wieland, Kai (Intern)
 Examiner:
Nielsen, J. Rasmus (Intern)
Grønkjær, Peter (Ekstern)
Ndjaula, Hilkka Opolii Ndahafa (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD
Environmentally effective nitrogen removal in fish farming using sludge hydrolysis (wiN-wiN) (39119)

Reducing nitrogen discharge is important to fish farms and their environmental performance. Removal of nitrogen can be done by applying denitrification filters end-of-pipe (i.e. before discharge) through an anerobic de-nitrification process using organic carbon as energy source.

Using external carbon is costly and introduces additional organic matter into the system. In contrast, sludge produced by the farmed fish might provide the organic matter given that a hydrolysis process can be controlled and optimised according to the needs of the denitrification process.

The project strives to establish, optimize and demonstrate an integrated system in commercial scale able to hydrolyse generated sludge and subsequently use it as energy source for nitrogen removal in end-of-pipe denitrification filters.

This project is coordinated by HME, Denmark.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP) and the partners involved.

National Institute of Aquatic Resources
Section for Aquaculture
HME
Lundby Dambrug
Period: 01/08/2013 → 31/12/2016
Number of participants: 4
Research area: Aquaculture
Project participant:
von Ahnen, Mathis (Intern)
Dalsgaard, Anne Johanne Tang (Intern)
Phd Student:
Letelier-Gordo, Carlos Octavio (Intern)
Project Manager, academic:
Pedersen, Per Bovbjerg (Intern)
Project

The early life of eel in the Sargasso Sea – Influence of oceanography and climate (SARGASSO-EEL) (39107)

The recruitment of the European eel has been in dramatic decline during the last 30 years, and is at a severe low of only 3-5 % of earlier magnitude. This change and its influence on the eel fishery have led to an intensified research in the oceanic phase of the European eel.

In order to contribute to further understanding of the life cycle of eel the Danish eel expedition set out in 2014 for the eel spawning grounds in the Sargasso Sea. Here a consortium of Danish scientists and international collaborators focused on the linkages between oceanography, biological production, eel spawning and the growth and drift of eel larvae.

During the expedition, a wide range of organisms was collected: From the smallest plankton of less than a millimeter to very large fish. A number of research groups are now working on samples and data from the expedition and assembling information on key processes in the early life of eels. Preliminary findings indicate that biological and physical changes have taken place in the spawning areas that may affect the eel larvae’s chances of survival and their journey to Europe.

The project was coordinated by DTU Aqua.

The project is funded by the Carlsberg Foundation and Danish Centre of Marine Research (cruise).

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of Copenhagen
Aarhus University
Pierre and Marie Curie University - University of Paris VI
Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Ecosystem based method for impact assessment (39142)

The project aimed to develop a methodology for impact assessment and measures to support the implementation of the Marine Strategy Framework and Natura 2000.

The project included:
- Development of an approach to impact assessment and step by step guide for management actions to ensure biodiversity, marine food webs and seabed integrity.
- A Case Study on the Dogger Bank to support the implementation of the Natura 2000 processes was evaluated and best practice identified.
- A Case study in the Kattegat with monitoring and ecosystem analysis of muddy habitats to optimize nature conservation and fisheries management under the Marine Strategy was evaluated and best practice identified.
- Development of cost-effective methods for management, monitoring and control in a report that describes the best practices in the subareas and the related costs.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Arctic Section
Danish Anglers Association
Dalsgaard Data A/S
Silkeborg Fiskerforening

Period: 01/08/2013 → 01/08/2016
Number of participants: 11
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Oceanography

Project participant:
Thomsen, Helge Abildhauge (Intern)
Sørensen, Sune Rii (Intern)
Bekkevold, Dorte (Intern)
Malanski, Evandro (Intern)
Jaspers, Cornelia (Intern)
Koski, Marja (Intern)
Christoffersen, Mads (Intern)
Hansen, Susanne (Intern)

Phd Student:
Ayala, Daniel Jiro (Intern)

Project Manager, academic:
Nielsen, Torkel Gissel (Intern)

Project Coordinator:
Munk, Peter (Intern)

Project

Ecosystem based method for impact assessment (39142)

The project aimed to develop a methodology for impact assessment and measures to support the implementation of the Marine Strategy Framework and Natura 2000.

The project included:
- Development of an approach to impact assessment and step by step guide for management actions to ensure biodiversity, marine food webs and seabed integrity.
- A Case Study on the Dogger Bank to support the implementation of the Natura 2000 processes was evaluated and best practice identified.
- A Case study in the Kattegat with monitoring and ecosystem analysis of muddy habitats to optimize nature conservation and fisheries management under the Marine Strategy was evaluated and best practice identified.
- Development of cost-effective methods for management, monitoring and control in a report that describes the best practices in the subareas and the related costs.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Arctic Section
Danish Anglers Association
Dalsgaard Data A/S
Silkeborg Fiskerforening

Period: 23/07/2013 → 01/05/2015
Number of participants: 4
Research areas: Observation Technology & Marine Living Resources & Coastal Ecology

Project participant:
Pedersen, Eva Maria (Intern)
Mosegaard, Henrik (Intern)
Dinesen, Grete E. (Intern)

Project Coordinator:
Initiative to improve mackerel assessment via tagging data (39080)
The assessment of NEA mackerel had issues with this assessment related to the data. The most problematic data issue for NEA mackerel is the unknown amount of unreported catches in the past. The single index was available only every third year, which caused substantial revision of the perceived stock each time a new survey point was incorporated. Furthermore, the uncertainty in the stock estimate in the terminal assessment year increased as one moved away from the last available egg survey point.

This project extended the state-space assessment model SAM (developed at DTU-Aqua) to use tag-recapture information. This was done in order to correctly propagate uncertainties associated with the tag-recapture data. In preparation of the benchmark two meetings were held with the objective to analyze the information given by the tagging data and write the code for the model extension.

The model was extended and accepted as the primary model for NEA mackerel at the following benchmark assessment meeting.

This project was coordinated by Danish Pelagic Producer Organization. The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

Catch Quota Management and choke species 2014 (39079)
The aim of the project is further development and test of Catch Quota Management (CQM) systems in Danish demersal fisheries by the use of electronic monitoring systems. Furthermore, to test whether electronic monitoring – video and sensor recordings – can provide the necessary documentation to support a CQM system. In addition the project will illustrate whether full documentation of catches can support implementation and certification and traceability solutions which requires linkage to project dealing with these issues.

This project is coordinated by DTU Aqua.

Short-term projections for short-lived species managed under MSY: Management of the sandeel stock in the North Sea (39148)
The industrial fishery for small short-lived species represents the economically most important fishery in Denmark, and traditionally the North Sea sandeel (*Ammodites marinus*) has played a key role in this fishery.

Currently, quota advice for sandeel is based on the so-called B-escapement strategy, the purposes of which is to ensure that the spawning stock biomass remains large enough to maintain the survival of the population even after fish-eating
fish, birds, and mammals have taken their share; and whatever is left is made available to the fishery. This type of management strategy relies on accurate predictions about the size of the incoming year class (the recruitment), if the criteria of MSY are to be fulfilled.

The aim of the project was therefore to ensure that the short-term prognosis reflects current knowledge about the biology of sandeels in the North Sea and applies all relevant data time-series. A new recruitment index was introduced. Seasonal and spatial patterns in log-book based catch rates of age-1 fish were analysed and compared to recruitment indices from the year before. Spatial differences in local larval retention strength were found. A genetic tool that allowed us to distinguish between different sandeel species in a quick and accurate way was developed. Lastly, development of a state based assessment model that can handle seasonal data (something which is necessary for sandeel) and estimate shifting selection patterns was initiated. All of this work is currently contributing significantly to the preparation of the coming North Sea sandeel benchmark assessment in ICES to be held in the fall of 2016. This project was coordinated bu DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
Sir Alister Hardy Foundation for Ocean Science
Centre for Environment Fisheries and Aquaculture Science
Period: 22/07/2013 → 01/05/2015
Number of participants: 6
Research areas: Marine Living Resources & Population Genetics
Project participant:
Mosegaard, Henrik (Intern)
Azour, Farivar (Intern)
Christensen, Asbjørn (Intern)
Bekkevold, Dorte (Intern)
Project Manager, academic:
Worsøe Clausen, Lotte (Intern)
Project Coordinator:
von Deurs, Mikael (Intern)

Optimal sustainable use of cod stocks accessible for Danish fisheries (DEL-TORSK) (39147)
Optimal sustainable utilization of cod stocks that contain several biological sub-populations requires taking population structure into account in stock assessment and management. The aim of this project was to develop scientific basis for cod management decisions in the North Sea and the Baltic that takes biological units of cod and their dynamics into account.

Methodological challenges concerning advising on stocks that contain sub-populations with differences in dynamics and biological parameters are common for North Sea and the Baltic. Therefore, the project considered both seas, in terms of developing methodological basis for addressing population structure in management advice. The results were presented at ICES benchmarks for North Sea and Baltic Sea cod in 2015, and used to developing further the management basis for optimal use of cod stocks.

The project included mapping of distribution of sub-populations using genetic analyses and modelling of transport of early life stages. These results were combined with existing knowledge on cod population structure both in the Baltic and North Sea, to identify distribution areas of sub populations. This information was then incorporated in area-specific stock assessment analyses.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 17/07/2013 → 30/04/2015
Number of participants: 8
Research areas: Ecosystem based Marine Management & Marine Populations and Ecosystem Dynamics & Population Genetics & Fish Biology & Marine Living Resources & Fisheries Management
Seal-inflicted damages to Danish fisheries (39143)
In recent years, there has been an increasing conflict between commercial fisheries and the increasing seal populations. Direct damages in the form of reduced or damaged catch is frequently seen in fishing with set gillnets, poundnets and hooks/lines. Fishermen have proposed that the diminishing fish stocks are a result of increased predation from seals. The problems appear to be most widespread in the small-scale coastal fisheries, which there is a political will to preserve, but basic information about the scale of the problem is lacking.

The present project aimed to remedy this situation by collecting information on the scale of the seal-inflicted damages to Danish commercial fisheries and assessing the economic consequences of the damages.

The project focused on the following areas:
- Seal populations in Danish waters – distribution, size, behaviour and feeding preferences (WP 1)
- Damage to catch and fishing gears inflicted by seals (WP 2, 3 and 4)
- Potential mitigation measures (WP 5).

The project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
Krog Consult ApS

Organic line mussels – Securing availability for the consumers (ØKOMUS) (39155)
The project objectives was to establish and develop an economically sustainable market for organic line mussels in Denmark by support and development of relevant channels of distribution to secure availability of Danish organic mussels for the consumers.

The project was coordinated by Danish Aquaculture Association.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Association
Danish Mussel Farmers
Period: 01/07/2013 → 31/05/2015
Number of participants: 1
Research area: Aquaculture & Shellfish and Seaweed
Linking the optical properties of DOM to its characteristics and origins (LOCO) (39110)
The majority of organic carbon in the ocean exists as dissolved organic matter (DOM). A fraction of DOM absorbs ultraviolet (UV) and visible light, while a specific subset of this subsequently exhibits a natural fluorescence. These spectroscopic properties can be used as markers for the turnover of different DOM fractions in the ocean.

This project will link the UV-visible characteristics (optical properties) of DOM to its chemical structure. The results will lead to the capacity for widespread proxy measurements of DOM chemical properties estimated from its optical properties, and the ability to trace the production of both new “reactive” DOM and the humification processes that lead to the production of the bio-refractory DOM pool.

An international team of scientists from Denmark, Norway, Sweden, Germany and USA will collaborate to forge links (calibrate) between the optical properties of DOM to its chemical characteristics which will pave the way for new insights into the fate of terrestrial DOM in marine environments and the role of DOM in the global carbon cycle.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Council for Independent Research.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Lund University
Norwegian Polar Institute
Alfred-Wegener-Institut für Polar-und Meeresforschung
North Carolina State University

The early life of the European eel in the ichthyoplankton community of the Sargasso Sea

National Institute of Aquatic Resources
Period: 01/06/2013 → 01/12/2016
Number of participants: 6
Phd Student:
Ayala, Daniel Jiro (Intern)
Supervisor:
Riemann, Lasse (Ekstern)
Main Supervisor:
Munk, Peter (Intern)
Examiner:
Eg Nielsen, Einar (Intern)
Grønkjær, Peter (Ekstern)
Miller, Michael J. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Gillnet fishing in Natura 2000 areas – Porpoises and stone reefs (39125)
The aim of the project was to determine the effects of gillnet fishing in Danish Natura 2000 areas, specifically the effects on harbour porpoises and on the hard bottom’s flora and fauna.
The project included 3 sub-projects and 9 work packages aimed at:
- documenting the extent of gillnet fishing in selected Natura 2000 areas;
- evaluate the effects of gillnet fishing on porpoises in these Natura 2000 areas;
- evaluate the effects of management initiatives on the gillnet fishing in these areas;
- assess the effects of gillnet fishing on the stone reef's flora and fauna in these Natura 2000 areas.

The methods employed were a combination of literature reviews, documentation of fishing activities and conduction of field experiments. The results of the project will contribute to a better knowledge base on the effects of gillnet fishing and should lead to an improved management of gillnet fishing in Natura 2000 areas, based on facts instead of assumptions and anecdotal evidence.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 15/04/2013 → 31/05/2015
Number of participants: 4
Research areas: Ecosystem based Marine Management & Coastal Ecology
Project participant:
Serensen, Thomas Kirk (Intern)
Christoffersen, Mads (Intern)
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Manager, academic:
Larsen, Finn (Intern)

Optimized sludge hydrolysis and improved nitrogen removal through denitrification

National Institute of Aquatic Resources
Period: 15/04/2013 → 15/03/2017
Number of participants: 7
Phd Student:
Letelier-Gordo, Carlos Octavio (Intern)
Supervisor:
Dalsgaard, Anne Johanne Tang (Intern)
Main Supervisor:
Pedersen, Per Bovbjerg (Intern)
Examiner:
Lund, Ivar (Intern)
Lund, Ivar (Intern)
van Rijn, Jaap (Ekstern)
van Rijn, Jaap (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

New approaches and methods to improve the removal of dissolved nutrients in aquaculture

National Institute of Aquatic Resources
Period: 01/04/2013 → 30/06/2016
Number of participants: 6
Phd Student:
von Ahnen, Mathis (Intern)
Supervisor:
Pedersen, Per Bovbjerg (Intern)
Main Supervisor:
Dalsgaard, Anne Johanne Tang (Intern)
Behaviour and feeding biology of lacustrine fish species in relation to lake type

National Institute of Aquatic Resources
Period: 01/03/2013 → 18/04/2018
Number of participants: 6
Phd Student:
Hansen, Joan Holst (Intern)
Supervisor:
Brodersen, Jakob (Ekstern)
Main Supervisor:
Skov, Christian (Intern)
Examiner:
Berg, Søren (Intern)
Olin, Mikko Johannes (Ekstern)
Rosten, Carolyn (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

ECSafeSEAFOOD. Priority environmental contaminants in seafood: safety assessment, impact and public perception

Seafood has been recognised as a high-quality, healthy and safe food type and is one of the most important food commodities consumed worldwide. However, seafood, like other types of food, can also be a source of harmful environmental contaminants with potential to impact on human health.

ECsafeSEAFOOD will assess food safety issues related to priority contaminants present in seafood as a result of environmental contamination (including those originating from harmful algal blooms and those associated with marine litter) and evaluate their impact on public health. ECsafeSEAFOOD will provide scientific evidence to serve as a basis for further development of common food safety, public health and environmental policies and measures, by seeking to establish a quantitative link between the contamination of the marine environment and that of seafood.

www.ecsafeseafood.eu

National Food Institute
Division of Food Chemistry
National Institute of Aquatic Resources
Section for Aquaculture
Period: 15/02/2013 → 15/02/2017
Number of participants: 4
Acronym: ECsafeSEAFOOD
Project ID: 31180
Project participant:
Granby, Kit (Intern)
Sloth, Jens Jørgen (Intern)
Larsen, Bodil Katrine (Intern)
Rasmussen, Rie Romme (Intern)

Relations
Activities:
Arsenic compounds in foodstuffs --recent developments in speciation analysis and food safety assessment
Seafood has been recognized as a high-quality, healthy and safe food type and is one of the most important food commodities consumed worldwide. However, seafood, like other types of food, can also be a source of harmful environmental contaminants with potential to impact on human health.

The research objectives of ECsafeSEAFOOD have been formulated from the research questions addressed in the specific objectives of the European research programme topic on building a Knowledge-Based Bio-Economy (KBBE.2012.2.4-01: Contaminants in seafood and their impact on public health (The Ocean of Tomorrow)). This topic aims to assess food safety issues related to priority contaminants present in seafood as a result of environmental contamination, including those originating from harmful algal blooms and those associated with marine litter and evaluate their impact on public health. ECsafeSEAFOOD will provide scientific evidence to serve as a basis for further development of common food safety, public health and environmental policies and measures, by seeking to establish a quantitative link between the contamination of the marine environment and that of seafood.

The specific objectives of the ECsafeSEAFOOD project include:
- Monitor the presence of priority environmental contaminants in the environment and seafood and prioritise those that are real hazards for human health.
- Quantify the transfer of relevant priority environmental contaminants between the environment and seafood, taking into account the effect of climate change.
- Study the effect of processing/cooking on the behaviour of priority contaminants in seafood.
- Understand the public health impacts of these chemical hazards, through toxicological characterisation in realistic conditions.
- Perform risk assessment to measure the potential impact of seafood contaminants on public health, using in-depth probabilistic exposure tools.
- Develop mitigation measures for risk managers, such as an online tool for different stakeholders, guidelines, phycoremediation (the use of algae to remove pollutants) and processing.
- Develop, validate and provide new, easy and fast tools to assess the presence of environmental contaminants in seafood.
- Confirm/refine the European Maximum Reference Levels in seafood for contaminants that are real hazards and for which no legislation exists or information is still insufficient.

DTU Aqua participates in the project by performing feeding trials using contaminated feed for Atlantic salmon and seabass respectively. Furthermore, the project also investigates potential effects of microplastic incorporated into feed pellets, on accumulation and elimination of the selected priority contaminants. The feeding trials consist of a 12 week to 15 week accumulation period for seabass and salmon respectively and a 8 week depuration period where all groups are fed control feed. The results obtained from the trail will be the used to develop mathematical models estimating accumulation and elimination of priority contaminants in filet.

The project is coordinated by Portuguese Institute of Sea and Atmosphere (IPMA), Portugal.

This project is funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Aquaculture
National Food Institute
Portuguese Institute for the Sea and Atmosphere
AZTI-Tecnalia
University of Maribor
Ghent University
National Veterinary Institute
Catalan Institute for Water Research
Institute for Agricultural and Fisheries Research
University of Porto
Institute of Research and Technology in Food and Agriculture
Selective and low impact gear for fishing live nephrops (39042)

The Danish nephrops fishery is important with an annual value of the landings of approximately 300m DDK. The quota is high as many nephrops inhabit the inner Danish waters. However, cod is a frequent by-catch which is problematic due to low cod quotas, and resulantly, nephrops quota a rarely fully exploited. Furthermore, nephrops are traditionally fished with bottom trawl which exert high impact on the seabed. The first aim of the project is to solve the cod by-catch issues by using trawling speed as a selective mechanism, which will take advantage of the superior swimming capabilities of cod as compared to nephrops. Lowering the trawling speed will enable cod to escape the trawl while still ensuring nephrops catch. The second aim is to design and implement a new type of trawl doors that do not touch the seabed and highly reduce impact of the sweeps. Besides, materials used for the new trawl will be produced in much lighter and stronger materials than the traditional trawls. Altogether this reduces the drag in the water and fuel consumption considerably.

Trawling at a lower speed lessens the mechanical damage to the nephrops and this enhances their chances of survival. The project will take this one step further by establishing gentle handling routines on board the ships, in addition to appropriate conditions for keeping live animals. Physiological tests will define threshold levels in relation to temperature, light and moist, and characterise the most favourable conditions for further survival. Besides optimising conditions on board the ships this knowledge will be used in relation to temporary storage and to ensure optimal conditions during transport of live nephrops to southern Europe. The final aim of the project is thus to establish an export chain of live nephrops to markets in southern Europe. This can provide the fishermen up to three times the price as compared to when landing nephrops on ice, and the price that the Danish export companies’ gain will likewise increase.

Within the project we successfully developed and tested pelagic doors for use in the nephrops fishery, showing that it is indeed possible to implement these in this fishery. Using reduced speed as a way to allow escape of round fish from the trawl (i.e reduce catch of these) did however not work as anticipated, and cannot be recommended for future practice. We tested the effects on survival of nephrops of sprinkling with fresh seawater on-board after trawling, light- and air exposure and various temperatures. Of these, air exposure and air temperature (the higher the worse) had the greatest effect on survival and in determining the period it took for nephrops to recover from post trawling and handling stress. Furthermore, a ‘one-tough’ packing system, including optimal conditions for the animals when transported, was successfully developed, tested and implemented, resulting in up to 95% survival of nephrops transported by truck to southern Europe. Finally, a manual with guidelines for optimal practice for fishery and export of live nephrops was made.

The project was coordinated by AquaMind and CATch-Fish.

The project was funded by Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
AquaMind
CATch-Fish
Sustainable technologies to control microalgae in land based saltwater recirculating systems (39032)

Land based salt water recirculating systems is a potential alternative to fish farming in net pens. This purpose of this project was to test different solutions on how to control unwanted microalgae growth thereby addressing a potential challenges associated with land based farming.

A high degree of water reuse and the associated nutrient accumulation may favour growth of microorganisms and thereby deteriorate the biological water quality.

The project included:
- Test of improved mechanical filtration (application of pilot scale protein skimmers on small to medium sized RAS, and application of full scale 4 meter vacuum airlift; an innovative treatment technique tested in full scale RAS)
- Test of chemical water treatment routines using easy degradable disinfectants (Peracetic acid, chloramine-T, hydrogen peroxide) to control and inhibit toxic microalgae,
- Test of electrochemical oxidation disinfection technology to assess the efficacy (radical formation and algicidal effects) of boron doped diamond electrodes.

Numerous batch and pilot scale experiments were made at the section for Aquaculture, Hirtshals. In addition, intensive, diurnal sampling/monitoring and analysis on location was performed on a commercial pike perch RAS facilities facing toxic algae problems.

The project is coordinated by DTU Aqua.

The project was funded by the National Environmental Protection Agency through Programme for Development and Demonstration of Bio-technologies (MUDP).
Pilot certification of freshwater farms and sea cages (Aquaculture Stewardship Council – ASC) (39041)
The project
- developed and tested systems and procedures for ASC certification of trout from Freshwater farms and Sea Cages
- collected and disseminated knowledge and experiences with ASC certification
- aimed at Danish ASC certified trout to be the first on the global market.
The project was coordinated by Danish Aquaculture Organization.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Dansk Akvakultur
Bureau Veritas
Aarhus University
Period: 01/01/2013 → 30/06/2014
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Jokumsen, Alfred (Intern)

Changes in marine resources in Skagerrak and Kattegat 1946-2012 – Catch and revenue in the post war fishery and transformation of the fleet (DIGIFISH) (39103)
The project has compiled catch and economic data from fisheries in Skagerrak and Kattegat since 1946. The aim of the project was to establish a common database for future utilization in the research of development of fisheries and socio-economics in the specific area.
Research institutes from Sweden (Swedish University of Agricultural Sciences), Norway (Oxford Research) and Denmark (DTU Aqua) participated in the project. Data has been extracted from various national statistical databases and logbooks/landing slips from the fishery. The output from the project is a database with landings and economic values of fish landed in Skagerrak and Kattegat, comprising all commercial species and thereby valuable for historic studies of the species and their utilization.
There is a pressure from consumers on the fishing industry to legitimate sustainability in the fisheries, which normally requires assessments and advice consistent with international criteria on sustainability. A prerequisite for such an approach is complete catch data back in time. Therefore, the present project provides important data to base assessments on and to perspective recent fisheries with historic data.
Economic data in the database will enable socio-economic analyses of the different fisheries, including changes on structure of society and fishery.
This project was coordinated by DTU Aqua.
The project was funded by the AG Fisk (Working Group for Fisheries), Nordic Council of Ministers.
National Institute of Aquatic Resources
Arctic Section
Swedish University of Agricultural Sciences
**Marine litter in Nordic waters (MANOFA) (39104)**

"Marine litter in the Nordic waters" was a project funded by The Marine Group (HAV) under The Nordic Council of Ministers in 2013-2014. The main aim of the project was to establish a Nordic forum for collaboration and exchange of knowledge on status for methodologies and available data for marine litter between Nordic experts, environmental managers and stakeholders, due to the common environmental concerns in our shared seas. Among other activities, the project compiled information that can be used as a contribution to facilitate the framing of this environmental problem in a Nordic perspective. Two workshops were held about I) Common knowledge status on marine litter in the Nordic countries, and indicators relevant for EU Marine Strategy Framework Directive (14 November 2013 in Gothenburg, Sweden) and II) Status for monitoring and Future actions (6-7 November 2014 in Oslo, Norway).

The project was coordinated by Aarhus University.

The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Aarhus University

**Marine nanoplankton (39091)**

The project is focusing on two groups of marine nanoflagellates, the loricate choanoflagellates and the weakly calcified coccolithophorids from polar seas.

Choanoflagellates are present in all aquatic environments and contribute a significant share of the heterotrophic nanoflagellate biomass. Recent molecular evidence has documented that the choanoflagellates is a sister group of the animal kingdom, a fact that has further increased the research focus on these organisms. This project will result in a monographic treatment of all loricate taxa described (c. 150) building upon the increasing molecular evidence unveiling relationships among genera and species, and a significantly improved understanding of the principles behind lorica formation.

Coccolithophorids are abundantly present with high species diversity in low latitude oceans. However, a small contingent of taxa has been shown to prevail in polar seas. Contrary to all other coccolithophorid species the polar contingent are all non-photosynthetic forms. Within this project attempts will be made 1) to sequence as many of these forms as possible in order to evaluate their relationship with coccolithophorids at large, and 2) provide hard core evidence from TEM thin sectioning of the lack of a photosynthetic organelle. All genera and species described will in turn be revisited in order to prepare a future reference basis.

The projects is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Optimizing the value of fish caught in the Danish mixed fishery – Improved quality and selectivity as a consequence of gear development (FishValue) (39033)

In the FishValue project (VærdiFisk) the main goal was to increase the biological and economical sustainability of the Danish Mixed fishery by increasing the gear selectivity and improve the quality of whole and processed fish. A horizontally divided codend was developed in the project to separate four fish species from Nephrops (Nephrops norvegicus) in an upper and lower compartment, respectively, to avoid physical contact between fish and animals with hard or spiny body surfaces. Focus was given to design and placement of a grid in the lower compartment to obtain an effective separation. Square meshes of different mesh sizes in the upper and lower compartment were used to investigate if it is possible to customise the selection of fish and Nephrops separately while retaining the most valuable catch. Quality assessments of the catch were performed to measure whether catch from the two compartments increased quality of whole fish and fish fillets, compared with the standard codend in which the catch components were mixed.

Design and placement of a grid in the lower codend gave an effective separation of all the species investigated when compared to the first version of the experimental codend. Catch from the upper compartment showed a significant quality improvement for whole fish, fillets and Nephrops compared to the standard codend. It was possible to customize the selection of fish and Nephrops separately and at the same time retain the most valuable catch using different mesh sizes of square meshes in the upper and lower codend. In fact, the horizontally divided codend had 10% higher catch rate of Nephrops compared to the standard codend. This more efficient fishery gives less fuel consumption per kilogram Nephrops caught, and may, if evaluated over longer time periods, imply less impact on the sea bottom than when fishing with the standard codend.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).  
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
FN-430 Tove Kajgaard
Strandby Net A/S
Clausen & Sonner
Strandby Fiskeeksport
Strandby Fiskeauktion
Fishermen's Collecting Central
Fishermen’s Association of Strandby
Period: 01/01/2013 → 27/05/2014
Number of participants: 3
Research area: Fisheries Technology
Project participant:
Krag, Ludvig Ahm (Intern)
Frandsen, Rikke (Intern)
Project Coordinator:
Karlsen, Junita Diana (Intern)
Project

Stone reefs: Review of the biological and ecological knowledge on stone reefs and their function in temperate areas (Stenrev) (39038)

Boulder reefs have been the subject of extensive mining where a number of reefs have been wholly or partially removed from the marine areas, especially the shallow coastal waters less than 10 m depth. A review on the importance of cold temperate reefs was requested. The review summary highlighted the following. Reefs are known for their high species richness and are biologically very productive. They are home to many fish using reefs for refuge. In particular cavernous reefs with high complexity and many small niches (between and around stones) are characterized by high species richness.
diversity, high productivity and have an important function as a feeding area for many species of fish and marine mammals. There are no quantitative estimates of the impact and effects of reefs for fish stocks in Danish waters. However, the relationship between refuge options and survival was shown for goby, as well as for juvenile cod. Larger cod are attracted to reefs during autumn before they start their spawning migration. Results of the first reef restoration project in Danish waters showed a clear development of both macro-algae and benthic fauna and in fish abundance for fish normally associated with reefs. The many fish had probably attracted porpoises, which are now observed more frequently and for longer periods in the area. The European lobster occurs in salty water (> 25 parts per thousand) at 2-40 m depth around vegetated reefs or rocky ground, and therefore, this habitat is an important habitat for lobster. Of the sessile invertebrates highlighted, mussels were found in several different types of habitats, including reefs and is one of the species that are first to colonize new habitats - such as newly established reefs.

This project was coordinated by DTU Aqua. The project was funded by the Danish Minestry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2013 → 15/02/2013
Number of participants: 5
Research area: Coastal Ecology
Project participant:
Stenberg, Claus (Intern)
Christensen, Helle Torp (Intern)
Wieland, Kai (Intern)
Dinesen, Grete E. (Intern)
Project Coordinator:
Støttrup, Josianne Gatt (Intern)

Assessment of a mixed hake stocks off Namibia
National Institute of Aquatic Resources
Period: 15/12/2012 → 26/09/2017
Number of participants: 8
Phd Student:
Kathena, Johannes N. (Intern)
Supervisor:
Hamukuaya, Hashali (Ekstern)
Jansen, Teunis (Intern)
Nielsen, Anders (Intern)
Main Supervisor:
Thygesen, Uffe Høgsbro (Intern)
Examiner:
Nielsen, J. Rasmus (Intern)
De Oliveira, José (Ekstern)
Kolding, Jeppe (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Pre-feasibility study regarding establishment of hatchery facility for production of juvenile lobsters (Homarus Gammarus) (39035)
Pre-feasibility study to obtain "state of the art" knowledge and to determine the biological as well as physical requirements and economic costs for establishing a lobster hatchery at the North Sea Research Centre for restocking purposes and for public communication.

The project was coordinated by the North Sea Science Park.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
Early Life of Capelin (Mallotus villosus) in West Greenland Waters

National Institute of Aquatic Resources
Period: 01/12/2012 → 01/09/2016
Number of participants: 6
Phd Student:
Malanski, Evandro (Intern)
Supervisor:
Munk, Peter (Intern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)
Examiner:
Neuenfeldt, Stefan (Intern)
Grønkjær, Peter (Ekstern)
Pedersen, Torstein (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Science Without Borders, Brasi
Project: PhD

Reducing bycatch of harbour porpoises – Insight, mitigation and effects (39037)
The main objective of the project was to provide a better basis for management of harbour porpoise by-catch in Danish setnet fisheries by:
- Elucidating the circumstances that leads to by-catch
- Developing and testing by-catch mitigation methods
- Assess the side effects of such mitigation methods

The project included 6 sub-projects organized under three headings:
- Behaviour of harbour porpoises around gillnets
- Reducing by-catch of harbour porpoises
- Effects on harbour porpoises of wide spread use of pingers

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Southern Denmark
Aarhus University
Period: 01/12/2012 → 31/05/2014
Number of participants: 2
Research area: Ecosystem based Marine Management
Phd Student:
**Study on stomach content of fish to support the assessment of good environmental status of marine food webs and the prediction of MSY after stock restoration (Open call for tenders No MARE/2012/02) (39036)**

In support of policies for sustainable management strategies of living marine resources, demands for integrated ecosystem advice are growing and more extensive use of long-term management plans, which are consistent with the ecosystem approach to fisheries management, is anticipated. However, long-term management plan evaluations of fish are particularly sensitive to changes in the proportion of fish removed by natural predators (natural mortality). A prerequisite for estimating this correctly is accurate knowledge of species interactions: Who is eating whom when, where and in which quantity?

Existing stomach content data are currently used in multispecies models using historic stomach content data from before 1995. Since this period, there have been considerable changes in the predator and prey stocks of both the Baltic and the North Sea. Thus, updated information on stomach contents of the essential predators in these two areas is urgently needed.

In order to update and improve the quality and quantity of the available background data for the above mentioned multispecies models and management plans, the aim of this project is to:
- conduct new stomach content analyses of Baltic cod to support our knowledge of the spatial and temporal stability of cod preferences
- conduct new stomach content analyses of Baltic whiting as well as grey gurnard, mackerel and hake collected in the North Sea to support our knowledge of potentially important predators for which the diet is presently poorly known or is expected to have changed significantly since the last sampling efforts
- compile historical data, which are existing in several institutes around the Baltic and North Sea, and convert them from paper or outdated electronic format into the necessary standard format
- incorporate the new as well as all appropriate historical stomach content information into the Baltic and North Sea stomach content databases

The end product will be updated stomach content databases for the Baltic and North Sea, which include all available information up to 2013. In the Baltic, the project will increase the number of stomachs available for modeling by more than 170%. In the North Sea, the project will increase the number of years where data are available for grey gurnard from 2 to 8, for mackerel from 2 to 6 and for hake from 0 to 1, hence substantially increasing the confidence in the temporal stability of the modeling results.

The databases will be made freely available to the scientific community and will form the basis for new estimates of natural mortality and improved long-term management plans in the Baltic and North Sea.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Johann Heinrich von Thünen-Institute
National Marine Fisheries Research Institute
Lund University
Institute of Food Safety, Animal Health and Environment
University of Hamburg
Wageningen IMARES
Cefas

Period: 27/11/2012 → 27/11/2014
Number of participants: 7
Research area: Marine Populations and Ecosystem Dynamics
Project participant:
- Andreasen, Heidi (Intern)
- Neuenfeldt, Stefan (Intern)
- Rindorf, Anna (Intern)
- Storr-Paulsen, Marie (Intern)
Fish index for streams (39024)

One of the (many) Danish shortcomings in fulfillment of the WFD requirements is the lack of a fish-based assessment method for rivers. DTU Aqua and Danish Centre for Environment and Energy (Aarhus University) was asked by the Danish Nature Agency to make basic analyses to enable the development of a national fish index to be used to produce the WFD required water plans. The challenge was to find a method to evaluate the ecological quality of small streams with only very few fish species. Using the extensive DTU Aqua database, a single-metric system was developed and tested. The results showed that the density of 0+ trout and salmon is a well-suited indicator that reflects water quality, physical modifications and connectivity. The method has now been implemented in the legislation and is used in the national water plans alongside the intercalibrated Lithuanian index LZI that is used in larger streams/rivers.

The project was coordinated by the Danish Nature Agency.

The project was funded by the Danish Nature Agency.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology

Danish Nature Agency
Aarhus University
Period: 01/11/2012 → 01/04/2013
Number of participants: 3
Research area: Freshwater Fisheries and Ecology
Project participant:
Pedersen, Stig (Intern)
Nielsen, Jan (Intern)

Project Manager, academic:
Jepsen, Niels (Intern)
Project

Investigation of causes for declines in fish abundance in coastal areas (KYSTFISK-I) (39031)

Danish fishermen complained of drastic declines in coastal fish populations, negatively impacting their fisheries opportunities but the nature and magnitude of the problem was uncertain.

This project aimed to collate information from fishers to map the problem, including which species and geographical areas involved. In total 74 fishers were interviewed and the problem mapped in Støttrup et al. (2014a). The project further aimed to explore existing survey data that could support the observed changes in fish distribution (Støttrup et al. 2014b) and conduct a literature review to explore if similar trends had occurred in neighboring countries and potential causes for the developments had been identified (Dutz et al. in revision).

The project is coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Danish Fishermen's Association
Period: 01/11/2012 → 01/10/2013
Number of participants: 7
Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics
Project participant:
Munk, Peter (Intern)
Dutz, Jörg (Intern)
Stenberg, Claus (Intern)
North Atlantic climate (NACLIM) (38945)
The North Atlantic Ocean is one of the most important drivers for the global ocean circulation and its variability on time scales beyond inter-annual. Global climate variability is to a large extent triggered by changes in the North Atlantic sea surface state. The quality and skill of climate predictions depends crucially on a good knowledge of the northern sea surface temperatures (SST) and sea ice distributions. On a regional scale, these parameters strongly impact on weather and climate in Europe, determining precipitation patterns and strengths, as well as changes in temperature and wind patterns. Knowledge of these factors, and of their development in the years to come, is of paramount importance for society and key economic sectors, which have to base their planning and decisions on robust climate information. NACLIM will contribute to this goal.

DTU Aqua is the leader of work package developing such climate services for marine ecosystems, pioneering the translation of decadal-scale forecasts of the ocean’s physical environment to forecasts of the biological environment.

There are 18 project partners in total. See http://naclim.zmaw.de/Consortium.2126.0.html

The project is coordinated by University of Hamburg, Germany.

The project is funded by EU, Framework Programme 7.

Section for Marine Ecology and Oceanography

National Institute of Aquatic Resources

Section for Oceans and Arctic
Period: 01/11/2012 → 31/01/2017
Number of participants: 3
Research areas: Marine Populations and Ecosystem Dynamics & Oceanography
Project participant:
MacKenzie, Brian (Intern)
Phd Student:
Miesner, Anna Katharina (Intern)
Project Manager, academic:
Payne, Mark (Intern)

Operationalization of trait-based modelling for an ecosystem approach to fisheries

National Institute of Aquatic Resources
Period: 01/11/2012 → 15/12/2015
Number of participants: 6
Phd Student:
Jacobsen, Nis Sand (Intern)
Supervisor:
Gislason, Henrik (Intern)
Main Supervisor:
Andersen, Ken Haste (Intern)
Examiner:
Nielsen, J. Rasmus (Intern)
Jennings, Simon (Ekstern)
Law, Richard (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD
The development of tools for tracing and evaluating the genetic impact of fish from aquaculture (AquaTrace) (38948)

The genetic changes associated with domestication in aquaculture pose an increasing threat to the integrity of native fish gene pools. Consequently, there is a burgeoning need for the development of molecular tools to assess and monitor the genetic impact of escaped or released farmed fish. In addition, exploration of basic links between genetic differences among farmed and wild fish and differences in important life-history traits with fitness consequences are crucial prerequisites for designing biologically informed management strategies.

The project “AquaTrace” will establish an overview of current knowledge on aquaculture breeding, genomic resources and previous research projects for the marine species seabass, sea bream and turbot. The project will apply cutting-edge genomic methods for the development of high-powered, cost-efficient, forensically validated and transferable DNA based tools for identifying and tracing the impact of farmed fish in the wild. Controlled experiments with wild and farmed fish and their hybrids will be conducted with salmon and brown trout as model organisms using advanced “common garden” facilities. These experiments will elucidate the fundamental consequences of introgression by pinpointing and assessing the effects on fitness of specific genomic regions.

Generated insights will form the basis of a risk assessment and management recommendations including suggestions for mitigation and associated costs. This information and the developed molecular tools will be available as open-access support to project participants and external stakeholders including the aquaculture industry. The project is expected to facilitate technology transfer to the aquaculture sector by promoting better tailored breeding practices and traceability throughout production chain. Overall this initiative will support the development of sustainable European aquaculture and provide “Good Environmental Status” in line with the Marine Strategy Framework Directive.

This project involved 21 partners and was coordinated by DTU Aqua.

The project is funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Living Resources
Havforskningsinstitutet
Università degli Studi di Padova
Universidad de Santiago de Compostela
Katholieke Universiteit
TRACE Wildlife Forensics Network Limited
European Commission - Joint Research Center
INRA Institut National de La Recherche Agronomique
Bangor University
Period: 01/11/2012 → 31/10/2016
Number of participants: 5
Research area: Population Genetics
Project participant:
Bekkevold, Dorte (Intern)
Mensberg, Karen-Lise Dons (Intern)
Project Manager, organisational:
Thomsen, Kirsten (Intern)
Phd Student:
Frank-Gopolos, Thomas (Intern)
Project Coordinator:
Eg Nielsen, Einar (Intern)

Salmon Management Plan revision (38944)

The Atlantic salmon is one of a number of species afforded special protection, along with their habitats, under the EU Habitats and Species Directive (Council Directive 92/43/EEC). This Directive provides for the creation of a network of protected sites across the EU known as ‘Natura 2000’, and includes Special Areas of Conservation (SACs) designated for salmon. In Denmark salmon is under the responsibility of the Ministry of the Environment (ME). ME has engaged DTU Aqua to update and revise the latest Danish Management Plan of Salmon (2004).

The project is coordinated by the Ministry of Environment.
Better use of nutrition resources for sustaining aquaculture production in Central Vietnam under climate change condition (SANSIV) (38975)

The main objective of the project is to contribute to the sustainable development of coastal aquaculture in Central Vietnam under climate change condition through better use of available nutrition resources.

ARSINC (Aquaculture Research Sub-Institute for North Central (ARSINC), under Research Institute for Aquaculture) No.1 (RIA1) in Vietnam is the applicant and main responsible while DTU Aqua is the Danish partner. The immediate objectives of this project are:

- Better use of nutrition resources by developing cost-effective formulated feeds for permit (Trachinotus falcatus) and by application of non-feed based and improved integrated aquaculture models as adaptive practices in coping with the impacts of climate change in Central Vietnam.
- Propose and disseminate adapted aquaculture options to farmers, authorities and other stakeholders in response to climate change condition.

The project management and coordination have so far been in good status. Overall the project made appropriate progress toward achievement of the project’s objectives. Reports on analysis of aquaculture system in Central region including Coastal farmer's livelihood and vulnerability to climate change were finalized. The reviews on known environmental effects of traditional diets for fish farming are on their final stage. Workshop on adaptive aquaculture techniques and models in response to climate change condition and proposed policy was organized. These are served for proposing both adaptive aquaculture techniques/models and policies for local authorities. Through training course and study tour adaptive aquaculture techniques/models have been introduced to local farmers and extension workers.

Regarding to development of cost-effective grow-out pellet feed for the selected commercial carnivorous fish species - pompano (Trachinotus falcatus) as case study to replace trash fish in response to global limitation of fish meal and fish oil, all original planned experiments have completed. Additional experiments required for PhD student's study will be carried out and finished within 2016. Experiments/trials on farming techniques for non-feed based species (hard shell clam Meretrix lyrata, macro alage Kappaphycus alvarezii) and integrated multi-tropic (shrimp and seaweed) have completed.

There have been 5 published articles, of which one article was published in an international peer review journal as the result of joint contribution between Vietnamese and Danish scientists.

All 3 MSC students from Aquaculture Research Sub-Institute for North Central (ARSINC-responsible institute) have finished their education through participation in project experiments by the end of 2015. These MSc staff will contribute to building research capacity and sustainability for ARSINC. Addition, one MSc student from Department of Science and Technology, Nghe An province, was also educated through participation in project experiments.

This project was coordinated by Aquaculture Research Sub-Institute for North Central, Research Institute for Aquaculture, Vietnam. The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Aquaculture
Aquaculture Research Sub-Institute for North Central
Aalborg University
Period: 01/10/2012 → 01/10/2015
Number of participants: 3
Research area: Aquaculture
Benthic ecosystem fisheries impact study (BENTHIS) (39021)

There is general concern about the adverse impact of fisheries on benthic ecosystem which may negatively affect the fisheries yield and integrity of the sea bed. In an integrated approach to marine management, there is a need to develop quantitative tools to assess the impact of fisheries on the benthic ecosystem and at the same time collaborate with the fishing industry to develop innovative technologies and new management approaches to reduce the impact on benthic ecosystems. BENTHIS will provide the knowledge to further develop the ecosystem approach to fisheries management as required in the Common Fisheries Policy and the Marine Strategy Framework Directive. It will study the diversity of benthic ecosystem in European waters and the role of benthic species in the ecosystem functioning. Fisheries impacts will be studied on benthic organisms and on the geo-chemistry. The newly acquired knowledge will be synthesized in a number of generic tools that will be combined into a fishing/seabed habitat risk assessment method that will be applied to fisheries in the Baltic, North Sea, Western waters, Mediterranean and Black Sea. Fisheries will be selected with the fishing industry based on the impact on the benthic ecosystem. BENTHIS will integrate fishing industry partners to collaborate in testing the performance of innovative technologies to reduce fishing impact. Finally, in collaboration with the fishing industry and other stakeholders, new management approaches will be developed and tested on their effects on the ecosystem and their socio-economic consequences. As such BENTHIS will substantially improve the scientific basis to integrate the role of marine benthic ecosystems in fisheries management.

The project has 33 partners from 12 countries.
The project is coordinated by Institute for Marine Resources & Ecosystem Studies (IMARES), Wageningen University, The Netherlands.
The project is funded by EU, Framework Programme 7.

Ecological speciation in salmonids: the genomic background for the evolution of eco-morphs (38957)

Speciation is a fundamental evolutionary process continuously creating the diversity of life. Salmonid fishes have fascinated scientists for centuries due to their iconic and diverse set of habitats and eco-morphs. In addition, the salmonid lineage underwent two whole-genome duplication events that provided an enormous DNA template to support adaptive radiation and speciation. These assets make salmonids excellent model species for studying fundamental issues relating to adaptation and speciation in the wild.

This project took advantage of a unique set of replicated samples representing different migratory eco-morphs in two species of salmonids, state-of-the-art genomic techniques and novel statistical methods to
- infer the genomic extent of adaptive divergence between different migratory eco-morphs in salmonid species.
- infer the genomic architecture during the early stages of ecological speciation by comparing different ecomorphs.
- identify footprints of selection at genomic regions of importance for adapting to local environmental conditions.
Knowledge about the mechanisms and conditions required for species to evolve by adapting to new surroundings is of paramount importance for predicting future responses to climatically (or anthropogenically) induced environmental change.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Independent Research.

National Institute of Aquatic Resources
Section for Marine Living Resources
University of Washington
Period: 01/10/2012 → 31/12/2014
Number of participants: 1
Research area: Population Genetics
Project Coordinator:
Limborg, Morten (Intern)

**Development of genetic tools to distinguish Greenland’s cod stocks (38956)**
The goal of this project is to develop genetic tools that can improve the management of Atlantic cod (Gadus morhua) in Greenland by enabling identification of separate population components. Building on results from a previous study that demonstrated pronounced population structure among cod inhabiting Greenlandic waters, we will 1) develop cost-effective DNA tests to reveal the population of origin for unknown individuals, 2) apply these tests in concrete case studies relevant for stock assessment and management advise, and 3) develop a user manual for implementing these tests in the management of cod in Greenland.

National Institute of Aquatic Resources
Section for Marine Living Resources
Greenland Institute of Natural Resources
Period: 01/09/2012 → 30/11/2012
Number of participants: 2
Research area: Population Genetics
Project participant:
Egil Nielsen, Einar (Intern)
Project Manager, academic:
Therkildsen, Nina Overgaard (Intern)

**BALTFIMPA generic tool (39001)**
The objective of the BALTFIMPA project (Managing Fisheries in Baltic Marine Protected Areas) was to develop a generic decision making assisting tool to give guidance and advice on impacts of different fishing practices and gear on protected habitats and species in the Baltic Sea. This was based on a comprehensive review of the existing literature. The tool has the form of a matrix of fishing gear types against habitats and species, and includes a generic level, a detailed level and a technical level in addition to a list of the relevant literature. At the generic and detailed levels impacts are scored in traffic light categories (red, yellow, green), whereas the technical level includes summaries of actual impacts.

The project was lead by DTU Aqua.

The project was funded by the Helsinki Commission (HELCOM).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Helsinki Commission - Baltic Marine Environment Protection Commission
Period: 01/08/2012 → 01/04/2013
Number of participants: 5
Research areas: Ecosystem based Marine Management & Coastal Ecology & Fisheries Technology
Project participant:
Sørensen, Thomas Kirk (Intern)
Dolmer, Per (Intern)
Frandsen, Rikke (Intern)
**MISTRA Working Group for Aquaculture Research in Sweden (38977)**

The main task of the Working Group was to provide MISTRA's Board with background information for its upcoming decision on whether the foundation should invest or not in aquaculture research. MISTRA is a Foundation for Strategic Environmental Research.

The Working Group should
- describe current Swedish aquaculture research and perform a state of the art review putting Swedish research in an international context,
- make an overview of Swedish aquaculture industry in a global context,
- briefly compare aquaculture to other food production systems,
- briefly discuss the bottlenecks for Swedish aquaculture development,
- critically analyse the arguments for why MISTRA should invest in aquaculture research (cf. MISTRA’s statutes),
- suggest scope and focus of a new MISTRA research initiative (if recommended).

The project was coordinated by DTU Aqua.

The project was funded by Swedish Environmental Strategic Research Foundation MISTRA.

National Institute of Aquatic Resources
Section for Aquaculture

Finnish Game and Fisheries Research Institute

Institute of Marine Research
Period: 01/08/2012 → 31/03/2013
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Jokumsen, Alfred (Intern)

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**North Sea Mackeral or Mackerel in the North (Sea)?**

National Institute of Aquatic Resources
Period: 01/08/2012 → 21/11/2012
Number of participants: 5
Phd Student:
Jansen, Teunis (Intern)
Main Supervisor:
Gislason, Henrik (Intern)
Examiner:
MacKenzie, Brian (Intern)
Sparholt, Henrik (Ekstern)
Villamor, Begoña (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: §15 Re-enrolment
Project: PhD

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**On the road to 2020 (38984)**

The goal of the project is to combine the present information systems and documentations systems such as traceability, electronic documentation systems, environmental labeling, economic analyzing tools and different communications methods in the fish sector.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
New application of farmed blue mussels: Mussel meal (39089)
The aim of this project was to create knowledge and develop the use of mussels as feed supplement for poultry and pigs.
Specifically, the objective was to optimize the rearing of mussels, optimize the process and examine the biological basis
for the use of mussels as feed supplement for poultry and pigs.

The results show that crude protein content and fatty acid content in mussel meal was at 57% and 15%, whereas the
silage had a content of 17% and 5%. The analyzes showed a high proportion of pure protein and mussel amino acid
composition was close to the values found in fish meal.

Experiments on pigs showed that there was no problem getting the pigs to eat the feed mixes with mussels and the
digestibility of crude protein and amino acids was higher than for the control feed mixture of fish protein. Feed mixed with
mussel silage gave the best digestibility. Overall experiments show that there is a clear potential for mussels as a protein
source especially for pigs.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and Vækstforum Region Nordjylland.
National Institute of Aquatic Resources
Danish Shellfish Centre
Aarhus University

Oyster care in Limfjorden (39120)
The purpose of the project was to develop methods for long-term efforts to support a stable population of oysters (Ostrea
edulis) suitable for the fishery.

The project aimed to determine the real size of the stock of oysters in Nissum Broads by calculating the stock in shallow
water and hence the overall reproductive potential in the area. Knowledge of the population size distribution can also be
used to identify areas with frequent reproduction.

The project tested whether it was possible to collect oysters on collectors placed in the water column. On bottom growth
and survival rates of different types of oysters (oysters collected in the water column, oysters from hatchery and oysters
fished in shallow water) were tested. The end result was a best practices description concerning the best sources of spat.

Estimation of oysters in shallow waters showed that in several areas there was a significant amount of oysters. The study
also showed that in some areas of the fjord especially in shallow water there were many oysters of the invasive pacific
oyster, Crassostrea gigas.

Stock assessment of oysters in shallow water provides a much more detailed picture of the total population of oysters in
the Limfjord.
The collection of oyster spat from the water column is not uniform in different areas and release date of larvae also had some impact on the amount of oysters on the collectors. In some areas collection of pacific oysters is a problem.

Stock enhancement of the European flat oysters in Limfjorden can be done in different ways, but will have to take place over a longer period, it apparent that a stock enhancement in Limfjorden is more difficult than expected. A successful program must involve several parameters, such as:
- Amount of pacific oysters in sub-areas of Limfjorden.
- Areas suitable for relaying of oysters spat
- Best source and size of spat for the area

This project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

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**Analysis of measures for increased stability in the industrial fisheries (39027)**
The objective of the project “Analysis of measures for increased stability in the industrial fisheries” has been to improve fisheries advice to ensure more stable quotas for the three main industrial species in the North Sea; sandeel, sprat and Norway pout. The means to get there was to improve data, calculation procedure and management plans by taking into account the special conditions that exist for each species.

Through an industry-scientist-manager collaboration platform initiatives were taken to a theoretically and practical cooperation, where collection and analysis of biological and fishery-based data and knowledge sharing between fisheries, bio-economy, management and research has supported development of robust management strategies that may increase economic stability in the industry if implemented in the future.

The project is coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
Development of sustainable technologies and modeling tools in aquaculture aiming at increasing overall production (UDTÆNK) (39030)

The project aimed at developing methods and modeling tools that may assist the aquaculture industry in expanding its production while minimizing the environmental impact.

To obtain this, the project included six work packages concerning:
- Increased production of rainbow trout by providing methods for reducing the discharge of nitrogen and organic matter.
- Increased production in net cages by providing academic guidance to social workers on concurrent production of trout and mussels.
- Improved sustainability of the industry by providing guidance on optimal system design with respect to reducing nutrient discharge.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Dansk Akvakultur
Period: 09/07/2012 → 31/05/2015
Number of participants: 6
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Larsen, Bodil Katrine (Intern)
Steenfeldt, Svend Jørgen (Intern)
Phd Student:
von Ahnen, Mathis (Intern)
Letelier-Gordo, Carlos Octavio (Intern)
Project Coordinator:
Dalsgaard, Anne Johanne Tang (Intern)

IT-solutions for environmental control of trout farms (39094)

In the project a IT-solution for direct reporting of environmental performance data from trout farms to the Municipality registration system was developed. Also, calculations of compliance with allowances etc. can be calculated and evaluated regularly by the farmer.

DTU Aqua further developed a discharge prediction model, able to calculate the resulting discharge from a ModelTroutFarm of any given layout and dimensions. This model ("Dambrugsmodellen" i.e. "the Trout Farm Model") is based on the existing Produktionsbidragsmodel ("Waste Production Model") and data and monitoring results from all treatment devices added and incorporated into a prediktive model. Both models are now widely used by the authorities as well as in the industry.

This project was coordinated by the Danish Aquaculture Association.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Association
DHI Denmark
Aarhus University
Trout farms
Long-term management plans for mussel production (39121)
The purpose of this project was to point out areas suitable for blue mussel production – using Vejle Fjord as a study case area – in relation to environmental factors e.g. distribution of eelgrass, macro algae and benthos but also using input from the local municipalities, environmental NGOs, mussel fishermen and other stakeholders like e.g. anglers, sailors, canoeist, kayaker and divers and their use of the sea into account. Based on input from authorities, environmental conditions like e.g. occurrence of eelgrass and concentrations of Chl. a were mapped establishing the basis for optimal location of fishery, relay plots and mussel farming. This was contrasted to local use of the Vejle Fjord and other recreational values. The two sets of information was merged a different areas in the Vejle Fjord were appointed suitable for various forms of mussel production. Furthermore, the project also wanted to inform how each mussel production approach (fishery, long-line farming and on-bottom cultures) is carried out, managed by the authorities as well as the environmental impacts associated to the different mussel production methods in order to create local awareness. During the course of the project, the information campaign changed local perception of mussel production resulting in a new local policy on utilization of the fjord for mussel production.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Danish Shellfish Centre

Traditional trout farms (39095)
Nutrient removal is imperative for Danish fish farms and upcoming requirements for environmental performance though application of BAT (Best Available Technology) cannot be met by traditional fish farms since simple, low-cost technologies does not exist. Removal of dissolved nutrients in low concentrations and large water volumes is especially difficult.

In the project, potential low-cost technologies for removing nitrogen and organic matter were tested and documented. Removal and turn-over of organic matter and nitrogen in biofilters was studied, and the performance of constructed wetlands on traditional farms was also investigated during a full year. In these farms, wetlands efficiently remove particulate matter and associated nutrients (O and P) whereas dissolved matter is almost not removed due to the hydraulic load and short residence time. Depending on the concentrations in the incoming water, requirements for O and P net-removal could be met, whereas a need for simple, low-cost nitrogen removal was clearly demonstrated.

This project was coordinated by the Danish Aquaculture Association.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Association

Commercial trout farms
Period: 05/07/2012 → 01/06/2016
Number of participants: 3
Research area: Aquaculture
Project participant:
von Ahnen, Mathis (Intern)
Pedersen, Per Bovbjerg (Intern)
Project Manager, academic:
Dalsgaard, Anne Johanne Tang (Intern)

MSC certification of the plaice fishery in area IIIa – basic investigations and development of a management model (39025)
A management plan is an important requirement for MSC certification of specific fisheries. However, prior to this project, reliable stock assessments, which are necessary for a management plan for plaice (Pleuronectes platessa) in area IIIa (Kattegat/Skagerrak), had not been available. These problems most likely originated from insufficient knowledge about the geographical distribution of populations as well as the interactions between populations in Kattegat/Skagerrak and neighbouring areas. Through a mapping of the distribution and dynamics of populations, this project aimed at providing the missing data that would ultimately allow for the development of a management plan for the plaice fishery in area IIIa. The work included information from genetics, tagging, otolith based growth estimation, oceanographic modelling and analyses of survey and fisheries data.
Results from the project showed evidence of both local population components in the Kattegat/Skagerrak as well as substantial mixing between North Sea population and these local components, and consequences of lumping or splitting these populations for stock assessment and management were discussed.
The outcomes of the work directly influenced the policy decisions since 2015. Decision was finally made to proceed with the lumping option, thus allowing a quantitative analytical assessment and management advice for the area. However, because of the differences in size between the two populations, there is a risk of depletion of the local Skagerrak population if the fisheries on it increase as a consequence of the increase in the North Sea stock. In terms of management, some mechanisms already exist for reducing the fishing pressure in the Skagerrak if deemed necessary, as plaice in the North Sea and in the Skagerrak are managed by two different Total Allowable Catches (TACs). It has therefore been suggested that routine monitoring of the survey and fisheries patterns would allow detecting any departures from the current situation, i.e. adcoupling of trends in the different areas and the different seasons that could indicate a reduced productivity of the local stock.
In the longer-term, the current progresses on the biological knowledge of the stock in Skagerrak should be sustained. Additional genetic allocation of individual fish to the different populations should be performed to obtain a better quantification of the mixing in different areas and seasons, and the survey coverage should be improved in the Skagerrak.
The project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Marine Living Resources

Danish Fishermen's Association

Danish Fishermen's Producers' Organization
Period: 01/07/2012 → 31/12/2014
Number of participants: 9
Research areas: Population Genetics & Fisheries Management & Marine Living Resources
Project participant:
Christensen, Asbjørn (Intern)
Ulrich, Clara (Intern)
Boje, Jesper (Intern)
Hüssy, Karin (Intern)
Geitner, Kerstin (Intern)
Worsøe Clausen, Lotte (Intern)
Meldrup, Dorte (Intern)
Hansen, Frank Ivan (Intern)
Project Coordinator:
Hansen, Jakob Hemmer (Intern)
**Restoration and management of cod in the Skagerrak/Kattegat (CodS) (38969)**

The project had two main aims:
- To develop plans for ecosystem based and sustainable management of coastal stocks of cod in Skagerrak/Kattegat.
- To develop necessary scientific knowledge needed for a first pilot restoration of a locally extinct stock of cod.

The work in the project was highly multi-disciplinary and included aspects of law, policies and institutional rules, socio economy, genetics, ecology, physiology and behavioural ecology. The work was divided into 10 work packages and one work package responsible for coordination.

The different WPs addressed the following tasks:
- WP1: Genetic mapping of potential donor stocks of cod.
- WP2: Genetic characterization of extinct cod stocks in fjord areas of Skagerrak.
- WP3: Ecological inventory of fjords with and without cod, to establish the effect of local cod stocks on fjord ecosystems.
- WP4: Risk assessment in particular focusing on the risk of contamination of released cod larvae or juveniles that migrate into nearby stocks.
- WP5: Legal and institutional aspects of restoring fjord stocks of fish.
- WP6: Societal costs and values of cod restoration.
- WP7: Establishing production of cod juveniles, for tests of feeding and migration behaviours in relation to individual genotype.
- WP8: Developing a step-by-step plan for starting a pilot restoration, including applications for necessary permissions.
- WP9: Development of suggestions of management plans for existing or restored fjord stocks of cod.
- WP10: Synthesis and final report to stakeholders. (Scientific reports will be submitted for publication in scientific journals, in addition).
- WP11: Coordination, internal and external communication including project meetings.

The main results of the project were:
- Cod was present in very small stocks in fjords in eastern Skagerrak, as found from trawling of fish eggs during spawning period. The eggs found were identified as cod from genetic markers. Thus restoration should wait and instead all possible protection should be applied so that these tiny small groups of local spawning cod can increase in numbers over the years to come.
- Several of the fjords in Skagerrak/Kattegat have cod that genetically is a mix of North Sea cod and Kattegat cod. Some fjords along the Norwegian coast have genetically unique elements in the cod stocks.
- The Kattegat spawning stock should be a very important source for eastern Skagerrak cod populations, according to our oceanographic models.

The project was coordinated by Department of Biological and Environmental Science, University of Gothenburg.

This project was funded by EU, InterReg (regional collaboration).

**Economically sustainable fishery for Nephrops in Skagerrak and Kattegat (ØBJ-FISK) (38865)**

Optimizing the exploitation of the resources of the sea areas Skagerrak and Kattegat is central to promote an economically sustainable development in the region. Norway lobster or Nephrops is one of the economically most important resources for the majority of the commercial fishery in the Kattegat-Skagerrak (KASK)-region where the annual
first value was app. 350 million DKR in 2011. Nephrops are mainly caught in bottom trawls (95 % of the total landings), where other species such as cod and sole constitute part of the by-catch. A minor fishery with creels – partly commercial and partly recreational – takes place along the Swedish and Norwegian coast in areas that are generally inaccessible to the trawlers. Taking into account the majority of the Nephrops landings in the KASK region are sold directly to the local fish processing industry or are sold directly in the local areas, the total socio-economic value is much higher than the first value.

In later years, there has been a shift towards an ecosystem-based management e.g. through the NATURA2000 regulations or the Community Action in the field of Marine Environmental Policy. The consequence of this shift is that the focus is no longer on the state of single species but on the entire marine ecosystem. This has led to regulations aiming at reducing discard of unwanted catch as well as reducing the impact of fishing on vulnerable habitats. Regulations that among other things include a discard ban (implemented for Skagerrak by Norway, Denmark and Sweden in 2013), area closures, reductions in number of days at sea, and minimization of unwanted by-catch, have caused uncertainty in the fishing industry and limits the possibilities of exploiting the resource maximally. To ensure an economically sustainable growth of the Nephrops fishery in the KASK region, an increased collaboration between science and industry is needed as is innovation in the design of low impact fishing gears and a reliable stock assessment.

The project aimed at:
- Establishing a platform where the industry, the science, and the managers could work together to identify the challenges that restrain an optimal exploitation of the Nephrops resource
- Establishing a knowledge based collaboration to identify low impact fishing methods that may lead to future economically sustainable growth in the KASK region
- Improving the biological knowledge on which the stock assessment is based - Increasing the reliability of the stock assessment.

The project was coordinated by DTU Aqua.

The project was funded by EU, InterReg (regional collaboration).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Institute of Marine Research
Lund University
Aalborg University
Danish Fishermen's Association
Period: 01/06/2012 → 31/12/2014
Number of participants: 7
Research area: Fisheries Technology
Project participant:
Madsen, Niels (Intern)
Lundgren, Bo (Intern)
Feekings, Jordan P. (Intern)
Karlsen, Junita Diana (Intern)
Nielsen, Anders (Intern)
Krag, Ludvig Ahm (Intern)
Project Coordinator:
Frandsen, Rikke (Intern)
Project

Sustainable bycatch in Danish fishery - Reasonable management under the landing obligation (39028)
he project facilitated a more robust advice of by-catch species in the Danish fishery in the Skagerrak by suggesting and testing stock assessment approaches for data poor stocks as well as providing guidance for various options to reduce by-catch without limiting the target fishery.

The approach applied in the projects was suggested to be adopted for other areas where the landing obligation potentially can be restrictive for target fisheries (mixed-fish cases). Through thorough exploration of existing data in survey time-series it was possible to provide size-based life-history models to gauge the sensitivity of stocks in relation to fishing pressure.

The models were used to determine relevant biological reference points for the most relevant by-catch species and the resulting assessment and stock status was then compared to the prevailing ICES/RGLIFE classification. Finally, the project suggested upgrading the stocks to a higher and less restrictive ICES category for management purposes where
This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources

Section for Marine Living Resources

Danish Fishermen's Association

Danish AgriFish Agency

Period: 01/06/2012 → 31/01/2014

Number of participants: 5

Research areas: Marine Living Resources & Fisheries Management & Marine Populations and Ecosystem Dynamics

Project participant:

Gislason, Henrik (Intern)

Andersen, Ken Haste (Intern)

Jørgensen, Ole A. (Intern)

Phd Student:

Kokkalis, Alexandros (Intern)

Project Manager, academic:

Worsøe Clausen, Lotte (Intern)

Project

Akvakulturuddannelsen

National Veterinary Institute

Section for Virology

National Institute of Aquatic Resources

Dansk Akvakultur

Danmarks Miljøundersøgelser

University of Copenhagen

Period: 01/05/2012 → 10/06/2014

Number of participants: 1

Project participant:

Boutrup, Torsten Snogdal (Intern)

Project

Reproduction capacity of European eel in captivity: Fecundity, follicular maturation and developmental competence of embryos and larvae

National Institute of Aquatic Resources

Period: 01/05/2012 → 30/09/2017

Number of participants: 7

Phd Student:

da Silva, Filipa (Intern)

Supervisor:

Kjærsvik, Elin (Ekstern)

Støttrup, Josianne Gatt (Intern)

Main Supervisor:

Tomkiewicz, Jonna (Intern)

Examiner:

Hansen, Jakob Hemmer (Intern)

Hamre, Kristin (Ekstern)

Rosenfeld, Hanna (Ekstern)

Financing sources

Source: Internal funding (public)
**Improving larval feeding in aquaculture: feeding behaviour in marine larval fish**

National Institute of Aquatic Resources  
Period: 01/04/2012 → 17/11/2016  
Number of participants: 7  
Phd Student:  
Bruno, Eleonora (Intern)  
Supervisor:  
Hansen, Benni Winding (Ekstern)  
Munk, Peter (Intern)  
Main Supervisor:  
Støttrup, Josianne Gatt (Intern)  
Examiner:  
Nielsen, Torkel Gissel (Intern)  
Geffen, Audrey Jacheline (Ekstern)  
Van der Meeren, Terje (Ekstern)

**Financing sources**  
Source: Internal funding (public)

**PhD in Recirculating Aquaculture Systems**

National Institute of Aquatic Resources  
Period: 01/04/2012 → 02/09/2015  
Number of participants: 5  
Phd Student:  
Fernandes, Paulo (Intern)  
Main Supervisor:  
Pedersen, Per Bovbjerg (Intern)  
Examiner:  
Dalsgaard, Anne Johanne Tang (Intern)  
Brinker, Alexander (Ekstern)  
Leiknes, TorOve (Ekstern)

**Financing sources**  
Source: Internal funding (public)

**Towards Sustainable Management of Marine Benthic Ecosystems in Greenland - in relation to national and international standards**

National Institute of Aquatic Resources  
Period: 01/04/2012 → 31/01/2018  
Number of participants: 6  
Phd Student:  
Jørgensbye, Helle (Intern)  
Supervisor:  
Mosegaard, Henrik (Intern)  
Main Supervisor:  
Stage, Bjarne (Intern)  
Examiner:  
Nielsen, Torkel Gissel (Intern)  
Grehan, Anthony J. (Ekstern)  
Møller, Peter Rask (Ekstern)
**Financing sources**
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

**PhD Scholarship in Physical Oceanography**
National Institute of Aquatic Resources
Period: 15/03/2012 → 30/09/2015
Number of participants: 7
Phd Student:
Rullyanto, Arief (Intern)
Supervisor:
Petersen, Ole Svenstrup (Ekstern)
Sørensen, Jacob Viborg Tornfeldt (Intern)
Main Supervisor:
Visser, Andre (Intern)
Examiner:
Mariani, Patrizio (Intern)
Burchard, Hans (Ekstern)
Sharples, Jonathan (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

**Grey-box methods for size-based estimation of fish stocks**
National Institute of Aquatic Resources
Period: 01/03/2012 → 02/06/2016
Number of participants: 7
Phd Student:
Kokkalis, Alexandros (Intern)
Supervisor:
Nielsen, Anders (Intern)
Thygesen, Uffe Høgsbro (Intern)
Main Supervisor:
Andersen, Ken Haste (Intern)
Examiner:
Mosegaard, Henrik (Intern)
Fernández, Carmen (Ekstern)
O'Brien, Carl Michael (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

**The macroalgae biorefinery - Sustainable production of 3G energy carriers and fish feed from macroalgae (MAB3) (39165)**
MAB3 is a four-year research project promoting biomass resources from the sea, namely algae. The overall goal is to contribute to solving the challenges with food and energy supply and find ways to exploit the sea instead of farm land.

The project aim is to develop new technologies in laboratory and pilot scale that will lead to sustainable growth and subsequent conversion of two brown algae (Saccharina latissima and Laminaria digitata) into three energy carriers - bioethanol, biobutanol and biogas - and a high-protein fish feed supplemented with essential amino acids.
This project was coordinated by DTU Aqua.
The project was funded by the Danish Council for Strategic Research.
**National Institute of Aquatic Resources**

**Danish Shellfish Centre**

**Aarhus University**

**National University of Ireland**

**Technical University of Denmark**

**University of Siena**

**University of Hamburg**

**Aller Aqua A/S**

**Orbicon**

**DONG Energy A/S**

**Vitalys I/S**

DanGrønt Products A/S  
*Period: 01/03/2012 → 29/02/2016*  
*Number of participants: 3*  
*Research areas: Shellfish and seaweed & Coastal Ecology*  
*Project participant:*

- Canal-Vergés, Paula (Intern)
- Tørring, Ditte Bruunshøj (Intern)

**Project Manager, academic:**

- Petersen, Jens Kjerulf (Intern)

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**Trait-based analysis and modelling of fish communities**

**National Institute of Aquatic Resources**

*Period: 01/03/2012 → 01/07/2015*  
*Number of participants: 6*  
*Phd Student:*

- Olsson, Karin (Intern)

*Supervisor:*

- Andersen, Ken Haste (Intern)

*Main Supervisor:*

- Gislason, Henrik (Intern)

*Examiner:*

- Christensen, Asbjørn (Intern)
- Falster, Daniel (Ekstern)
- Jørgensen, Christian (Ekstern)

**Financing sources**

*Source: Internal funding (public)*

*Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet*

*Project: PhD*

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**The Mysterious Lumpfish (Cyclopterus lumpus) (38985)**

*The aim of the project is to exchange the knowledge of the lumpfish resources between the Nordic countries. There is no firm knowledge that can support a sustainable utilization of lumpfish e.g. lumpfish roe. We exchange data of the size and age distribution of the individual fish populations.*

*The project is coordinated by the Institute of Marine Research, Norway.*

**National Institute of Aquatic Resources**
Cruise with RV Dana. North Atlantic-Arctic Ocean Coupling: Deep water overflows and surface water outflow (NAAO) (38928)

This cruise was planned as an essential part of the Danish contribution to oceanographic fieldwork as part of the NAACOS project (2011-2014), funded by the Strategic Research Council.

The main objectives of the cruise were to obtain a comprehensive suite of physical, chemical and biological oceanographic measurements across the East Greenland shelf, extending into the Greenland Sea, and to study the deep-water overflow in the Denmark Strait.

The data collected on this cruise formed the basis of validating and improving circulation and ecological models in the region and developing new approaches to tracing freshwater and organic carbon exported from the Arctic.

The project was funded by the Danish Center for Marine Research.

Efficient and low impact gear in the Danish fishery for industrial species (GUDP Tobis) (38849)

The aim of the project was to ensure the future of the Danish industrial fisheries in the increasing demands for reduced environmental impact. The Danish industrial fisheries amount to around 800 million DKK a year in first value. The industrial fishing for sandeel, was seen threatened by a potential ban against bottom trawling in the main fishing areas at Dogger Bank in the North Sea, due to appointment of a large Natura 2000 area by UK, the Netherlands and Germany were bottom trawl could be considered to affect the conservation status of the sand habitat negatively. In addition profitability was threatened by the high vessel operating cost, considering fuel prices at the time.

The objective was to develop and document a fishing method for industrial fisheries (sandeel, Norway pout and sprat) where the trawl doors don't have bottom contact and where modern materials are used in the gear and for the wire. Thus, compared to traditional gear, an overall energy saving of minimum 30% on each kg fish caught was expected, and also the damages on the benthic fauna was expected to be reduced or eliminated.

The new pelagic gear was constructed according to specifications. It behaved as intended and could easily be operated on Dogger Bank. The new gear consisting of pelagic doors and Dynema equipped trawl has attracted considerable attention among fishers and can be considered a business success. Catch volumes (tons/hour) did not differ between the experimental and standard trawl under parallel fishing. Sandeel behavioral differences could not be identified from sonor and UV-camera recordings, and size and oil content of sandeels was not systematically different between the two gears.
Calibration experiments demonstrated 24% lower fuel consumption in the new trawl. Bottom surveys were carried out annually from 2012 to 2014 in the North-eastern part of Dogger Bank (in the Dutch/NL EEZ) at approximately 35 meters depth. Sediment analyses showed a grain size composition dominated by fine sand mixed with small amounts of gravel, whereas fine particles comprises 1% maximum ideal as a sandeel habitat. Grain size composition was not altered by trawling or time.

Bottom impact with new gear is estimated to be 30% reduced compared to a similar trawl using conventional doors. Based on the side-scan sonar recordings it was not possible to distinguish differences between the two trawl types in sediment depth penetration. The foot prints left by both sandeel trawls in one year were not discernible in subsequent years. Results from the video record analyses showed especially conch and hermit crabs were more abundant soon after trawling compared to before impact. The sediment analyses revealed nearly 100 different invertebrate species many of which lives burrowed or tube building in the sand. Overall diversity did not differ significantly between transects trawled by the two gears and the non-trawled transect. Detailed analyses showed, however, that some species (fragile sea anemones, polychaetes and echinoderms) were less abundant after impact from the conventional trawl compared with the newly-designed trawl and the control transect. A few species were more abundant in the transect trawled by the conventional trawl, including some smaller crustaceans. These results suggest the newly-designed sand eel trawl has a lower impact on benthic fauna than the conventional trawl and we expect the final analyses will support these results.

The project is coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Marine Living Resources
Thyborøn Harbours Fishermen’s Association

Northsea Trawl
Thyborøn TrawlDoor.dk
Period: 01/01/2012 → 05/01/2015
Number of participants: 6
Research areas: Marine Living Resources & Fisheries Management & Observation Technology
Project participant:
Eigaard, Ole Ritzau (Intern)
Dinesen, Grete E. (Intern)
Stage, Bjarne (Intern)
Madsen, Niels (Intern)
Project Manager, organisational:
Pedersen, Eva Maria (Intern)
Project Coordinator:
Mosegaard, Henrik (Intern)

A coast to coast network of protected areas: From the shore to the deep sea (CoCoNet) (38863)
The project targeted design and implementation of marine protected areas, as well as advancement of the scientific basis for optimal design and implementation. The project focused on two pilot studies in the Mediterranean and Black Sea for establishing a network of MPAs.

DTU Aqua participated in developing the scientific basis for optimal design of MPA networks by developing spatial size-based models to describe biodiversity as appropriate scales, as well as habitat connectivity from trait-based modelling, and procedures for analyzing habitat connectivity. DTU Aqua also contributed to governance issues relating to establishment of MPA networks.

The project had 39 partners from the EU and Eastern Europe and Near Asia.

The project was coordinated by Universita del Salento, Italy.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Living Resources
Aqua Fingerprint - Early warning for contamination of drinking water (38966)
The majority of Danish drinking water supplies to some extent have at some point been troubled with periods of decline in water quality. For the majority of instances the contamination event is discovered by the routine microbiological control grab sampling and occurs in conjunction with extreme events, such as intense rain, where contaminated water enters the network as a short pulse with high concentration. For most cases the actual source of the contamination cannot be traced as the event has already passed through the network and this hinders progress in improving the network.

Some events could have been avoided if an early warning system indicating the occurrence of such a pulse was available. This project was focused on developing such an on-line sensor using organic matter fluorescence. Proof of concept was proved and a prototype online sensor was built to prove the feasibility of the technology.

This project was coordinated by Krüger AS, Denmark.

The project was funded by the Danish Environment Agency.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Krüger A/S
TREFOR Vand A/S
Technical University of Denmark

Aquaponics NOMA (Nordic Marine) – New innovations for sustainable aquaculture in the Nordic countries (38987)
A detailed study of the nutritional status of effluents from land-based fish farms as fertilizer for relevant plant species, adapt state-of-the-art technology and compare several aquaponic systems to meet the current and future challenges of both the aquaculture and horticulture industry, to develop commercial Aquaponics in the Nordic countries.

The project was coordinated by Bioforsk Øst, Landvik, Norway.

The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Aquaculture
Norwegian Institute for Agricultural and Environmental Research
Norwegian Institute for Water Research
FB Aqua
Aquaponics AS
Hobas AS
Icelandic Food Research
Assessing and improving the quality of aquatic animal gametes to enhance aquatic resources – The need to harmonize and standardize evolving methodologies and improve transfer from academia to industry (AQUAGAMETE) (39130)

The aim of the AQUAGAMETE COST Action is to reach a consensus on protocols and guidelines (using internationally defined terminology, units of measurement and format of reporting) that permit the use of results in relational databanks for sound and common application in aquaculture research and commerce. There is an urgent need towards a universal scale to assess both the precise state of sexual maturation (for secure broodstock use) and related life history traits (gamete quality assessment, incubation of eggs) in teleost fish and other commercially important invertebrates used in either bioassays or aquaculture.

During the past six years, three international workshops on fish gametes demonstrated a rapid development of methodologies that encompass extensive opportunities for promising use in basic reproductive biology, genetic research, biotechnology and aquaculture practice. All of these can have far-reaching consequences on conservation of endangered species, assessment of anthropogenic and climatic impacts on aquatic species and application in aquaculture, as well as in fisheries management. In particular, it has been recognized that there are many highly diverting details in the practical application of these new methods used by most scientists and laboratories, which can cause highly variable if not contradicting results, even using the same species.

COST action management and scientific activities comprise meetings, congresses and workshops, training schools and short term training mission (STSM) program. The action has funded participation of delegates Jonna Tomkiewicz and Ian A.E. Butts in action management meetings and three AQUAGAMETE conferences, participation of two students in training schools, six short term missions (STSM) of MSC and PhD students performing work at the labs of international collaborators as well as their participation in AQUAGAMETE conferences. Exchange of students and collaboration has resulted in a series of publications enhanced through collaboration as well as enriched learning by students through international networking.

Other partners than DTU Aqua (countries and number of institutes): Austria (1), Belgium (1), Bulgaria (2), Croatia (1), Czech Republic (1), Finland (3), France (3), Macedonia (1), Germany (1), Greece (4), Hungary (1), Israel (2), Italy (2), Netherlands (1), Norway (1), Poland (2), Portugal (1), Serbia (1), Slovenia (2), Spain (10), Sweden (2), Turkey (2), UK (2), International Partner Countries (IPC): Brazil, Japan (1), Singapore, South Africa (1).

AQUAGAMETE is funded by COST, EU (European Cooperation in Science and Technology).

Center for Ocean Life (COOL) - a Villum-Kahn Rasmussen Centre of excellence for the study of life in a changing ocean (38960)

Our goal is to develop a fundamental understanding and predictive capability of marine ecosystems through the use of novel trait-based approaches and models.

The Centre is organized around three main research activities:
- Identification and mechanistic description of the traits and trade-offs required to characterize the main Darwinian missions (feed, survive, reproduce) of the various life forms in the ocean through experimental and theoretical work, as well as analysis of literature data.
- Models: scaling of individual behavior to population and ecosystem dynamics through the development of trait-based models.
- Testing model prediction by comparing to observed trait patterns in the ocean.

The Centre involves biologists, physicists, chemists, and mathematicians and has a very strong training component through the supervision of master students, and about 30 PhD and postdoctoral fellows as well as by offering PhD summer schools and organizing international workshops. The Centre in addition host many visiting students and scientists.

The Centre is lead by DTU Aqua.

The project is funded by the Villum Kahn-Rasmussen Foundation (Velux Foundations) as well as through various national and European fellowship programs (Research Council, H.C. Ørsted Fellowship programme, Marie Curie, Carlsberg Foundation, etc).

National Institute of Aquatic Resources
Centre for Ocean Life
Roskilde University
University of Copenhagen
Massachusetts Institute of Technology
University of Oxford
Michigan State University
University of Bergen
Kiel University
Period: 01/01/2012 → 31/12/2017
Number of participants: 10
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics & Marine Living Resources & Ecosystem based Marine Management
Project participant:
Andersen, Ken Haste (Intern)
Visser, Andre (Intern)
Stedmon, Colin (Intern)
Gislason, Henrik (Intern)
Payne, Mark (Intern)
Thygesen, Uffe Høgsbro (Intern)
MacKenzie, Brian (Intern)
Mariani, Patrizio (Intern)
Nielsen, Torkel Gissel (Intern)
Project Manager, academic:
Kiørboe, Thomas (Intern)

Collaboration between the scientific community and the fishing sector to minimize discards in Baltic cod fisheries (38918)

The main aim of this study was to identify technical solutions, both economically and biologically sustainable, to mitigate the discards of cod in the Baltic Sea cod fishery.

The aim of the project was divided into three main tasks:
- Assessing the present knowledge on discards and causes of discards in the Baltic cod fishery, and exploring the temporal and spatial distribution patterns of discard sensitive size classes of cod and of the fishery effort.
- Identifying technical solutions and suggesting final technical measures to further mitigate discards in the trawl fishery for Baltic Sea cod.
- Evaluating the possible impacts of the proposed technical solutions and technical measures on the stock and on the economy of the fisheries concerned.

These tasks were undertaken through a desktop study, a technical study and an impact study.
In order to engage trawl fishermen in the project, a questionnaire was sent in spring 2012 to active fishermen in Sweden, Denmark, Germany and Poland. The aim was to establish a dialogue with the industry on selectivity, gear selection, discard patterns and management options, and to collect their views, problems and potential solutions to mitigate discards. This questionnaire was the basis for further discussions with the industry during a workshop.

This project was coordinated by Swedish University of Agricultural Sciences.

The project was funded by EU, Calls for proposals/tenders (Mare/2010/11 LOT 1 programme).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Swedish University of Agricultural Sciences
Thünen Institute of Baltic Sea Fisheries

Sea Fisheries Institute
Period: 01/01/2012 → 31/12/2014
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Madsen, Niels (Intern)

Developing competences in the fishing activities of round goby (39071)
The fishermen in the southern part of the island of Zealand have the last years fished large quantity of the invasive fish species round goby (Neogobius melanostomus). When the project started the fishermen lacked the necessary skills to handle these catches and to find buyers of the catch. The majority of the catches were discarded or sold to fishmeal- and fish oil factories. So it was evident that a proper catch handling and reliable sale was needed.

The main results are:
- The nature History Museum of Denmark has mapped the distribution of the round goby and has gained new knowledge of the goby’s biology and behaviour.
- The fishermen have developed new fishing gear, especially as traps. The catch handling has been improved with rapid cooling.
- Small round goby has been found to be of no value as fish for human consumption.
- Silage has proved to be a good method to store the catch, before used as raw material to the feed producers. The only drawback is that the prices paid to the fishermen were too low.
- A manual for proper handling of the catch has been produced.

This project was coordinated by Danish Seafood Association.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Seafood Association
Natural History Museum of Denmark
Gemba Seafood Consulting

Fishermen
Period: 01/01/2012 → 31/12/2014
Number of participants: 1
Research area: Fisheries Management
Project Manager, academic:
Larsen, Erling (Intern)

Harmonised environmental sustainability in the European food and drink chain (SENSE) (38973)
The food and drink industry in Europe, of which 99 % are SMEs, is highly fragmented, and food chains are very complex. Hence, to assess the environmental sustainability of a product there is a need for applying integrated, harmonised and scientifically robust methodologies, together with appropriate communication strategies for making environmental sustainability understandable to the market.
SENSE will deliver a harmonized system for environmental impact assessment of food & drink products. The research will evaluate existing relevant environmental impact assessment methodologies, and consider socio-economical, quality and safety aspects, an approach that has been rare till now, to deliver a new integral system that can be linked to monitoring and traceability data. The concept of harmonized environmental impact assessment system will integrate: (i) (regionalized) data gathering system; (ii) matrix of key environmental performance indicators; (iii) methodology for environmental impact assessment; and (iv) a certification scheme. The methodology will be transferred to food & drink sectors and stakeholders of the food supply chain by means of specific communications strategies.

SENSE will validate the new harmonized system in the juice, meat & dairy and aquaculture chains. The methodology and the associated software will be modular allowing its implementation for any food product. In addition, it will be economically viable and acceptable for the consumers, food industry and relevant stakeholders of the food and drink chain.

These tools will allow food companies to set realistic environmental sustainability goals and to improve their competitiveness towards a more sustainable production culture for all levels of the production process. The sustainability information collected along the production cycle of any food stuff and reflected into the EID (Environmental Identification Document) will be accessible by the EID-Communication Platform, contributing to make the environmental sustainability part of the usual purchasing behavior of consumers and provide a competitive advantage to those products (and companies) which choose to use the developed concept.

External partners are five universities and public research institutions, four national and European organizations and eleven private companies.

The project is coordinated by Marine and Food Technological Centre (AZTI), Spain.
The project is funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management
Period: 01/01/2012 → 31/12/2014
Number of participants: 1
Research area: Fisheries Management
Project Manager, organisational:
Larsen, Erling (Intern)
Project

How Danish fisheries can exploit the CFP discard ban – An elucidation (39075)
European fisheries should ultimately operate without discards. This is clearly expressed by both the European Union and the most important fishery nations outside the Union in Europe. This is in accordance with the overall intention to reduce the ecological impact through changing production and consumption patterns. The most important tool introduced by the Union is the Landing Obligation (LO). The new Common Fisheries Policy (CFP) will move towards a gradual elimination of discards on a case-by-case basis (EC, 2013). This policy is fully implemented in 2019. To be in due time, before the implementation of the LO, a project trying to describe the consequence of this new policy, was done in the years 2012 to 2014. The state of the art of knowledge of discard and the future use of this fraction that will be landed have been evaluated.

The final report suggests that the practical implementation of the LO-principle may take place as a scheme where large scale trials on results based management demonstrate the possible needs of prescriptive regulation in addition to full catch accountability.

The report thoroughly investigates the issues related to a management that can give the fishermen the incentive and tools to comply with full catch accountability it assesses the amounts of discard and offal in Danish fisheries and it points to solutions regarding handling and marketing of the “discard fraction” in the form of fresh raw material or silage solutions.

The report recommended to:
- Evaluate the economy of a silage solution on vessels and in relevant harbours. The evaluation should be made as a commercial venture projects including storage, handling distribution, marketing and economic performance.
- Analyse the values fish under reference sizes if sold for human consumption.
- Establish reliable and cheap methods to quantify species composition in silage.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

AquaMind
Period: 01/01/2012 → 31/12/2014
Number of participants: 2
Research areas: Fisheries Management & Population Genetics
Project participant:
Eg Nielsen, Einar (Intern)
Project Coordinator:
Larsen, Erling (Intern)

**Macroalgae - Technical support for new principles of management in mussel fishery (39090)**
The main purpose of the study was to provide knowledge on key ecosystem components, with special emphasis on macroalgae in Natura 2000 areas in Limfjorden in order to improve the scientific basis for management of shellfish fisheries. In addition, effects of closing areas for shellfish fisheries on benthic vegetation were studied by comparing coverage of macroalgae and eelgrass in two adjacent areas, one of them having been protected from fisheries for the last 20 years.

Primary method was monitoring through video surveys to create a description of seabed composition, existing habitats and coverage of macroalgae and eelgrass. Approximately 800 recordings were performed covering 5 broads in Limfjorden.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources

Danish Shellfish Centre
Period: 01/01/2012 → 31/01/2015
Number of participants: 2
Research area: Coastal Ecology & Shellfish and Seaweed
Project Manager, academic:
Canal-Vergés, Paula (Intern)
Project Coordinator:
Petersen, Jens Kjerulf (Intern)

**Maximizing yield of fisheries while balancing ecosystem, economic and social concerns (MYFISH) (38850)**
The European Common Fisheries Policy has made a commitment to direct management of fish stocks towards achieving Maximum Sustainable Yield (MSY) by 2015 (or no later than 2020 in special cases). Attaining this goal is complicated by lack of common agreement on the interpretation of both ‘sustainability’ and ‘yield’, and because achieving MSY for one stock may affect the possibility of achieving MSY for other stocks and compromise ecological, environmental, economic, or social aims.

The objective of MYFISH was to face these difficulties and provide definitions of MSY variants, evaluations of the effect on ecosystems, economy and social aspects of attaining these variants, their social desirability and an operational framework for their implementation.

This was achieved through cases addressing a range of fisheries in all European regional areas. The cases cover situations ranging from data-poor to the most studied and well-understood marine ecosystems in EU waters. The suggested implementation of MSY builds on the existing ecosystem and fisheries models in the cases, modified to perform the maximization of the relevant yield measure operationally. Social aspects were integrated throughout the project by active involvement of stakeholders in the definition and evaluation of MSY variants. Global experience was engaged through associated partners and communication of results was enhanced through two major events, a dedicated MYFISH/ICES symposium in 2015 and a targeted policy meeting in 2016. More details can be found at www.myfishproject.eu.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2012 → 29/02/2016
Number of participants: 10
Research areas: Ecosystem based Marine Management & Fisheries Management & Marine Living Resources
Project participant:
Ulrich, Clara (Intern)
Eigaard, Ole Ritzau (Intern)
Mortensen, Lars O. (Intern)
Nielsen, J. Rasmus (Intern)
Worsøe Clausen, Lotte (Intern)
Nielsen, Anders (Intern)
van Deurs, Mikael (Intern)
Vinther, Morten (Intern)
Neuenfeldt, Stefan (Intern)
Project Manager, academic:
Rindorf, Anna (Intern)
Project

MyOcean 2 (38862)
The project advanced and coordinated European scientific and technical infrastructure in the European operational oceanography community, for collecting and distributing ocean observations and ocean forecasts, being a continuation of MyOcean. DTU Aqua was reference intermediate user (RIU) in WP3 aimed at integrating MyOcean products into national systems and services and foster downstream exploitation of MyOcean information especially at a regional level.

The project had 61 partners from the EU and was coordinated by Mercator Ocean, France.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Living Resources
Period: 01/01/2012 → 30/09/2014
Number of participants: 2
Research areas: Marine Living Resources & Oceanography
Project participant:
Mariani, Patrizio (Intern)
Project Manager, academic:
Christensen, Asbjørn (Intern)
Project

Net escapement of Antarctic krill in trawls (NEAT) (38919)
The pelagic trawlers involved in the Antarctic krill harvest apply different trawl systems and fishing gear. There were many unknown parameters on which to estimate the catch efficiency of the different trawls that were used.

The aim of the project was to establish morphology based description of the selection process of Antarctic krill in towed fishing gear (FISHSELECT). This knowledge lead to optimizations of trawl designs in the krill fishery and was used to quantify the consequences in terms of catch efficiency, potential escape mortality and catch loss of using different gear designs of different population structures. Such information is valuable both for managers and the industry exploiting the resource. We performed a study including morphology based mathematical modeling (FISHSELECT) of different krill sex and maturity groups, from data acquired through AKES (Antarctic Krill and Ecosystem Studies). The FISHSELECT method has previously been used to describe and predict size selection of fish and crustaceans. The methodology was used to describe and predict size selection of krill in trawl gear. The model was used to predict basic selective characteristics of different netting designs. The results from these calculations were used to quantify the theoretic catch efficiency and escape mortality in different nets and to construct a net configuration with optimal mesh size and shape in order to minimize escape mortality. Finally, we constructed design guides, which described the basis selective properties for krill in different mesh shapes and sizes.

This project was coordinated by DTU Aqua.

The project was funded by the Research Council of Norway.

National Institute of Aquatic Resources
**Operational ecology: Ecosystem forecast products to enhance marine GMES applications (OPEC) (38864)**

The primary goal of OPEC was to improve the quality of operational services for biogeochemical and ecological parameters and hence, improve our ability to project the future status of European marine ecosystems, by delivering a suite of error quantified indicators which describe changes in ecosystem function suitable for implementation in operational centers.

In order to advance our understanding and predictive capacities for the response of marine ecosystems to global change, OPEC employed a combination of numerical simulations, data assimilation of satellite and in situ data, observational strategy evaluation and cross-disciplinary synthesis. The MSFD takes a regional approach to the development of strategies for environmental status, identifying four main regions: NE Atlantic, Baltic, Mediterranean and Black Seas. The MSFD also identifies a number of high level descriptors of environmental status (e.g. biodiversity, commercial fish, eutrophication, food webs, and invasive species) each of which has a defined set of indicators. Using the regional approach as framework we implemented and tested a suite of indicators in each region. These descriptors along with the ECVs provided a framework for the definition of new environmental applications (e.g. habitat for biodiversity, oxygen depletion/eutrophication, fisheries and marine climate change research).

A common set of descriptors with associated GES indicators and ECVs were defined across the four regions, to ensure a commonality of approach and the development of a consistent capacity across Europe. Auditable quality is essential for GMES environmental applications, and OPEC emphasized the assessment of predictability of key indicators. The R&D of the project included development of coupled end to end ecosystem models, where DTU Aqua implemented the coupling between the SMS model for higher trophic levels and HBM-ERGOM for physics and biogeochemistry.

The project had nine partners from the EU and was coordinated by Plymouth Marine Laboratory, UK. The project was funded by EU. Framework Programme 7.

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**Pilot project: Demonstration of possible energy efficiency in a North Sea fishery using the top end technology and having the maximal selectivity and ability to document the activities (38988)**

The aim of the project is to demonstrate how the use of "best ad viable technology" in fishing gear and equipment can increase the earning for the individual fishing vessel.

The project is coordinated by Thyborøn Fiskerforening, Denmark.

National Institute of Aquatic Resources
Public Sector Consultancy
The role of deep convection on the dynamics of the North Atlantic phytoplankton community

National Institute of Aquatic Resources
Period: 01/01/2012 → 01/07/2015
Number of participants: 6
Phd Student:
Lindemann, Christian (Intern)
Supervisor:
Mariani, Patrizio (Intern)
Main Supervisor:
St. John, Michael (Intern)
Examiner:
MacKenzie, Brian (Intern)
Bruggeman, Jorn (Ekstern)
Martin, Adrian Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Fisheries Oceanography of Northern Pelagic Fish Populations

National Institute of Aquatic Resources
Period: 15/12/2011 → 02/09/2015
Number of participants: 6
Phd Student:
Tsoukali, Stavroula (Intern)
Supervisor:
Visser, Andre (Intern)
Main Supervisor:
MacKenzie, Brian (Intern)
Examiner:
Nielsen, Torkel Gissel (Intern)
Folkvord, Arild (Ekstern)
Miller, Thomas J. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Perspective analysis of sustainable aquaculture in the Nordic countries (PABAN) (38986)
A broad description of the status of aquaculture for each of the Nordic countries to form the basis for Nordic perspectives with recommendations to the political government on how to include aquaculture in the picture of obtaining green development, industry development and common synergies and use of comparative benefits. A SWOT analysis was developed for each country/region as basis for the perspectives. The report was presented to the Nordic Ministers of fisheries affairs at the Nordic Ministers annual meeting in Trondheim 2012.
The project was coordinated by SINTEF Fisheries and Aquaculture, Norway.

The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Aquaculture
SINTEF
Finnish Game and Fisheries Research Institute
Icelandic Food Research
Lund University

**Stress coping Styles’ effect on fitness and life history choice in wild salmonids**

National Institute of Aquatic Resources
Period: 01/12/2011 → 02/09/2015
Number of participants: 7
PhD Student:
Larsen, Martin Hage (Intern)

Supervisor:
Höglund, Erik (Intern)
Skov, Christian (Intern)

Main Supervisor:
Aarestrup, Kim (Intern)
Examiner:
Koed, Anders (Intern)
Lucas, Martyn (Ekstern)
Thorstad, Eva (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

**Comparative growth and feeding ecology between whiting (Merlangius merlangus) in the Baltic Sea and the North Sea**

National Institute of Aquatic Resources
Period: 01/11/2011 → 21/04/2016
Number of participants: 7
PhD Student:
Ross, Stine Dalmann (Intern)

Supervisor:
Andersen, Niels Gerner (Intern)
Gislason, Henrik (Intern)

Main Supervisor:
Nielsen, J. Rasmus (Intern)
Examiner:
MacKenzie, Brian (Intern)
Rijnsdorp, Adriaan D. (Ekstern)
Temming, Axel (Ekstern)

**Financing sources**
Fish welfare aspects of individual variation in cognition, physiology and behavior

National Institute of Aquatic Resources
Period: 01/11/2011 → 01/05/2015
Number of participants: 2
Phd Student: Moltesen, Maria (Intern)
Main Supervisor: Höglund, Erik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Improved farming technology to optimize production, water quality and disease prevention in model trout farms (FOOP) (38950)
The aim of the project was to identify water quality parameters of significance to production traits and disease resistance in rainbow trout; specifically ammonia nitrogen, nitrite nitrogen, carbon dioxide, oxygen and nitrogen gas.

The project further aimed to pinpoint where in the model trout farm changes in water quality occurs. From these findings the project will attempt various rectifying actions to improve water quality. Finally, a series of experiments in collaboration with DTU Vet will clarify the importance of water quality parameters on disease resistance

Examination of operational conditions at a number of different model trout farms showed that supersaturation with nitrogen gases was a chronic problem, and that dissolved CO2 levels were generally 2-3 fold higher than equilibrium conditions. Nitrogen supersaturation did however not occur at levels that negatively influenced production parameters (feed intake, feed conversion, and growth), however, CO2 levels were shown in laboratory experiments to negatively influence production at the observed levels. Ammonia and nitrogen levels were all within safe thresholds as verified by growth studies performed in the laboratory.

Fixed bed and moving bed biofilters each have their advantages and shortcomings. Hydraulic conditions in fixed bed biofilters caused a reduction in N turnover efficiency; however under laboratory conditions (optimal hydraulic conditions) fixed bed biofilters outperform moving bed. In site observations shown that fixed bed biofilters are also more resilient to variations in operational conditions, and are better at removing chemical therapeutants, possibly due to a higher load of organic material within the filter.

Biofilter performance was shown to be sensitive to both dissolved oxygen levels and alkalinity, but not at levels relevant for daily operation.

The project was coordinated by DTU Aqua.

This project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Veterinary Institute
National Institute of Aquatic Resources
Section for Aquaculture
Dansk Akvakultur

Model trout farms
Period: 01/10/2011 → 01/10/2013
Number of participants: 3
Research area: Aquaculture
Project participant: Pedersen, Lars-Flemming (Intern)
Pedersen, Per Bovbjerg (Intern)
Project Coordinator:
Development of a sorting grid for the Danish Norway pout fishery (38954)
The objective of the project was to ensure a sustainable Danish fishery for Norway pout through the development of a sorting grid that minimizes unwanted by-catch.

Through a series of grid designs and tests the project:
- developed a durable and easy-to-handle grid which can sustain the large strains on gear and decks equipment typical of the Norway pout fishery.
- identified an optimal bar spacing for the grid, that reduces by-catch to the extent possible without jeopardizing the rent ability of the fishery through large losses of target species.

As a consequence of the scientific work in the project a sorting grid-system was made mandatory in the Danish trawl fishery for Norway pout to reduce unwanted by-catch (Danish legislation in 2013).

The project was coordinated by Danish Fishermen's Association.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

PhD Scholarship in Marine Ecology and Climate

National Institute of Aquatic Resources
Section for Marine Ecosystem Management
Danish Fishermen's Association
Period: 20/09/2011 – 31/12/2012
Number of participants: 4
Research area: Fisheries Technology
Project participant:
Nielsen, J. Rasmus (Intern)
Hermann, Bent (Ekstern)
Andersen, Helle (Intern)
Project Coordinator:
Eigaard, Ole Ritzau (Intern)
Project
**Supervisor:**
MacKenzie, Brian (Intern)

**Main Supervisor:**
Visser, Andre (Intern)

**Examiner:**
Gislason, Henrik (Intern)
Martin, Adrian Peter (Ekstern)
Subramaniam, Ajit (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

**Historical changes in population distribution and micro-evolution in response to climate variability: Retrospective genomic analysis of archived fish tissue collections**

National Institute of Aquatic Resources

Period: 01/09/2011 → 05/11/2014
Number of participants: 5
Phd Student:
Bonanomi, Sara (Intern)

Main Supervisor:
Eg Nielsen, Einar (Intern)

Examiner:
Bekkevold, Dorte (Intern)
Ogden, Rob (Ekstern)
Olafsdottir, Gudbjorg Asta (Ekstern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

**Eastern-western Baltic cod: Improved management based on stock discrimination of eastern and western Baltic cod (Øst-Vesttorsk) (38989)**

The aim of this project was to improve the management of western Baltic cod by incorporating stock identification routines in order to discriminate between eastern and western Baltic cod stocks.

In recent years evidence from fishery patterns and otolith structures have indicated an increasing degree of mixing between the two cod stocks which until 2013 were managed as two separate stocks. Changes in fishing pressure and patterns would therefore result in a risk for local depletion of the smaller western stock.

Stock identification methods were based on established approaches using genetic discrimination and otolith shape analysis, and improved by linking these methods. This method provides a tool to estimate the degree of stock mixing using the existing otolith archives. This approach documented an increase of eastern Baltic cod from 30% to > 80% in the eastern part of the western Baltic Sea management area. As a consequence of this stock mixing, a new procedure incorporating stock mixing on an annual basis was set in place in, with the aim to improve stock exploitation and reduce the risk of local depletion. The knowledge gained also influenced recent management regulations, particularly a prolongation of spawning closer of the fishery in 2016.

The project was coordinated by Centre for Environment, Fisheries & Aquaculture Science, UK.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Cefas

Period: 27/06/2011 → 29/03/2013
Number of participants: 18
Research areas: Marine Populations and Ecosystem Dynamics & Marine Living Resources & Population Genetics & Fisheries Management
Development of monitoring plans for incidental bycatch of harbour porpoises in inner Danish waters (38869)
Incidental bycatch of harbour porpoises in Danish fisheries has till now primarily been documented by on-board observers or voluntary reporting by fishermen. An observer program in 1992-98 showed bycatch in Danish North Sea fisheries to occur primarily in bottom-set gillnets for turbot, cod, hake and plaice, but a similar program has not been conducted in inner Danish waters and the Baltic Sea.

The objective of the present project is thus to further develop and carry out plans for monitoring of incidental bycatch of harbour porpoises in inner Danish waters by use of CCTV camera systems. Further, to ensure full documentation of smaller gillnet vessels' fishing operations by:
- monitoring all seasons of the major gillnet fisheries;
- providing information on bycatch of harbour porpoises and seabirds by fishery/season/area with a view to develop management plans for Natura2000 areas;
- providing information on discard of cod by gillnet vessels in inner Danish waters.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 16/06/2011 → 28/02/2014
Number of participants: 4
Research area: Ecosystem Based Marine Management
Project participant:
Olesen, Hans Jakob (Intern)
Other:
Rasmussen, Mie Lundsfryd (Intern)
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Manager, academic:
Larsen, Finn (Intern)

Pilot project for the preparation of certification (MSC) of gillnet fishing in the Baltic Sea (38974)
Fishing for some important stocks has been assessed in accordance with Marine Stewardship Council (MSC) principles for sustainable fisheries. All these fisheries have now passed the assessment and are certified, with a single exception: Gillnet fishing in the Baltic. This is due to the lack of evidence for gillnet fishing East of Bornholm not having by-catches of the very small population of harbor porpoises which are found in the Baltic Sea in Ices Subdivision (SD) 24 and East.

There has not been registered by-catch of porpoises in the Danish gillnet fishing East of Bornholm, neither in biological
studies nor by fishermen themselves. But as the Swedish and Polish studies have shown individual by-catches in some
gillnet fisheries and the current estimates of stock size means that the by-catch of even a few individuals can prevent it
from being restored, the MSC considered that it was not sufficiently proven that the Danish gillnet fisheries did not
constitute a threat to the population.

There is therefore a need for documentation of the level of by-catch of harbor porpoises in the Danish gillnet fisheries.

This project is coordinated by Danish Fishermen's Association.

National Institute of Aquatic Resources

Section for Monitoring and Data

Danish Fishermen's Association
Period: 09/06/2011 → 01/05/2015
Number of participants: 6
Research area: Fisheries Management
Project participant:
Larsen, Finn (Intern)
Kindt-Larsen, Lotte (Intern)
Degel, Henrik (Intern)
Rasmussen, Mie Lundsfryd (Intern)
Lundgaard, Louise Scherffenberg (Intern)
Project Manager, academic:
Olesen, Hans Jakob (Intern)

Organic Fry-1: Development of Danish farming of organic trout fry (38951)
Research based advisory for Danish farmers for conversion and management of the first Danish farms for production of
organic fry according to the EU regulation on Organic aquaculture (EC no. 710/2009, article 25e) as well as further
development of the applied and scientific platform for development of organic aquaculture in Denmark.

The project was coordinated by Danish Aquaculture Association.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources

Section for Aquaculture

Danish Aquaculture Association
Producers of Trout Fry
Period: 01/06/2011 → 31/12/2014
Number of participants: 2
Research area: Aquaculture
Project participant:
Pedersen, Lars-Flemming (Intern)
Project Manager, academic:
Jokumsen, Alfred (Intern)

Functional biology of krill in northern marine ecosystems

National Institute of Aquatic Resources
Period: 01/05/2011 → 30/09/2014
Number of participants: 6
Phd Student:
Agersted, Mette Dalgaard (Intern)
Supervisor:
St. John, Michael (Intern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)
Examiner:
Neuenfeldt, Stefan (Intern)
Kaartvedt, Stein (Ekstern)
Schmidt, Katrin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Amino acid uptake patterns in fish fed plant based protein and the effects on protein utilization.
National Institute of Aquatic Resources
Period: 01/04/2011 → 27/08/2014
Number of participants: 7
Phd Student:
Rolland, Marine (Intern)
Supervisor:
Dalsgaard, Anne Johanne Tang (Intern)
Holm, Jørgen (Ekstern)
Main Supervisor:
Skov, Peter Vilhelm (Intern)
Examiner:
Lund, Ivar (Intern)
Espe, Marit (Ekstern)
Skiba-Cassey, Sandrine (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Protozooplankton in Northern Marine Ecosystems
National Institute of Aquatic Resources
Period: 01/03/2011 → 19/12/2014
Number of participants: 6
Phd Student:
Riisgaard, Karen (Intern)
Supervisor:
St. John, Michael (Intern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)
Examiner:
Kiørboe, Thomas (Intern)
Jakobsen, Hans Henrik (Intern)
Stoecker, Diane K. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Externally driven mortality of Eastern Baltic cod early life stages: Impact of predation and hydrography
National Institute of Aquatic Resources
Period: 01/02/2011 → 30/08/2017
Number of participants: 6
Phd Student:
Neumann, Viola (Intern)
Supervisor:
Optical properties of Greenlandic coastal waters: modeling light penetration in a changing climate (38931)
The availability and spectral quality of light are key parameters controlling the productivity of Greenlandic coastal waters. Although solar elevation and sea ice cover play an important role, light is also regulated by water constituents (e.g. organic matter, phytoplankton and suspended sediments). Changing ocean circulation patterns and enhanced glacial melt stand to considerably alter the underwater light environment. This project will develop a 1D model for spectral light attenuation based on field measurements planned in two contrasting fjord systems. Results will provide valuable ground-truth data for remote sensing applications and more accurate description of the light environment for hydrodynamic models.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
Aarhus University
Period: 01/01/2011 → 31/12/2012
Number of participants: 1
Research area: Oceanography
Project Coordinator:
Stedmon, Colin (Intern)
Project

Analysis of historical and contemporary salmon samples in the world’s northernmost salmon population (38835)
The project investigates potential genetic changes in the world’s northernmost population of Atlantic salmon (Salmo salar) from the Kapisillit river in Greenland. The aims are to elucidate whether geographical isolation in concert with overexploitation and habitat degradation has led to loss of genetic diversity and associated loss of evolutionary adaptive potential. By comparing genetic diversity in DNA extracted from historical scale collections from the 1950’s and contemporary samples, migration from other populations, loss of allelic diversity as well as genetically effective population sizes can be estimated. The research will contribute to setting management priorities for this unique and extremely vulnerable Atlantic salmon population.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Greenland Institute of Natural Resources
Period: 01/01/2011 → 31/12/2012
Number of participants: 2
Research area: Population Genetics
Project Manager, academic:
Eg Nielsen, Einar (Intern)
Hansen, Jakob Hemmer (Intern)
Project

Best available technology applicable to traditional pond farms (38811)
As a consequence of environmental concerns – also following the Water Framework Directive legislations – traditional Danish pond farms need to install and operate (affordable) technology to reduce environmental impact from fish farming. In this project the best available technology applicable to traditional Danish flow-through pond farms was assessed and defined. Different technologies were installed/evaluated on selected farms and environmental effects were analysed, evaluated and discussed. Based on the study the best available technology and its applicability and effects on traditional farms was established, and the environmental authorities were supplied with details regarding what can realistically be
done on this type of farms. Nutrients (N & P) as well as organics, the pollutants most immediately relevant to the watercourse in such farms, were considered in the assessment. The project was coordinated by Danish Aquaculture Association, Denmark. The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Organisation
Aarhus University
Period: 01/01/2011 → 01/01/2013
Number of participants: 2
Research area: Aquaculture
Project participant: Dalsgaard, Anne Johanne Tang (Intern)
Project Manager, organisational: Pedersen, Per Bovbjerg (Intern)

**Bottom culture project with relaying of mussel seed collected at Smart Farm System (38796)**

Commercial production of mussels has a number of challenges whose solution requires a focused research and development effort. Requirements for nature conservation, including implementation of Natura 2000 and Water Framework Directives, restrict exploitation of wild populations of mussels in many areas. A reduction of concentrations of nutrients in the inner Danish fjords can over time be expected to reduce fishing of mussels further. A solution to this problem is the development of new area-intensive forms of production, as the cultivation of mussels on longlines or in bottom cultures. Another challenge in the production of mussels is a growing competition from Chilean producers of cooked or frozen mussels. A development strategy for Danish mussel production is an increased focus on the production of high quality mussels for fresh consumption, where competition is restricted to European producers. Important parameters of competition in this market are quality and supply continuity. The overall aim is to optimize a 500 tons production concept, where mussel seed is farmed in the water column on Smart Farm Systems, harvested and laid in bottom culture for future harvesting as mussels for fresh consumption.

The project milestones are:
- To document the optimal harvesting and relay size.
- Study if sizing before relaying in bottom cultures can improve the end-product.
- Documenting the growth and survival of relayed mussel seed as a function of layout density.
- Comparison of growth rates of mussels on longlines and in bottom cultures.
- Establish 3-D model of biological production in the area near the east coast of Jutland, and implement a survey of the best areas for culture bank cultivation.
- Analyze the management and operation of economic prospects for production concept.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Danish Aquaculture Association
DHI Denmark
Danish Shellfish Centre
Period: 01/01/2011 → 31/05/2012
Number of participants: 1
Research areas: Coastal Ecology & Shellfish and seaweed
Project Manager, academic: Dolmer, Per (Intern)

**Catch quota project 2011 (38823)**

The aim of the project is further development and test of Catch Quota Management (CQM) systems in Danish fisheries by the use of electronic monitoring systems. Furthermore, to test whether electronic monitoring – video and sensor recordings – can provide the necessary documentation to support a CQM system. In addition the project will illustrate whether full documentation of catches can support implementation and certification and traceability solutions which requires linkage to project dealing with these issues.
As the Danish Government has worked intensively for the implementation of CQM in the new Common Fisheries Policy (to be implemented from 2013 and onwards) the project should also facilitate international cooperation on European level to set up common standards for CQM data collection, data processing, data exchange and base development.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Public Sector Consultancy
Ministry of Food, Agriculture and Fisheries
Archipelago Marine Research Ltd
Gemba Seafood Consulting
Period: 01/01/2011 → 30/09/2012
Number of participants: 5
Research area: Fisheries Management
Project participant:
Olesen, Hans Jakob (Intern)
Jensen, Reinhardt (Intern)
Kirkegaard, Eskild (Intern)
Håkansson, Kirsten Birch (Intern)
Project Manager, academic:
Dalskov, Jørgen (Intern)

Certification of eel and other minor species (38952)
Implementation of the “Sustainable Eel Standard” (cf. www.sustainableeelgroup.com) for sustainable production of eel in a Danish pioneer eel-farm as well as dissemination of knowledge about eel and assessment of potentials of sustainability certification of other minor species.

The project was coordinated by Danish Aquaculture Association.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Association
Danish Eel Farmers Association
Period: 01/01/2011 → 31/12/2013
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Jokumsen, Alfred (Intern)

Climate change on marine ecosystems and resource economics (NorMER) (38898)
Marine ecosystems are under pressure from both anthropogenic climate change and high exploitation rates. A major challenge to managers and scientists is to identify ways that oceans can provide food and other services in a sustainable way under changing climatic and socioeconomic conditions. As physical, biological and socioeconomic factors interact at several levels, cross-disciplinary approaches are needed to meet this challenge.

This Nordic project has
(1) evaluated climate effects on Nordic marine ecosystems,
(2) build new tools for predicting biological consequences of climate change,
(3) quantified impacts on profit, employment, and harvesting of cod.

This has been achieved through the work of 16 PhDs, 4 postdocs, 1 climate scientist, and the combined expertise of 45 senior scientists located at 10 institutions in 8 Nordic countries.

The project was coordinated by University of Oslo, Norway.
The project was funded by Nordforsk, Nordic Council of Ministers.
National Institute of Aquatic Resources
Centre for Ocean Life
University of Oslo
Stockholm University
Åbo Academy University
University of Helsinki
Swedish Meteorological and Hydrological Institute
University of Iceland
University of the Faroe Islands
Greenland Institute of National Resources

University of Bergen
Period: 01/01/2011 → 31/12/2015
Number of participants: 6
Research areas: Oceanography & Marine Population and Ecosystem Dynamics & Population Genetics
Project participant:
Andersen, Ken Haste (Intern)
Visser, Andre (Intern)
Thygesen, Uffe Høgsbro (Intern)
Eg Nielsen, Einar (Intern)
MacKenzie, Brian (Intern)
Project Manager, academic:
Kiørboe, Thomas (Intern)

Project Design optimization of SELTRA 180 (38908)

After implementation, the industry was concerned that a newly developed selective codend (SELTRA codend) was causing relative large losses of the economically important Nephrops. The aim of the project was to optimize the geometry of a 2-panel and 4-panel version of the SELTRA codend through extensive monitoring of their global geometry in the flume tank in Hirtshals. The global geometry was monitored with optic stereo-system techniques over a gradient of catch weights. The final design was demonstrated in the flume tank for the industry for further discussion. The project delivered detailed design specifications for the Nephrops fishery in Kattegat. Further, the test conducted in the project delivered a detailed understanding of the effect of changing design parameters like panel construction, selvegedes, codend construction (number of panels, meshes in circumference, tension lines during the catch build-up.

The changes in the design is today implemented in the technical legislation in the Kattegat and Skagerrak and there were no problems or difficulties raised by the industry during the commercial take-up process.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Danish Fishermen's Association
Period: 01/01/2011 → 31/12/2012
Number of participants: 5
Research areas: Fisheries Technology & Observation Technology
Project participant:
Herrmann, Bent (Intern)
Madsen, Niels (Intern)
Frandsen, Rikke (Intern)
Lundgren, Bo (Intern)
Project Manager, academic:
Development of ecological sustainable fisheries practices in the Benguela Current Large Marine Ecosystem (EcoFish) (38847)

EcoFish promotes the ecosystem approach to fisheries (EAF) and is conducted in the Benguela Current Large Marine Ecosystem (BCLME), encompassing fish stocks from Angola, Namibia and South Africa.

The objectives are:
1. Adaptation of state-of-art assessments methods and Marine Protected Areas (MPA) planning tools
2. Validation or modification of current assessment practices based on spatially explicit analyses
3. Incorporation of stakeholders' knowledge in data collection and analysis
4. Strengthening of regional capacity to apply the developed assessment tools on a regular basis.

The project represents a paradigm shift compared to DTU Aqua 20 years of FAO/Danida courses in the 80's and 90's, where fish stock assessment was taught in 85 countries by using comparative simple techniques. In contrast EcoFish applies advance stock assessment methodology based on open access, web-based state space (SAM) and geostatistical (GeoPop) tools. Thus the capacity building involved also includes a focus on DTU Aqua because of similar ongoing challenges in the Nordic seas, and two DTU Aqua PhD projects are integrated in EcoFish.

Focus in Ecofish is on hake, horse mackerel and sardinella, coordination to important donor projects in the area such as the Norwegian climate project NansClim and EAF-Nansen is ensured through the leadership of Benguela Current Commission. There are potential synergies to several EU projects (FP6 IMAGE, FP7 MEECE and FP7 FACTS) as well as national projects such as Sunfish (Description of the life cycle and recruitment of cod) and REX/RESOURCE (fishermen-science collaboration on cod in the North Sea). The potential database for BCLME is unique and EcoFish offers the possibility for developing a master example to be used as a generic tool in African Large Marine Ecosystems as well as the large lakes.

The project is coordinated by Benguela Current Commission, Namibia.

The project is funded by EuropeAid.

National Institute of Aquatic Resources
Section for Marine Living Resources
Benguela Current Commission
Institute National Investigacao Pescas
National Marine Information and Research Centre
Marine and Coastal Management
University of Cape Town
University of Stellenbosch
Period: 01/01/2011 → 31/12/2015
Number of participants: 4
Research areas: Marine Living Resources & Marine Population and Ecosystem Dynamics
Project participant:
Wieland, Kai (Intern)
Jansen, Teunis (Intern)
Project Manager, organisational:
Köster, Fritz (Intern)
Project Manager, academic:
Beyer, Jan (Intern)

Documentation of the selective effect of SELTRA 180 in Kattegat (38917)

The cod stock in Kattegat was at a critical low level. A selective SELTRA codend concept was developed to reduce the fishing mortality of cod in the Nephrops directed fishery in Kattegat. A version of the SELTRA design, SELTRA 180 was developed directly for the Kattegat situation and optimized through flume tank tests. The aim of the project was to document the selective effect of SELTRA 180 codend, which was made mandatory in Kattegat in 2011, and to compare it with the standard 90 mm gear used in Kattegat. The SELTRA design was developed to get an efficient selection of cod while retaining Nephrops. Results from an increased commercial onboard monitoring of the catch composition obtained with the SELTRA codends were compared with results obtained from experimental fishing.
The project demonstrated that the 90mm codend with a SELTRA escape panel obtained similar selectivity for cod as a 120 mm standard codend. This documentation led to the implementation of the SELTRA codend in Skagerrak in 2011. The project was coordinated by DTU Aqua. This project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Danish Fishermen's Association
Period: 01/01/2011 → 31/12/2012
Number of participants: 2
Research area: Fisheries Technology
Project participant:
Herrmann, Bent (Intern)
Project Manager, academic:
Krag, Ludvig Ahm (Intern)

Fish welfare aspects of individual variation in cognition, physiology and behaviour (Cope Well) (38813)
The project targeted welfare aspects of individual variability fish. Such differences include both behavioural and physiological traits, which are often clustered in separate stress coping styles. These stress coping styles seem to be coupled to fundamental differences in how information is processed. The aim of this project was to develop methods for separating fish with respect to stress coping styles, and investigate how fish with contrasting stress coping styles differ in cognitive evaluation of challenges. Moreover, the neural mechanism separating fish with contrasting stress coping styles was investigated. The project was part of a large scale collaborative project, funded by the European Commission FP 7 (Cope Well), aiming to establish, evaluate, and further develop, a new scientific framework for the understanding and application of the concept of animal welfare in farmed fish.

The project was coordinated by Havforskningsinstituttet ((IMR), Norway.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Aquaculture
Havforskningsinstituttet
Uni Research AS
Partnership Transnational Consulting Partnership
Instituto Superior de Psicologia Aplicada
University of Stirling
University of Patras
University of Crete
Katholieke Universiteit
NOFIMA
Centro de Ciências do Mar do Algarve
Universidad Autonoma de Barcelona
University of Oslo
Stichting Dienst Landbouwkundig Onderzoek
Uppsala University
IFREMER
Period: 01/01/2011 → 31/12/2015
Number of participants: 2
Research area: Aquaculture
Flatfish nursery grounds (38176)
The aim of the project is to determine what constitutes a good nursery area for specific flatfish in coastal soft bottom areas in the inner Danish waters using a combination of empirical and theoretical approaches. Field studies on juvenile flatfish feeding, growth and condition use both wild and released fish. One approach is to explore different statistical methods to determine potential nursery grounds for different flatfish based on physical parameters such as wave exposure, sediment type and abiotic variables such as temperature, salinity and depth. This research coupled with the development of tools to map different coastal habitats will provide the basis for advice on management of coastal fish nursery areas.

Implementation of PIT-tag technology in coastal marine waters will be developed in order to build up expertise to sample released individuals in different habitats.

The project was coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Organization for Amateur Fishermen
Aarhus University
Period: 01/01/2011 → 31/12/2013
Number of participants: 5
Research areas: Coastal Ecology & Freshwater Fisheries and Ecology & Marine Living Resources

Genetic mapping of Danish trout populations (38828)
The objective of this project is to map the genetic structure of Danish trout populations and to develop genetic tools for use in management of Danish trout populations. This tool will be used for identifying indigenous populations of trout, and to identify causes for maintenance of genetic differentiation between populations. In the longer term we aim to map the geographical distribution of genetic diversity of most Danish trout populations. The genetic database will also be used to establish a molecular testing system allowing the determination of the river origin of individual sea trout, thereby describing migration patterns. This is done by developing genetic stock identification methods specifically targeting sea trout in Danish waters.

A genetic map with more detail (both geographically and genomic) compared to previous genetic studies will become an important tool for conservation and restoration of natural trout. It will be applied for identifying trout populations that are locally adapted or differs genetically from other populations and therefore are particularly important for maintaining genetic diversity. This tool will be used to define management units and assessment of evolutionary potential. A genetic map provides an overview of indigenous populations and conservation units, and will thus have important implications in counselling practical restoration efforts.
The identification of local adaptations of specific populations, and knowledge of whether individual stocks are adapted to life in their particular environment can be applied in identifying causes for maintenance of genetic differentiation between populations, e.g. whether certain populations are genetically adapted to spawn under certain environmental conditions or at certain times.

Individuals from approx. 50 rivers are selected in a manner that ensures a good coverage of Danish trout populations. These are genotyped for 6000 candidate SNPs (Single Nucleotide Polymorphisms) on an Illumina iSelect bead array. The SNP chip is developed in another DTU Aqua project (Living North Sea Project). Results from the 6000 SNPs will be used to identify a subset of SNPs that are particularly well suited to distinguish between Danish trout populations. These SNPs will be used as a genetic tool in the future and it is therefore extremely important to get proper coverage of Danish trout populations in the mapping of the genetic diversity.

The projects was coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Marine Living Resources

Period: 01/01/2011 → ...
Number of participants: 3

Research areas: Population Genetics & Freshwater Fisheries and Ecology

Project participant:
Bekkevold, Dorte (Intern)
Als, Thomas Damm (Intern)
Aarestrup, Kim (Intern)

Project

Handbook for management of lake fish and fisheries (38826 & 39169)

This project has developed a web based handbook in lake fisheries management. The end goal was to provide local anglers and lake managers (which are often not biologists) with knowledge about the biology of focal species as well as a tool box on how to manage these with regards to both environment and fisheries. A central part of the handbook focus on compiling thorough descriptions of species and their ecology, environmental requirements etc. based on existing knowledge from our own research and the literature. Focus is also on a description of different measures that can be used to protect or enhance abundance of specific fish species. The handbook incorporates existing legislation on freshwater fisheries and management as well as a description of angling techniques. In addition we give advice on how anglers specifically and citizens in general can participate in the process, i.e. by practical help or cooperation with the municipalities or other authorities that may be responsible for the lake management.

The handbook covers all types of lake fishery preferences (species, sizes, quantity, etc.), with due consideration to authenticity and environmental conditions. All pages include FAQ’s to answer the most common inquiries, as well as email addresses of the authors of the text which facilitates that users of the handbook easily can interact with the researchers. The lake handbook was published on line in 2013 as an integrated part of the existing homepage www.fiskepleje.dk. It is continuously updated when new knowledge is available, always providing latest knowledge on fisheries management to a broad audience of users.

Lake ecology and fish population dynamics is complex and often very lake specific. Unfortunately knowledge on the environment and fish populations of specific lakes is often scarce or lacking, making fisheries management difficult. A part of the project has focused on how to use citizen science to increase our knowledge. Hence, we explore the use of anglers log book as a method to get knowledge on fish populations and we initiated a nation-wide anglers log book for pc and cellphones (which in 2013 became an independent project expanding from lakes to cover all freshwater and marine habitats). The project also explores the use of citizens reporting on environmental parameters in lakes. We have by now recruited a corpse of citizens (‘Water Environment Agents’) who measure Secchi depths and presence of the invasive zebra mussel in various lakes on a regular basis. We continue recruitment of citizens for this purpose.

Another part of the project has been aimed at establishing a web-based platform, named The Knowledge Base, where citizens and authorities can find knowledge about specific lakes. The cornerstone is a web-library, where close to 1000 reports on lake environment or fish covering the last ca. 75 years can be found in pdf-format. Some reports has never been published before, others has been very hard to find (only paper-versions in The National Library). A large collection (1000+) of historic (1915-1960) photos of Danish lakes and rivers taken by former employees of the department (C. V. Otterstrøm and Knud Larsen) has been digitalized and will be available online in fall 2016. The primary search method is via a GIS-based map. This will be supplemented with a more traditional database search option fall 2016.

The project is coordinated by DTU Aqua.
History of marine animal populations (HMAP) (38156)
The History of Marine Animal Populations (HMAP) is the historical component of the Census of Marine Life program (CoML), which is an international, multi-disciplinary project which will investigate biodiversity in the world’s oceans. HMAP’s long-term aim is to improve our historical understanding of ecosystem change and our ecological understanding of man’s role in changing marine ecosystems.

The long data series and time-specific snapshots of marine ecological conditions that are being generated are being used to provide input to contemporary ecological modelling in order to characterize and visualize variations in past ecosystems. Such visualizations and testing of ecological hypotheses will enhance the disciplines of history and ecology in seeking to explain long-term changes in marine animal populations and their ecosystems, especially those changes resulting from man’s activities.

Some key results from our earlier historical ecology work include reconstructions of extended time series of cod and sprat biomasses in the Baltic Sea which have enabled us to document how the relative importance of different ecosystem drivers (e.g., fishing, hydrographic variability, mammal predation, eutrophication) of biomass dynamics change and interact over time, and how eutrophication has affected forage fish production in the Baltic Sea. Ongoing work is evaluating and documenting the causes of long-term declines of a local herring population in the Baltic Sea and swordfish fisheries in coastal New England, Nova Scotia and Italy. Another key result is a recent consensus article by an ICES expert group on how historical ecology can contribute to fisheries and ecosystem management.

Because HMAP and CoML have ended, DTU Aqua’s work in this area continues with support from other projects and as contributions to new successor fora established in 2013-2015. These include the Oceans Past Initiative, ICES Study Group on the History of Fish and Fisheries and the EU COST program Oceans Past Platform (2015). DTU Aqua’s work will contribute to the development of new management and conservation policies by demonstrating the species compositions, sizes and distributions of animals that lived in the ocean during periods with less human impact than today, and how these biological properties have changed over time.

The project was coordinated by Trinity College, Ireland.

The project was funded by Trinity College, Dublin, Ireland.
One of the issues of the rapidly growing aquaculture sector is to find fish meal substitutes. The main focus has been on plant proteins as a substitute for fish meal in the diet formulation. However, significant incorporation of plant proteins in the fish diet often results in reduced growth and/or impaired feed efficiency. Recent trials performed at our lab have shown that the profile of amino acid uptake (timeline) varies between rainbow trout fed plant-based diet and fish meal diet. This difference in amino acid availability might well influence the protein synthesis and could add to the explanation of reduced performance of fish fed plant-based diets and also the observed increased ammonia excretion.

Following these initial observations made in 2011 the project will perform a series of experiments to further examine how and why amino acid uptake patterns differ. Correlations between amino acid profile in the diet and amino acid in the blood following feeding will be made for different plant protein sources and added crystalline amino acids.

The concomitant effects on liver enzyme activity and protein synthesis will be examined and relevant indicators for protein synthesis (i.e. growth) hopefully determined. Specific digestibility and nitrogen excretion studies as well as traditional growth studies will be performed to support the findings.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Aquaculture
BioMar A/S

Improvement of aquaculture high quality fish fry production (IMPAQ) (38904)
IMPAQ aims at increasing the sustainability of the Danish marine aquaculture farms producing high value fish through the development of large-scale cultures of copepods as start feed for larval fish. Copepods represent an important alternative food to present classical live feed organisms in marine fish hatcheries. Their use is known to improve survival, growth, and development of fish larvae.

The specific aims of DTU Aqua contributions to the project have been (i) to describe copepod behaviors that are mediated through water-borne chemical cues (pheromones, grazing attractants); (ii) to chemically characterize these chemical cues and develop bioassays that can facilitate the identification of water fractions containing active substances; and (iii) to test the quality of developed live feeds in pilot-scale fish larval cultures.

IMPAQ is built on knowledge transfer and direct collaboration between fundamental and applied scientists and private enterprises (SMEs and industries) and has devoted substantial effort into PhD and Postdoc training.

External partners of the project are Roskilde University (coordinator), University of Copenhagen, Aarhus University, universities in France and Taiwan and four Danish private enterprises.

The project is funded by the Danish Council for Strategic Research.

National Institute of Aquatic Resources
Innovative practices and technologies for developing sustainable aquaculture in the Baltic Sea region (AQUABEST) (38924)

In opposition to the global trend, aquaculture production in the Baltic Sea region had stagnated. It is widely accepted that aquaculture had great potential to feed the growing human population in the era of declining wild stocks ("Blue Revolution"), but new production has to be built on sustainable practices and technologies. The European Union has identified this challenge and has adopted aquaculture as a flagship project in the EU strategy for the Baltic Sea region.

Firstly, AQUABEST demonstrated that Baltic Sea region aquaculture was capable of becoming a nutrient neutral food production system. This was assessed to be achieved by replacing oceanic feed ingredients and plant products harvested at other continents with regional feed ingredients. Potential regional ingredients included Baltic Sea fish catches and Baltic Sea grown mussels not used for human consumption, as well as plant proteins and single cell proteins produced and processed in the region.

Secondly, AQUABEST adapted lessons from maritime spatial planning projects, developed them into guidelines and by regional testing demonstrated that spatial planning tools can be adapted to create environmentally, economically and socially sustainable aquaculture. Spatial planning activities were completed by activities that could support farmers to move fish cages offshore and which could support mussel farmers to adapt technologies that tolerated harsh winter conditions in the northern Baltic Sea.

New farming technologies using recirculating water have been developed especially in Denmark. The third solution of AQUABEST was to transfer these technologies to other regions and further develop them to adapt to brackish water conditions of the Baltic Sea. Furthermore, although recirculation farms already released much less nutrients in the effluent than conventional farms, nitrogen release of these farms could be further diminished.

As the final outcome, AQUABEST carried out regional self-evaluation of current environmental regulation models in aquaculture. A novel ecosystem-based regulation needed new approach, environmental policy instruments and economic incentives. Concrete improvements were proposed after dialogue between major stakeholders.

The project was coordinated by Finish Game and Fisheries Research Institute, Finland.

The project was funded by EU, InterReg (regional collaboration).

National Institute of Aquatic Resources
Section for Aquaculture
Finnish Game and Fisheries Research Institute
The Government of Åland
Jämtland County Council
Lund University
Swedish Board of Agriculture
Polish Trout Breeders Association
Institute of Food Safety, Animal Health and Environment
Belarusian State Agricultural Academy
Danish Aquaculture Organisation
Association of Marine Aquaculture Ltd
Johann Heinrich von Thünen-Institute
University of Tartu
University of Helsinki
Period: 01/01/2011 → 31/12/2014
Number of participants: 5
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Suhr, Karin Isabel (Intern)
Dalsgaard, Anne Johanne Tang (Intern)
Pedersen, Lars-Flemming (Intern)
Project Manager, academic:
Jokumsen, Alfred (Intern)

Relations
Activities:
Microparticles in Recirculating Aquaculture Systems
Nitrogen removal in RAS farms for Baltic Sea coastal farming

Integration of European marine research networks of excellence (EUROMARINE) (38903)
EuroMarine seeks to integrate three major European marine FP6 networks of excellence (EUR-OCEANS, MarBEF and Marine Genomics Europe) into one organization, “The EuroMarine Consortium” with a road map for joint programming, creating synergies between different scientific fields, towards a common research strategy and a shared vision for the oceans of tomorrow. EuroMarine will bring together leading European marine scientists to create a major internationally competitive network.

The goal is to exploit the knowledge created within the consortium to address questions related to the functioning of marine ecosystems and the needs of society. This project also wishes to engage the European marine data management and scientific communities in shaping the long-term integration of data, historical, present and future. Moreover, EuroMarine aims to create a 21st century marine scientist, with deep knowledge in one discipline and basic “fluency” in several others, as well as a natural ability and desire to work as part of a team.

The project is coordinated by University of Gothenburg, Sweden.
National Institute of Aquatic Resources
Centre for Ocean Life
University of Gothenburg
Centre of Marine and Environmental Research
Centro de Ciências do Mar do Algarve
Centre National de la Recherche Scientifique
Station Biologique de Roscoff
IFREMER
Centre de Recherche Halieutique Méditerranéenne et Tropicale, Institut de recherche pour le développement
Royal Netherlands Institute for Sea Research - NIOZ
Marine Biological Association of the United Kingdom
Stazione Zoologica Anton Dohrn, Ministero dell'Istruzione dell'Università e della Ricerca
Max Planck Institute
University of Groningen
Ghent University
Flanders Marine Institute
University of Bremen
Environmental & Marine Project Management Agency
Inter- and intralake behaviour and migration of fish (38266)
This project supports the research area fish migration. In many shallow lakes cyprinid fishes like roach (*Rutilus rutilus*) and bream (*Abramis brama*) aggregate in inlet- and outlet streams during winter. Up to 85% the bream and roach may leave the lake and individuals may stay out of the lake for periods up to 7 months during winter. However, there is interannual variation in the part of the population that participates in this so-called partial migration. Since 2005 DTU Aqua has investigated patterns of seasonal migrations of cyprinids in three Danish lakes and thereby, in combination with international collaborators, furthered our knowledge on the behavior of some of the most common fish species in Denmark. This has resulted in numerous publications/reviews about partial migration. By expanding the investigation period to include 2011-2016 we have increased the length of the time series leading to a better understanding of the annual variation in migration patterns. In addition, we included the effects of seasonal preymigration on top predator fitness in the study. Top predators such as pike (*E. lucius*) are important species in recreational fisheries, and in order to optimize fisheries management, it is crucial to understand the biology of these predators. Since the migrating cyprinids are important prey for the pike, and previous results have shown that pike do not follow the prey into the stream, the migration of cyprinids may affect seasonal patterns of predator fitness. Overall, this project increases our knowledge on fish behavior and fish population dynamics in lakes and thereby expands our tool box for management of lacustrine fishes.

During the project period focus has been on three areas (the last two as part of a PhD project with deadline in 2017):

**Mechanisms behind partial migration**
The risk of predation from birds and fish as well as the distribution of feeding resources are two very likely explanatory components in spatial ecology of fish in general and partial migration in specific. DTU Aqua have published several studies and reviews focusing on these as well as other mechanisms involved in partial migration such as body morphology, sex, individual variations in boldness and temperature.

**The influence of cyprinid partial migration on top-predator pike feeding dynamics**
Pike feeding patterns and prey availability in anumber of open and closed lakes are monitored from early fall to late spring. This could reveal that pike in open lakes where prey abundance fluctuate during season require more management attention i.e. due to restricted growth and/or increased cannibalism in periods with low prey abundance.

**Migration between neighboring lakes**
Two of the three focal lakes in which we are monitoring seasonal migrations are situated only 3 km apart and connected by a small stream. So far, it has become obvious that from time to time large amounts of fish move from one lake to another. By continuing to tag and monitor fish migration we are likely to observe more of these mass migration events, which in turn facilitate a better understanding of why and when these mass migrations occur. Clearly, the level of fish exchange between neighboring lakes is an important factor to consider when it comes to management of lakes.
The project is coordinated by DTU Aqua.
The project is funded by the Danish Rod and Net Fishing License Funds.
Key fishers project II (38172)
The aim of this project is to collate data on recreational catches of fish around Denmark’s 7,300 km coastline. The objectives are to collate data on species caught in coastal areas and fjords around Denmark. The project is carried out in close collaboration with the Danish Organization for Amateur Fishermen and the Danish Union of Recreational Fishermen, who facilitate and support contact with up to 95 recreational fishers. This project is an extension of a previous project (2005-2007) and an earlier project “Catch Registration” initiated in 2002. Whereas the first project allowed the fishers to fish as they normally did with whatever gear they normally used and register all their catch, including undersized fish or non-edible fish, the Key Fishers projects had a different approach. In the Key Fishers projects, the fishers use standardized gear unanimously agreed upon and supplied by DTU Aqua. They fish at fixed positions during a particular time period each month. Catch data is sent to DTU Aqua for analysis. Information on temperature is provided by each fisher through a temperature data logger placed at the fishing position. General site information is provided by the fishermen through interviews conducted with each fisher. Further environmental data is obtained from other sources for the multivariate analyses to explore potential causes of change or spatial and temporal variations in CPUE.

Several reports have been produced from the project (Pedersen et al., 2005; Sparrevohn et al., 2009, Støttrup et al. 2012; Kristensen et al. 2014). With ten years of data it is now possible, in collaboration with other Baltic Sea countries, to contribute with data to develop fish indicators for the entire Baltic Sea (Helcom 2015). A first peer-reviewed publication on the method for crowd sourcing and citizen science used here is being developed and data analyses looking at spatio-temporal changes have been initiated.

The project is coordinated by DTU Aqua.

The project is funded by Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Organization for Amateur Fishermen
Danish Union of Recreational Fishermen

Period: 01/01/2011 → 31/12/2016
Number of participants: 1
Research areas: Coastal Ecology & Ecosystem based Marine Management
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)

Local raw materials for production of fish feed for aquaculture (38840)
The aquaculture industry is the fastest growing food production industry in the world and approximately 50 % of all fish consumed by humans comes from aquaculture. The main cost factor in aquaculture is the cost of feed. Furthermore, high amounts of feed ingredients from marine sources have been of concern both environmentally and economically. Thus, it is of importance for the aquaculture industry to aim for the development of new locally-produced, cost-effective, beneficial and eco-friendly ingredients for innovative practical feed production. Food production, not least in the marine sector and aquaculture, is one of the main fundamental industries in the Nordic countries. Wild fisheries have stagnated or even declined and the aquaculture in other continents has been increasing substantially. It is therefore essential for these industries to implement innovative solutions to maintain the competitiveness of the region in this field. New opportunities for sustainable aquaculture production are emerging providing the tools.

The main objectives of the project were to test new local raw materials for aquaculture feed and to implement those into the production chain, with the purpose to:
- Move the Nordic aquaculture industry towards a more competitive and sustainable production with focus on efficient and responsible use of local feed sources.
- Lowering carbon footprint of aquaculture production
- Identify novel fish feed ingredients and optimizing use of marine raw materials
- Create added-value of feed sources like seaweed, microalgae and mussel meal.
- Decrease dependency of fish meal and fish oil as fish feed ingredients
- Establish a user driven diversified “green growth” aquaculture production of high quality fish products.

The specific role of DTU Aqua in the project was to evaluate mussel meal as a protein source in fish feed. For this purpose a series of digestibility and growth trials at different inclusion levels of mussel meal, with fishmeal based diets as reference, were successfully performed. DTU Aqua also examined potential environmental effects (nitrogen excretion) of replacing fishmeal with mussel meal. Furthermore, the trials provided tissue and blood-samples for closer examination of physiological effects of mussel meal on gut epithelia as well as effects on various hormones. The latter was performed by partners from University of Gothenburg.

The project was coordinated by Islensk Matorka ehf, Iceland.
The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Aquaculture
Islensk Matorka ehf
University of Gothenburg
University of Nordland
Period: 01/01/2011 → 31/08/2014
Number of participants: 1
Research area: Aquaculture
Project participant:
Larsen, Bodil Katrine (Intern)

Management and environmental improvement of recirculating aquaculture systems (38815)
The aim of this project was to identify new applicable measures and management strategies to optimize trout production in recirculating aquaculture systems (RAS), in particular the model trout farms. Model trout farms have gained lots of positive attention since their recent launch, as the rearing concept allows increased production, increased water reuse, and decreased nutrient discharge with obvious advantages for the natural fish fauna. Currently, model fish farms have generally experienced a certain fish mortality related to pathogens and suboptimal water quality. Scopes for improvement have been identified in terms of more focus on chemical and (micro-)biological water quality.

The project included four interrelated work packages:
1) Biological filtration (stable, optimal nitrification, nitrite accumulation issues, biofilter kinetics and management)
2) Denitrification: self-contained, operational end-of-pipe solution to reduce N-total from model trout farms
3) Water disinfection and sanitation: evaluation of UV systems disinfection efficacy, resulting water quality and test of easy degradable disinfectants to replace formalin
4) Gas saturation: consequences and effects of N super saturation and total gas pressure on fish performance in RAS.

Each WP addressed specific issues of concern based on current scientific knowledge and practical experience in dialogue with the aquaculture industry. The investigations included bench and pilot scale experiments conducted under controlled conditions at the research facilities at the Section for Aquaculture, DTU Aqua, Hirtshals. The project also included monitoring campaigns and experiments on commercial model trout farms in collaboration with stakeholders.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Organisation
UltraAqua
Model fish farmers
Period: 01/01/2011 → 31/12/2012
Number of participants: 4
Research area: Aquaculture
Contact person:
Pedersen, Per Bovbjerg (Intern)
Project Manager, academic:
Pedersen, Lars-Flemming (Intern)
Suhr, Karin Isabel (Intern)
Skov, Peter Vilhelm (Intern)

Marine behaviour of Atlantic salmon (38825)
The last years of development of the salmon stocks in western Jutland has been a success. This is achieved through specific management focus on removing the constraints identified in freshwater and coastal areas, as well as a modified release practices. One of the major challenges for the continued successful management is knowledge of the salmon's marine life. This is the project's overall objective, to obtain more knowledge about this part of the salmon's life, so as to describe the salmon's marine life. So far it has not been possible to make more specific behavioural studies of Danish
salmon marine life for two reasons. First: there were very few salmon, and second: there has simply not been technology available to get behavioural data from the fish, apart for the very expensive marine expeditions.

Especially with the development of electronic tags, such as data storage tags (DST) and pop-up satellite tags (PSAT) it is now possible. DST tags are passive tags that records information about the fish's environment and store them. Upon retrieval the data can be offloaded to a computer. The tag is labelled providing an address and information about the reward by for return of the tag. A PSAT tag is essentially the same type of tag, but also contains a satellite device that can send the recorded information to the ARGOS satellite system and a release mechanism. At a predetermined time, the tag detaches from the animal and rises to the surface sending stored information to the satellites. These new types of tags allow you to record information about the fish's environment with an unprecedented accuracy and both types of labels have large application possibilities (Neuenfeldt et al. 2009, Aarestrup et al 2009). Currently, the limitation is the size of the transmitters and attachment method. Both types of tags are (still) too big for smolt, so kelts will be the most obvious group of salmon to tag. Another way to examine the salmon's movements in the sea is to investigate the chemical fingerprints of fish's scales (Svendsen et al. 2009). The method is a consequence of the fact that a number of stable compounds from the fish food items are incorporated in the fish scales and otoliths. By analysing the fish's scales or otoliths a "chemical fingerprint" depending on where the fish were and what they have eaten can be obtained. Scale samples will be taken from the tagged salmon and the "chemical fingerprint" from these Danish salmon will be compared with "chemical fingerprint" of scales from other population where salmon has been tagged with PSAT tags.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Freshwater Fisheries Ecology

Norwegian Institute for Nature Research

Aalborg University
Period: 01/01/2011 → 31/12/2015
Number of participants: 1
Research area: Freshwater Fisheries and Ecology
Project Manager, academic:
Aarestrup, Kim (Intern)

Marine habitats and restorations methods (MaHaR) (38817)
Restoration of habitats in marine areas is a new research area. DTU Aqua has in recent years worked to develop and restore biogenic reefs (mussel) (project BioReef), boulder reefs (project BlueReef), habitat complexity (project Vejle Fjord), effects and solutions of coastal areas affected by suction dredging (Project Nørrefjord). The project will compile and review these projects and gather knowledge on how to further develop the concept of area "marine habitat restoration methods". Focus will be on the areas structures and functions as nurseries, refuge and feeding opportunities for fish and shellfish.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Danish Nature Agency

Aarhus University
Local fishermen associations
Period: 01/01/2011 → 31/12/2013
Number of participants: 4
Research area: Coastal Ecology & Danish Shellfish Centre
Project participant:
Poulsen, Louise K. (Intern)
Sætrup, Josianne Gatt (Intern)
Dolmer, Per (Intern)
Project Manager, academic:
Stenberg, Claus (Intern)

Marine model trout farms (38816)
Based on the success with the development and implementation of Danish model trout farms in freshwater, a somewhat similar concept was developed for sea water farming of large trout and potentially also salmon in land-based, recirculating
systems. Design and technology for the recirculation unit as well as for end-of-pipe treatment were developed and tested in 3 consecutive seasons.

During the project, design and operation were optimized and documented. End-of-pipe treatment, especially related to nitrogen removal and sludge hydrolysis were also investigated.

Based on the concept and the results achieved in the major unit in commercial scale at DTU Aqua premises in Hirtshals, it can be concluded that there is potential for such open land-based sea water farming units and that they can be operated commercially sustainable. Major issues related to reducing/preventing (toxic) algal blooms and supersaturation in seawater needs to be addressed before commercial operations should be initiated, though.

The project was coordinated by North Sea Science Park, Denmark.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP) and the partners involved.

National Institute of Aquatic Resources
Section for Aquaculture
North Sea Science Park
BioMar A/S
AquaPri Innovation
Billund Aquaculture Service Aps
RK Plast A/S
Grundfos A/S
Period: 01/01/2011 → 31/12/2015
Number of participants: 4
Research area: Aquaculture
Project participant:
Letelier-Gordo, Carlos Octavio (Intern)
Pedersen, Lars-Flemming (Intern)
Project Manager, academic:
Pedersen, Per Bovbjerg (Intern)
Suhr, Karin Isabel (Intern)

Match and mismatch in the ocean (38897)
Only a very small fraction of the enormous amount of eggs that a fish population spawns survives the larval stage and enters the population as young fish: the majority die as larvae. The synchronicity between the timing of the plankton blooms and the food requirements of larval fish is thought to be one of the most important factors for the survival of larvae. This "match-mismatch" hypothesis will be tested using data from fish populations across the planet and global satellite observations of plankton dynamics. The results will increase our understanding of why fish populations vary throughout time and thereby contribute to their sustainable management.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life

Swiss Federal Institute of Technology
Period: 01/01/2011 → 01/04/2012
Number of participants: 1
Research area: Oceanography
Project Manager, academic:
Payne, Mark (Intern)

Nordic network and conference on aquaculture recirculation technology (NordicRAS) (38842)
DTU Aqua has taken the initiative to establish a Nordic Network on Recirculating Aquaculture Technology (RAS). The idea is motivated by the facts that: (i) the geographical location and species composition requires certain breeding conditions and solutions, and (ii) the Nordic region has an excellent academic and commercial background for initiating such
The purpose of the network is to strengthen Nordic research and research collaboration in RAS and associated water treatment including e.g. application of existing techniques in new setups, resolving potential new research areas, and investigating innovative operation forms that ensure high water quality. We anticipate that the network will become a continuous activity which could result in the establishment of consortiums that perhaps could apply for national and transnational European research funding, exchange of students, development of projects and potential educational programmes, etc.

The network is coordinated by DTU Aqua, and was founded at a steering committee meeting in April 2011 with country representatives from Denmark, Norway, Sweden, Finland and Iceland.

As one of its first activities, the network organises a RAS workshop in Helsinki on October 5-6, 2011. The aim of the workshop is to bring researchers and industrial partners with an interest in RAS together, creating a unique opportunity for exchanging practical experiences and scientific knowledge on the newest developments in RAS. We anticipate that the workshop will become a recurrent event every other year in the country holding the presidency of the Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2011 → …
Number of participants: 2
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Project Manager, academic:
Dalsgaard, Anne Johanne Tang (Intern)
Project Coordinator:

Nordic Network and Conference on Aquaculture Recirculation Technology (NordicRAS) (38842 & 39099 & 39223)

DTU Aqua has taken the initiative to establish a Nordic Network on Recirculating Aquaculture Technology (RAS). The idea is motivated by the facts that: (i) the geographical location and species composition requires certain breeding conditions and solutions, and (ii) the Nordic region has an excellent academic and commercial background for initiating such collaboration.

The purpose of the network is to strengthen Nordic research and research collaboration in RAS and associated water treatment including e.g. application of existing techniques in new setups, resolving potential new research areas, and investigating innovative operation forms that ensure high water quality. We anticipate that the network will become a continuous activity which could result in the establishment of consortiums that perhaps could apply for national and transnational European research funding, exchange of students, development of projects and potential educational programmes, etc.

The network is coordinated by DTU Aqua, and was founded at a steering committee meeting in April 2011 with country representatives from Denmark, Norway, Sweden, Finland and Iceland.

The main activity of the network will be to organise a RAS workshop every second year in one of the Nordic countries. The first workshop will be held in Helsinki (Finland), October 2011, the second workshop in Aalborg (Denmark) October 2013, and the third workshop in Molde (Norway) September - October 2015. The aim of the workshops is to bring researchers and industrial partners with an interest in RAS together, creating a unique opportunity for exchanging practical experiences and scientific knowledge on the newest developments in RAS.

This project is coordinated by DTU Aqua.

In 2011, the project was funded by AG-Fisk (Nordic Council of Ministers) and “Formandskabspuljen” (Nordic Council of Ministers). In 2012, follow-up activities and planning of future activities was funded by AG-Fisk. In 2013 and 2015 it was funded by AG-Fisk.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2011 → 31/12/2017
Number of participants: 2
Research area: Aquaculture
Project Manager, academic:
Pedersen, Per Bovbjerg (Intern)
Nørrefjord: A case study of coastal habitat status and restoration possibilities (38171)

Nørrefjord has been used as a case study to study to analyze Danish coastal habitats and their fate and ecological function for fish. As many other Danish coast areas the fjord has undergone dramatic changes in its biological structure and function due to human activities and influences. The fjord is nutrient loaded and eutrophication has led to reduction in the photic zone and frequent hypoxia in fjord deeper parts (>10 m). In addition, there has formerly been extraction of gravel and sand in shallow areas of the fjord (<5 m). These activities have created suction holes which still stand despite the fact that they were created over 15 years ago. The project aims to study local fish fauna community, fish distribution and ecological structure and function for different habitat types in the fjord in order to suggest how local fish fauna could be restored.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Local fishermen associations
University of Southern Denmark
Danish Nature Agency
Local Municipalities (Fåborg and Assens)

Period: 01/01/2011 → 31/12/2013
Number of participants: 3
Research areas: Coastal Ecology & Observation Technology
Contact person:
Støttrup, Josianne Gatt (Intern)
Project participant:
Kristensen, Louise Dahl (Intern)
Project Manager, academic:
Stenberg, Claus (Intern)

North Atlantic - Arctic coupling in a changing climate: Impacts on ocean circulation, carbon cycling and sea-ice (NAACOS) (38888)

Climate change is most pronounced at high latitudes, with rapid and dramatic changes observed in sea-ice coverage, circulation and the ecosystem. These changes have profound effects both at the regional scale as well as globally.

The North Atlantic and Arctic Ocean are the headwaters of the thermohaline circulation (THC), the global heat engine responsible, amongst other things, for the relatively mild climate we experience in Denmark. Subtle change in sea-ice formation, deep water circulation, and freshwater supply on a relatively local scale will have repercussions around the world. More subtle still are the feed-back controls these processes have on climate change. Sea-ice coverage and the earth's albedo is one feed-back, but there is also the draw down and sequestering of atmospheric CO2 in deep waters by physical and biological processes. The whole is an intricate weave of interrelated mechanisms: the scientific challenge to draw together expertise across disciplines to address these issues was accomplished; the strategic outcome was a suite of knowledge-based tools designed to reduce the uncertainty and contribute to climate policies.

The NAACOS team comprised a number of well-recognized scientists with profound experience and a significant international collaboration. NAACOS developed and refined oceanographic models using remote sensing and observations to evaluate the impact of high latitude climate change on circulation, deep water formation, sea-ice and carbon flux, and their implications at regional scales.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Strategic Research and a DHI student stipend.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Danish Meteorological Institute
Aarhus University
Offshore aquaculture, development of technology for offshore sea farming (38925)
The Danish sea territory spans 105,000 square kilometers of relatively shallow water with salinities ranging from brackish to fully oceanic. The present Danish sea farms are located in the least exposed regions in the Danish fjords and sounds. Environmental constraints are limiting production increase, and new locations in the coastal zone are rarely allocated. The shortage of suitable inshore sites emphasizes the urge to move to more exposed sites where benthic impacts are reduced or eliminated.

The offshore areas of the Danish sea territory holds vast areas with no or negligible activities apart from capture fishery. Venturing into these areas with aquaculture opens a major window of opportunity, but is also a serious challenge being too great for a single company to lift.

The overall purpose of developing the offshore production system is to create the technical foundation for “farming the ocean”. In other words to make it possible to locate cage culture facilities in areas now not considered suitable for fish farming because of their exposure to the physical forces of the open sea.

The project developed and tested different cage designs, anchoring and mooring systems and serviceability for offshore production. Submersible systems were found to be too unreliable in their operation as well as being difficult to maintain and service. The project found that a modification of conventionally designed cages constructed in more heavy duty materials were well suited for offshore production. Test production of trout showed that even in locations where significant wave heights exceed 3 meters, fish production was possible. Excess water currents were found to negatively influence production efficiency, resulting in poorer feed conversion, and increased nutrient emission from fish production. Similarly, increasing salinity was found to have a major negative influence on feed utilization. Physiologically, it was found to be possible to submerge fish for periods of up to 2 weeks without adverse effects on fish. The project concludes that offshore farming is possible, but also that environmental impact from fish farming and production efficiency are influenced by the physical environment that fish are farmed in, which should be taken into account during site selection.

The project was coordinated by Hvalpsund Net, Denmark.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
Optimal sustainable exploitation of Nephrops norvegicus in Kattegat and Skagerrak (38909)

The scientific advice on management of fisheries is primarily aiming at avoiding overfishing of the fish and shellfish stocks and only to a very limited extend addresses how the utilisation of the resources can be optimised within a sustainable ecosystem framework. An example is the regulation of the demersal trawl fisheries in the Skagerrak and the Kattegat which to protect the cod stock is sub-optimal in relation to the utilisation of the Norway lobster (Nephrops) stocks. The project takes a new approach to the management and aims at optimising the utilisation of Nephrops stocks without compromising the protection of cod.

The Nephrops fishery is one of the economically most important fisheries in Denmark. In the Kattegat and Skagerrak, Nephrops catches accounted in 2010 for 53 % and 25 %of the total value of fish and shellfish, respectively, landed by Danish fishermen. Cod is taken as by-catch in the Nephrops fishery and it has been necessary to introduce measures to limit the by-catches of cod, which is currently below agreed reference points for stock size. These measures have had a negative impact on Nephrops catches.

The project addressed four objectives: (i) development of advice on the fishing mortality for the Nephrops stocks, which is consistent with maximum sustainable yield; (ii) mapping of the distribution of Nephrops in Skagerrak and Kattegat; (iii) development of a new trawl concept optimising the catchability on Nephrops while limiting the by-catches of cod and impact on the sea bed; and (iv) evaluating alternative fishing methods for Nephrops including fishing with pots.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

Population dynamics of sea trout (Salmo trutta) in freshwater habitats (38253)

Brown trout (resident and migratory) is the most common freshwater species in Danish streams and rivers, the specie is highly important for the recreational fisheries in fresh and saltwater, also as an index-species for the quality of the water. Sea trout populations are regulated by biotic factors, such as densities, territorial behavior and predation that regulate the number of different year-classes in accordance to the carrying capacity of the habitat, and to abiotic factors, such as available spawning areas, water temperatures, water flow, silting of spawning reds and quality of available juvenile habitats as growth-up areas. In Danish streams abiotic factors vary greatly in response to levels of organic and non-organic materials entering the streams from surrounding agricultural areas and water flow, ice cover and water temperature variations during the year. The number of migratory sea trout depends on the annual smolt production from the stream and the recruitment of the year class, two to three years before the smolt run in the spring, and up to four year classes migrate to the sea in a single year. However, little is known about the natural variation in fish densities from year to year and why the smolt production can vary from year to year in the same river. This project is aimed to analyze the natural variations in trout population structure in a stream that is unaffected by stocking activities. Besides from two other studies in UK and Spain (both studies in highland streams) this Danish study is the only long term study of a trout population in a lowland stream that integrates all the variations from year to year of the population dynamics.

Since 1978 DTU Aqua has monitored the trout population in two small first order streams; Brandstrup Brook (4½ km), and Tjærbaek Brook (7½ km) running to the Gudenå river system, where both resident and anadromous trout spawn annually (Rasmussen, 1986). The population dynamics of brown trout (Salmo trutta) in relation to year class size (Pol.
The variations in numbers of offspring produced in the stream have been monitored by electro fishing before and after the smolt run and in autumn. These data can via scale readings be divided into year classes, and from these data it is possible to calculate growth, mortality, smolt production and biological production of the age groups and year-classes. In several years two smolt traps have been run, the annual smolt production estimates based on electro fishing before and after the smolt run and trap catches during the run are compared. Water temperatures and water flow have been monitored more or less continuously during the years. Every year during autumn electro fishing sea trout are registered, scales sampled and aged and fish tagged.

The project will finalize all the results during the years and analyze the relationships between recruitment and biotic and abiotic factors. The temperature recordings and estimated growth rates of the different age groups will enable comparing growth and growth model (i.e. sensu Elliott and From & Rasmussen) and growth rate and feeding rates as a function of fish densities.

Section for Freshwater Fisheries Ecology
National Institute of Aquatic Resources
Period: 01/01/2011 → 31/12/2013
Number of participants: 0
Research area: Freshwater Fisheries and Ecology

Population dynamics of stocked eel in a river system (38261)
The objectives are to evaluate the effect of stocking eel in a river system, and examine how anthropogenic factors such as weirs, trout farms and ponds in a river system may delay or hinder the downstream migration of silver eel.

A few studies have previously been performed to assess the biological value of stocking elvers in small to medium size streams. The studies however showed, that the eels either suffer high mortality or disperse to downstream sections of the streams where monitoring by electro fishing is not possible. Thus, only limited information on the fate of the stocked elvers is available. This project seeks to alleviate this shortcoming.

No, or only very little, natural recruitment occurs to the upper part of River Gudenå. Therefore, the area is excellent for eel stocking experiments, and all migrating fish can be monitored in a downstream fish trap.

During 1987, 1988 and 1992 the area was stocked with 1.6 million elvers. In 2001 and 2002 coded wire tagged eels of size 3.5 gram and 10 gram were stocked. The size and age composition of the silver eel run at Vestbirk fish trap suggest that most males from these stockings have by now, left the feeding areas during the spawning runs, whereas older females are immigrating in these years. All eel passing the trap are being recorded and measured. The population parameters; growth rate, numbers, sex and age at silvering are used to describe the yield of the stockings.

Silver eels leaving the upper reaches of the River Gudenå have to pass several weirs and lakes when migrating towards the sea. How these obstructions influence the migration is largely unknown, but a delay and possibly a higher mortality may be expected. Migrating silver eels are equipped with telemetric tags (PIT) and the progression rate of downstream migrants will be recorded by automatic listening stations and manual tracking.

Population genetics of flounder in Danish waters (38819)
Knowledge about population structure and local adaptation is central for successful management of both freshwater and marine fisheries. For instance, recently accumulated knowledge about the geographical scale and extent of local adaptation in anadromous fishes has resulted in the abandonment of fish transplants and releases of foreign fish into natural populations, because such activities threaten the survival of natural populations. In coastal habitats, local fishermen have expressed interests in moving marine fish between geographically distant areas, but until now a lack of scientific knowledge about the scale and extent of local adaptation has prevented any detailed advice on the scale that such movements may be possible. In one particular case, it was proposed to move European flounder from the western parts of the Limfjord to the Bay of Aarhus in order to support a fishery in the bay where the species had reached very low
abundances. Since these two areas are both geographically distant and environmentally different, it is possible that fish are also adapted to local environmental conditions. However, although earlier work has strongly suggested that populations of European flounder may be locally adapted, no study had directly compared samples from these areas.

In this project, we aimed to use a combination of genetic markers previously found not to be affected by selection (so-called “neutral markers”) and markers situated in or close to genes which may be important for local adaption. The application of such a combination of genetic markers may allow the assessment of geographical patterns and scales of both population structure and local adaptation in natural populations. The first stage of the project was the development of new genetic markers through screening candidate genes, identified as differentially expressed in relation to various stressors in laboratory experiments, for the presence of suitable genetic markers. Genetic markers were subsequently analyzed in individuals collected from the target as well as reference populations in 2011 and in additional reference samples available from 2003/2004. Results showed markedly different levels of genetic variation in putatively neutral and candidate gene associated markers throughout the species’ distribution. Furthermore, different frequencies of genetic variants near the stress response candidate gene, Hsc70, were observed between the Limfjord and the Bay of Aarhus, suggesting local adaptation to the two areas. Consequently, it was advised that fish were not moved between these two regions. In addition to providing information about the specific case, these results could also be important for guiding future research on finer geographical scales in this and other marine fishes.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Northwest Jutland Recreational Fishermen’s Association
Period: 01/01/2011 → 31/12/2012
Number of participants: 5
Research areas: Population Genetics & Coastal Ecology
Project participant:
Meldrup, Dorte (Intern)
Støttrup, Josianne Gatt (Intern)
Sparrevohn, Claus Reedtz (Intern)
Nicolajsen, Hanne (Intern)
Project Manager, academic:
Hansen, Jakob Hemmer (Intern)

Predation from birds and mammals and the significance for populations of freshwater fish (38829)

It is a well-known fact that predation can be a key factor for many fish populations and in some areas predation may even be the most important regulating factor for fish stocks of major recreational importance. Several species of predators were earlier persecuted, but are now protected and have experienced high population growths recently. This includes species like: cormorant, grey heron, seals and otter. Thus, the protection of these species has been a conservation success, but has also caused severe conflicts between various user-groups. To handle and mitigate these conflicts, scientific documentation is severely needed.

During a long period, DTU Aqua has carried out a number of projects that directly or as side-results have assessed the magnitude of predation and its impact on various fish stocks. This has provided some insight in when, where and by whom the important recreational fish species are being eaten. This project gathered and synthesized this knowledge to provide an overview of the significance of predation.

Outputs:
- Synthesis and analyses of existing knowledge/results.
- Method evaluation for scanning for PIT tags in cormorant/heron colonies.
- Investigations of possible causes for the recent drastic decline in grayling (Thymallus thymallus) populations.

The project was funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2011 → 31/12/2013
Number of participants: 4
Research area: Freshwater Fisheries and Ecology
Project participant:
Skov, Christian (Intern)
Reactivity of terrestrially derived dissolved organic matter in aquatic systems - relation to molecular composition and bacterial community structure (38927)
Aquatic systems play a significant role in transforming, remineralizing and sequestering, terrestrially derived organic matter (tDOM). The prevalence of tDOM in aquatic systems is a forcing factor affecting light climate, species distributions, productivity and biogeochemical cycles in freshwater systems and many coastal and marine systems.

Despite the significance of tDOM for the function of aquatic systems and global biogeochemical C cycling, we are only beginning to understand the quantitative and qualitative aspects of aquatic tDOM processes. A key to a better understanding of the role of tDOM is compound level information on the distribution and reactivity of tDOM.

The objectives with the project were to:
- examine which molecular size fractions of DOM are available to degradation processes such as flocculation/sedimentation, photooxidation and bacterial utilization and hence how reactivity of tDOM connects to molecular composition.
- determine if bacterial community structure in different systems alter the molecular size distribution of tDOM differently.

In essence, the project addressed if and how the molecular composition of tDOM and the structure of bacterial communities determine the fate of tDOM in aquatic systems.

The project was funded by the Swedish Research Council.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Lund University
Uppsala University
Period: 01/01/2011 → 31/12/2013
Number of participants: 1
Research area: Oceanography
Project participant:
Stedmon, Colin (Intern)
Project

Recirculation technology for future aquaculture (REFA) (38843)
An Innovation Consortia with many industrial partners. In the project, basic and applied research was performed by several partners to support the development of new and energy-efficient technologies for recirculation systems.

Some of the research issues were:
- to develop new filter technologies and energy-efficient aeration systems
- to develop process- and CFD models to improve our understanding and insight into dynamic variation in water quality parameters
- to determine the importance of particulate matter for biofilter operation (this was the DTU Aqua research package)
- to develop tools and instruments for advanced regulation and control of recirculating aquaculture systems
- to develop technologies for waste management

Twelve larger Danish companies were further partners in this project.

The project was coordinated by Danish Hydraulic Institute, Denmark.

The project was funded by the Danish Agency for Science, Technology and Innovation and the participating companies.
Department of Environmental Engineering
National Institute of Aquatic Resources
Section for Aquaculture
DHI Denmark
Reporting tagging experiments (38250)
The project 1) manages expenses (rewards) and databases with results from tagging experiments and 2) elaborates results on selected previously not reported issues from former tagging experiments.

1) Handling incoming reports on recaptures of tagged fish comprises payment of rewards and registering of recaptures. Reports from previous experiments are normally received over a longer period of time and it is practical to locate expenses in one continuous project. Dating back to the 1970’s and until recent years numerous tagging experiments have been conducted on salmon and trout at DTU Aqua. The use of tags and tagging has been and remains a key method in fish studies. Results from tagging experiments has previously been stored in separate databases, but one objective of the project is to assemble results in a single database accessible using GIS software in order to facilitate access to conducted experiments, being relevant both for research and advisory activities.

2) The elaboration of results from former tagging experiments, where results may already have been used for their primary purpose, aims at extracting as much as possible the information available in the results. Information from the experiments are extracted ad hoc for various purposes, and elaborated for reporting on selected issues.

Presently work is being carried out on a series of tagging experiments on wild and reared sea trout (smolt and adults) in river Kolding Å, as well as on catch pattern of salmon in the Baltic Sea in relation to fishing effort and environmental variables for a selected time series. It is the intention to analyze results on data from several countries around the Baltic Sea in corporation with relevant national institutes.

Response of pelagic food webs to warmer, acidified oceans (Pelagic foods) (38923)
Atmospheric CO2 is projected to double by 2100, resulting in increased global temperature, ocean acidification (OA) and changes in the balance of marine ecosystems. A general lack of multifactorial studies means very limited knowledge on the combined effects of these pressures on ecosystem structure and function. Preliminary mono-factorial data indicate important but little studied appendicularians (pan-global pelagic urochordates) may be strongly impacted, directly and indirectly via altered phytoplankton growth and chemical composition. Effects on other key plankton such as copepods may depend on phytoplankton size. Appendicularians repetitively secrete and discard filter-feeding houses. Discarded houses with trapped particles make a significant contribution to global vertical carbon flux. We will study combined effects of temperature and CO2 on these dominant zooplankton by manipulating natural plankton in mesocosms. We hypothesize climate change will impact the important zooplanktonic trophic level through top down altered predation fields and bottom up changes in prey type and size. Copepods are size-selective feeders and recent data suggest appendicularians are bottom up regulated by large and spiny particles. We will test these hypotheses in mesocosms by generating blooms of diatoms (large) or flagellates (small) and evaluate subsequent zooplankton population dynamics. Under these different conditions, we will also examine competitive predatory interactions between copepods and appendicularians, leading to models of projected effects of p(CO2) and temperature on appendicularians and copepods through alterations in phytoplankton community structure and uni-directional predatory pressure. Both appendicularians and copepods are important in oceanic carbon sequestration, but do so via different pathways. Data from these experiments should also have important predictive value on the nature and extent of future carbon sequestration in marine pelagic communities.

The project is coordinated by University of Bergen, Norway.
Salmonid freshwater habitats (38256)
The procurement of knowledge in this project aims at improving the basic available knowledge for advising on restoration and stream maintenance activities. Realizing that the question of stream restoration is huge, focus is on selected issues often in cooperation with external partners whenever relevant. Regular cooperation has been done with other Danish universities (Roskilde University, Aalborg University, Aarhus University), local authorities, Environmental centers and anglers associations.

In the coming years it is expected that several issues will be particularly relevant, such as stream restoration (removal/sanitation of barriers and restoration of spawning areas), implementation of EU Water plans, fine sediments and sand transport in streams. Realizing that erosion and transport of fine sediment (sand) is a major problem in many Danish streams, several methods to mitigate this have been tested. One attempt to prevent the embedment of excessive amounts of fine sediment in spawning gravel, has been placing tubes below the gravel in order to allow the sediment transported by the stream to be transported past the area with spawning gravel. Investigations on artificial spawning areas constructed with tubes will be carried out by measuring the content of fine sediment in the gravel on comparable artificial gravel areas with and without tubes.

A database with ongoing and previous stream restoration projects has been created. This is continuously being updated, to enable meta-analysis on relevant variables with the purpose of providing advice on restoration projects. Focus will be on the identification of factors influencing restoration effects towards fish populations.

A number of restoration projects (addition of spawning gravel) are being followed over a longer time span (years). Habitat parameters such as depth, water velocity, substrate composition and vegetation cover was initially measured before the restoration together with fish species and size composition. The same variables are measured annually to register effect from and durability of the restoration.

In a stream where approximately half of the productive area was previously inaccessible to migrating trout, all obstacles are being removed in a major restoration project. Habitat parameters are measured for the entire system, aiming at modelling the effect of the removal of barriers on trout production (cooperation with project 38259).

In a study on brown trout population dynamics and effects on the population from sports fishing, two sections (total length approx. 8 km) have been mapped for habitat quality. All fish with sufficient size for tagging inside the two sections have been tagged (PIT tags) and migrations in and out of the experimental section is monitored. A controlled fishing pressure is being applied to one of the sections in order to evaluate the effect on trout population from sport fishing.

The project is coordinated by DTU Aqua.
Silver eel biomass and non-fishing mortality (38845)

The EU-plan for restoring the European eel population, requires for each MS to issue a national Management Plan and report status of the eel population to the EU Commission in 2012 (and 2015, 2018). Among other things, the report must include estimates of the total production of silver eels (from freshwater), the magnitude of non-fisheries mortality and the reduction of this due to management measures.

This project aimed at providing solid estimates of mortality and biomass. This was be done by trapping silver eels in a number of representative river-systems and extrapolate the results to a national level. The mortality in association with hydropower passage has already been measured (and published), but the mortality of silver eels migrating pass fish farms (with weirs) was measured using radio-telemetry. Sixty migrating silver eels will be radio tagged (surgical implants) and followed on their way downstream in the river Kongeå, where they had to pass 3 fish farms to reach the sea. The results revealed massive loss and delay of silver eels at fish farms.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2011 → 31/12/2012
Number of participants: 4
Research area: Freshwater Fisheries and Ecology
Project participant:
Aarestrup, Kim (Intern)
Mikkelsen, Jørgen Skole (Intern)
Project Manager, academic:
Jepsen, Niels (Intern)
Pedersen, Michael Ingemann (Intern)
Project

Socio economic effects of management measures of the future CFP (SOCIOEC) (38940)

Objectives and Background
The main aim of the SOCIOEC FP7-KBBE-2011-5 project under KBBE.2011.1.2-10 (Socio-economic effects of the main management principles of the future CFP: impact of new policy framework and opportunities for the fishing sector) was to evaluate innovative fisheries management measures and develop self- and co-management. It has been important that the project focused on the interpretation of overarching (i.e. EU) objectives in local and regional contexts.

Deliverables and Tasks
In the first step the project developed a coherent and consistent set of objectives for fisheries management, which addressed ecological, economic and social sustainability targets. The objectives were consistent with the aims of the CFP, MSFD and other EU directives, but also understandable by stakeholders and the community and engaged their support. This led to the proposal of a number of innovative management measures, based on existing or new approaches. The second step was to analyze the incentives for compliance provided by these measures through examination of fisher’s responses to and perceptions of measures based on historical analysis, direct consultation and interviews, and how the governance of the measures operated.

Finally, the project examined the impact of the measures that emerge from this process, particularly in terms of their economic and social impacts on the industry and the wider community. All this was done through a generic analysis of the wide range of current and emerging measures in the current CFP and possible measures introduced in the future. This required and has resulted in interdisciplinary work across a range of scientific disciplines (economics, social and natural sciences).

DTU Aqua was involved in the North Sea and Baltic Sea case studies and in the project Steering Group. For the North Sea, DTU Aqua focused on analyses of catch quotas compared to landing quotas in mixed consume fisheries including related discard processes. Also, small meshed pelagic fisheries in the North Sea were addressed for efficient management of those. For the Baltic Sea, DTU Aqua focused on evaluation of spatial management measures among other in relation to NATURA 2000 areas and implementation of windmill farms, and larger marine constructions. This resulted in evaluation of success and failures of several management measures, and enabled us to draw conclusions on which measures are best introduced in which circumstances, possibly on a regional basis. On this basis DTU Aqua has produced several peer reviewed journal papers under SOCIOEC. In the CFP we need to distinguish between the basic, overarching regulations of the EU or regional seas level and the specific and local management by Member States in sea
areas where self- and co-management schemes are often already informally in place. Here the cooperation with the ACs was essential to derive objectives applicable for the CFP based on the ecological, economic and social drivers and to reconsider management at more regional or local levels. This process involved: (i) investigation of how the objectives regarding ecological, economic and social sustainability could be defined in the short term and ensures the long-term sustainability and viability of fisheries; (ii) analyzing which management measures and at what organization level, created the right incentives to tackle structural failings in the CFP with focus on technical measures, command and control instruments (TACs, quotas, effort), market instruments (transferability of collective or individual rights) and social instruments (self- or co-management possibilities); and (iii) determination of the socio-economic and spatial effects of these management measures.

The project had 30 project participants from European universities and National Fisheries Economics and Fisheries Research Institutes as well as SMEs.

The project was coordinated by Institute of Sea Fisheries, Johann Heinrich von Thünen Federal Research Institute for Rural Areas, Forestry and Fisheries, Germany.
The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2011 → 31/12/2014
Number of participants: 4
Research area: Fisheries Management
Project participant:
Bastardie, Francois (Intern)
Ulrich, Clara (Intern)
Eigaard, Ole Ritzau (Intern)

Project Manager, academic:
Nielsen, J. Rasmus (Intern)

Statistical aspects of heterogeneous population dynamics (38102)
A variety of ‘indices’ of distribution are often considered: occurrence, aggregation and geographical range. However, the estimators of these indices are frequently biased and the results often do not reflect changes in distribution, often due to effects of non-random sampling in space and time. Another type of bias in many existing methods results from the assumption that the individual observations of abundance in an area are all independent and spatial correlation is ignored. Methods that do take spatial correlation into account, such as kriging, are often inappropriate because they do not handle the high frequency of zero observations, which are typical of survey data. During this task we will develop new types of models using the so-called “Log Gaussian Cox Process” (e.g. Lewy and Kristensen 2009; Kristensen 2008), which account for spatial correlation and better involve the information from zero observations. These models will further strengthen our ability to detect changes in distribution and provide useful indices of biological aggregation or ‘clumping’ based on the degree of spatial correlation.

24 research institutes and 14 universities are partners in the project.
The project is coordinated by Plymouth Marine Laboratory, UK.

National Institute of Aquatic Resources
Section for Marine Living Resources
Period: 01/01/2011 → 31/12/2011
Number of participants: 3
Research area: Marine Living Resources
Project participant:
Rindorf, Anna (Intern)

Project Manager, organisational:
Lewy, Peter (Intern)

Project Manager, academic:
Gislason, Henrik (Intern)

Survival and growth of eel in coastal habitats (38830)
Very little is known about settling, habitat utilization and survival of European eel (Anguilla anguilla) in coastal areas (fjords and estuaries). We don’t know what proportion of elvers take residence in the coastal zone. For eels stocked in fjords and
estuaries, only little is known about survival and growth. In Denmark it has been suggested that the main production of eel takes place in the coastal areas and not in freshwater. Thus, it is very important to obtain some information about this to enhance our management of this threatened species.

The overall objective is to investigate the importance of various marine habitats for settlement, density, survival and growth of eel. In relation to survival, the importance of fishing and cormorant predation will be sought estimated.

In the first stage (pilot) new sampling methods are being tested in order to be able to generate data about the juvenile eel in the coastal habitats. This is not trivial as no methods have proved effective in sampling small (<15 cm) eels on the coast. To distinguish between wild and stocked eels, 25,000 coded wire tagged eels have been stocked in a semi-closed estuary and the lower river. Spring and fall sampling will provide information on relative survival and growth of these and wild eels.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2011 → 31/12/2016
Number of participants: 4
Research area: Freshwater Fisheries and Ecology
Project participant:
Mikkelsen, Jørgen Skole (Intern)
Project Manager, academic:
Jepsen, Niels (Intern)
Pedersen, Michael Ingemann (Intern)
Aarestrup, Kim (Intern)

The population of whitefish (Coregonus lavaretus) in Ringkøbing Fjord: Effects of fishery, stocking and natural reproduction (38827)

Objectives of the project are to improve our knowledge on the whitefish population in the Ringkøbing Fjord Lagoon and effects associated with the commercial exploitation of the population, i.e. to what extent the traditional gill-net (46 mm monofilnet) fishery for whitefish affect both the whitefish population and otherspecies of fish in the lagoon. Another goal is to establish how much natural reproduction and stocking of hatchery reared fry contributes to the adult population. These results will provide a much better basis for the management of whitefish populations in Denmark in general and in Western Jutland in particular.

The natural population of whitefish in the Ringkøbing Fjord Lagoon has been the subject of an extensive fishery for more than 100 years. The fishery is primarily performed by commercial fishermen, but estimated from the number of recreational fishers in the area, a substantial amount is caught by this groups as well. The lagoon holds the largest population of whitefish in Denmark. The official landing statistics (only covering the commercial catches) shows that the catch through the 20th century typically has varied between 10 and 60 tons per year (e.g. mean 1980-2000 25.1 tons per year). Since 2001 the landings have increased to a mean of 55 tons per year (range 14-94 t), with a mean value of 1.2 m DKK. This constitutes 75-95 % of the total Danish whitefish fishery.

Since 1986 ca. 4 million hatchery reared fry has been stocked in the lagoon each year. 3.6 million are stocked as newly hatched larvae in April. 0.4 million are raised to a size of 3-4 cm before stocking in late May.

The population of sea trout (Salmo trutta) in the main tributary of the lagoon, the River Skjern, is much smaller than expected, considering the environmental conditions of both the river and the lagoon and the size of the river. One possible reason is by-catch in the whitefish fishery. The landing of sea trout and the endangered salmon (Salmo salar) from the lagoon is prohibited and the discard mortality for sea trout is considered to be very high. Investigations on the subject of by-catch in gill-nets set for whitefish in the Baltic Sea supports this hypothesis.

In the project we estimate the catch of whitefish and the by-catch of other fish species in the whitefish gill-net fishery, with special emphasis on salmonids, by a combination of experimental fishery, monitoring selected commercial fishing trips and a questionnaire the fishermen and their effort. A number of different approaches re time and place of fishing and net construction is tested to describe how much by-catch can be minimized.

The result of natural spawning in River Skjern is investigated by a combination of catching newly hatched larvae with drift-nets and e-DNA analysis of water samples from the river. The latter method is a very novel approach.

Through the experimental fishing, supplemental data on the whitefish, salmonids as well as other species (less detailed) are collected to describe population dynamic parameters (size and age distribution, growth, condition etc.), primarily of whitefish and salmonids.

The results show that by-catch of sea-trout in the whitefish gill-net fishery is unavoidable, but also that the by-catch can be reduced substantially by employing specific gears and methods. The by-catch of salmon is insignificant while the by-catch of other species, especially flounder is substantial. These results will be reported in autumn 2016. Their investigation on natural reproduction in the River Skjern is still ongoing and will be reported in 2017.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2011 → 31/12/2016
Number of participants: 4
Research areas: Freshwater Fisheries and Ecology & Population Genetics
Project participant:
Eg Nielsen, Einar (Intern)
Phd Student:
Hansen, Brian Klitgaard (Intern)
Project Manager, academic:
Berg, Søren (Intern)
Støttrup, Josianne Gatt (Intern)

**Trait based plankton ecology (38896)**
Plankton is the dominating life-form in the ocean. It is mainly invisible and lives in a viscous world that is not part of our sensed experience. As a consequence, important properties of life in the oceans remain poorly understood. This project has aimed to further a cross-disciplinary research activity to promote an understanding of the dynamics of marine pelagic ecosystems that is based on mechanistic descriptions of the functioning of and interaction between its individuals. We provided trait-based descriptions of the key functions of plankton, formulate their associated trade-offs, and develop trait-based models of plankton ecosystem that we will test against observations.

The core activity of the project was the development of mechanistic descriptions of key plankton traits and their trade-offs and development of trait-based models of pelagic systems. The immediate goal of the project was to achieve fundamental insights in the functioning of pelagic ecosystems but ultimately the models to examine effects of environmental changes and human impact. The project was a ‘precursor’ for the Centre for Ocean Life.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Independent Research.

National Institute of Aquatic Resources
Centre for Ocean Life
Roskilde University
Aarhus University

**Vectors of change (VECTORS) (38907)**
Marine life makes a substantial contribution to the economy and society of Europe. VECTORS aimed at elucidating the drivers, pressures and vectors that cause change in marine life, the mechanisms by which they do so, the impacts that they have on ecosystem structures and functioning, and on the economics of associated marine sectors and society. VECTORS particularly focused on causes and consequences of invasive alien species, outbreak forming species, and changes in fish distribution and productivity. New and existing knowledge and insight was synthesized and integrated to project changes in marine life, ecosystems and economies under future scenarios for adaptation and mitigation in the light of new technologies, fishing strategies and policy needs. VECTORS also evaluated current forms and mechanisms of marine governance in relation to the vectors of change. Based on its findings, VECTORS outlined solutions and tools for relevant stakeholders and policymakers during the lifetime of the project. The VECTORS consortium included a mixture of natural scientists with knowledge of socio-economic aspects, and social scientists (environmental economists, policy and
governance analysts and environmental law specialists) with interests in natural system functioning.

DTU Aqua contributed to VECTORS by developing new statistical models of fish species distributions, by further developing spatially resolved bio-economic models of fishing, and by analyzing fish species richness and distribution in the north Atlantic and the general relationship between changes in fish stock abundance and distribution area. We coordinated the Baltic WP where we implemented the ATLANTIS end-to-end model and performed initial scenario testing. We also analyzed the most important drivers of fish population dynamics in the Baltic, and contributed to the study of invasive species.

VECTORS comprised a total of 37 European Universities, research institutions and professional associations dealing with applied maritime and marine research.

The project included marine environmental scientists, fisheries scientists, conservation biologists, sociologists and economists from across the European scientific community providing expertise in marine ecosystems, management, fisheries, maritime transport, tourism and coastal development.

The project was coordinated by Plymouth Marine Laboratory, UK.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management
Period: 01/01/2011 → 31/01/2015
Number of participants: 9
Research areas: Ecosystem based Marine Management & Fisheries Management & Marine Living Resources
Contact person:
Köster, Fritz (Intern)
Nielsen, J. Rasmus (Intern)
Lewy, Peter (Intern)
Rindorf, Anna (Intern)
Bastardie, Francois (Intern)
Kristensen, Kasper (Intern)
Huwer, Bastian (Intern)
Project Manager, academic:
Gislason, Henrik (Intern)
Eero, Margit (Intern)

Life history adaptation in marine fishes

National Institute of Aquatic Resources
Period: 15/12/2010 → 15/08/2013
Number of participants: 3
Phd Student:
Mosgaard, Thomas (Intern)
Supervisor:
Rindorf, Anna (Intern)
Main Supervisor:
Gislason, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Marine Survival of Sea Trout

National Institute of Aquatic Resources
Period: 15/12/2010 → 27/08/2014
Number of participants: 6
Phd Student:
Development of a strategy for aquaculture in the Baltic Sea Region (38978) (BESTAQ)

Development of a strategy for aquaculture in the Baltic Sea Region. The acronym is BESTAQ (Baltic Environmentally Sustainable Aquaculture) and the project was a flagship project, including a range of stakeholders along the whole value chain to provide a tool for the governments and industries for decisions for development of aquaculture as well on national as on regional level.

The project was coordinated by the Finnish Game and Fisheries Research Institute.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Finnish Game and Fisheries Research Institute
Food Safety, Animal Health and Environment Research Institute
County Council of Jämtland
Lund University

Swedish National Board of Fisheries
Period: 01/12/2010 → 31/12/2014
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Jokumsen, Alfred (Intern)
Project

Modelling the competition between two closely-related copepod species in Arctic under climate change

National Institute of Aquatic Resources
Period: 01/12/2010 → 07/05/2014
Number of participants: 6
Phd Student:
Sainmont, Julie (Intern)
Supervisor:
Andersen, Ken Haste (Intern)
Main Supervisor:
Visser, Andre (Intern)
Examiner:
Mariani, Patrizio (Intern)
Aksnes, Dag L. (Ekstern)
Banas, Neil S. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Workshop on Baltic Sea Trout Helsinki, Finland, 11-13 October 2011 (38836)
In order to provide solutions for the possible implementation of management initiatives suggested in ICES recommendations a three day workshop was established.

An updated status of sea trout populations in the Baltic Sea was presented directly to invited managers from all countries around the Baltic Sea and to the EU Commission DG MARE/E2.

The status in each country was presented by national experts from all countries around the Baltic Sea. For a wider perspective the status of sea trout in Scandinavia, the status for Norwegian trout populations was presented by an invited expert from Norway.

Possible solutions to problems for the sea trout already implemented in some countries were presented and discussed between managers and scientists. Furthermore expected effects from additional implementations and the need of these were discussed. A set of statements were formulated.

Project report can be downloaded from aqua.dtu.dk

This project was coordinated by DTU Aqua.

The project was funded by Nordforsk, Nordic Council of Ministers.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Natural Resources Institute Finland
Period: 01/11/2010 → 01/02/2012
Number of participants: 1
Research area: Freshwater Fisheries and Ecology
Project Coordinator:
Pedersen, Stig (Intern)

Development of an energy saving trawl (39029)
The aim of the project was to test and document the reduced drag in a novel trawl design made by Herman Trawl. Detailed testing and drag measurements was conducting at the flumetank in Hirtshals where the new designs measurements were compared with similar drag measurements of a standard trawl of similar size.

The developed design demonstrated a relative large reduction in drag compared to similar sized standard gears. The specific effect was documented at different towing speeds. All measurements were made on scale models.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Agency for Science, Technology and Innovation.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
SINTEF
Herman Trawl
Municipality of Frederikshavn
Period: 10/10/2010 → 31/12/2012
Number of participants: 1
Research areas: Fisheries Technology & Fisheries Management
Project Coordinator:
Krag, Ludvig Ahm (Intern)

North Denmark Region as strategic development platform for offshore sea farming technology (38805)
The development of offshore aquaculture has reached a point where the next step forward is to physically move the last step from off coast to off shore. This is a challenge though, and will be a multidisciplinary task only to be carried out by a consortium of private sector partners, research institutions and government authorities. The project launches the concept
of describing such a development platform based at the North Sea Science Park. This will place the North Denmark Region in the center of a coming national R&D activity and be the foundation for a coming Danish offshore aquaculture production.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Aquaculture
North Sea Science Park
Period: 01/10/2010 → 31/03/2012
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Steenfeldt, Svend Jørgen (Intern)

The blue revolution: Perspectives for sea based food production (38804)
The project will conduct an investigation of the possibilities for use of a larger part of the Danish sea territory for aquaculture of food as well as non food products.

The project will review the current state of world sea based aquaculture with focus on offshore activities of fish, shellfish and algae. The project will also review the national state of sea based culture of fish shellfish and algae before conducting an analysis of potential transfers of technology to support the Danish development of the sector.

The project will initiate the formation of a national Blue Revolution Network that will link the different activities on sea based production in a network to support exchange of knowledge and cooperation between the different activities on the subject.

A set of recommendations on the future development of Danish sea based production will be outlined and serve as guidelines for the coming development of the sector.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/10/2010 → 30/06/2012
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Steenfeldt, Svend Jørgen (Intern)

Implementation of Global Certification (Aquaculture Stewardship Council - ASC) for rainbow trout and assessment of sustainable certification of new species (38809)
Aquaculture is globally the fastest growing food producing sector. However, to continue that trend requires efficient solutions to negative environmental and socioeconomic impacts that may be associated with aquaculture production. This project aimed to support the process of global certification of rainbow trout, i.e. to develop global, measurable, performance-based, and transparent standards that minimize negative environmental and social impacts from farming of trout in fresh water and maintain economic sustainability of trout production. The basis was the current types of production and strategies for farming of rainbow trout in fresh water in Denmark from the embryonic stage to marketable size and broodstock fish. Also included were the principles and the main national and EU regulations related to fish farming as well as issues related to feed, veterinary health conditions, and use of antibiotics and therapeutants. Production facilities included the design and construction, of the various types of fish farms (i.e., traditional farms, model trout farms, and Fully Recirculation Aquaculture (FREA) systems). Finally, farming of organic trout in Denmark and the related regulations affiliated with the organic label were included. The project was part of the Aquaculture Trout Dialogue facilitated by World Wide Fund for Nature (WWF) to develop the certification standards in cooperation with the other partners. Once the certification standards were fixed the Aquaculture Stewardship Council (ASC) became responsible for the certification of the produces.

The project was coordinated by Danish Aquaculture Association, Denmark.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Organisation
World Wide Fund for Nature (WWF)
Aarhus University
Period: 01/09/2010 → 01/04/2012
Number of participants: 1
Research area: Aquaculture
Project Manager, academic:
Jokumsen, Alfred (Intern)
Project

Mussel growth and filtration in relation to salinity and food conditions
National Institute of Aquatic Resources
Period: 15/07/2010 → 30/11/2015
Number of participants: 4
Phd Student:
Landes, Anja (Intern)
Supervisor:
Dolmer, Per (Intern)
Poulsen, Louise K. (Intern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Management of fisheries in harbour porpoise (Phocoena phocoena) marina protected areas
National Institute of Aquatic Resources
Period: 01/05/2010 → 02/09/2015
Number of participants: 7
Phd Student:
Kindt-Larsen, Lotte (Intern)
Supervisor:
Northridge, Simon (Ekstern)
Stage, Bjarne (Intern)
Main Supervisor:
Larsen, Finn (Intern)
Examiner:
Madsen, Niels (Intern)
Macleod, Kelly (Ekstern)
Read, Andrew Justin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Welfare in farmed rainbow trout, social and environmental preferences
National Institute of Aquatic Resources
Period: 01/03/2010 → 03/07/2013
Number of participants: 6
Phd Student:
Laursen, Danielle Caroline (Intern)
Physical-biological influence on the spawning and larval development for an inshore population of cod (Gadus morhua) in Greenland

National Institute of Aquatic Resources
Period: 01/02/2010 → 27/11/2013
Number of participants: 6
Phd Student:
Swalethorp, Rasmus (Intern)
Supervisor:
Nielsen, Torkel Gissel (Intern)
Main Supervisor:
Munk, Peter (Intern)
Examiner:
Støttrup, Josianne Gatt (Intern)
Folkvord, Arild (Ekstern)
Grønkjær, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

The importance of the copepod species Metridia spp. in the Godthåbsfjord at present and future climate conditions

National Institute of Aquatic Resources
Period: 01/02/2010 → 27/08/2014
Number of participants: 6
Phd Student:
Kjellerup, Sanne (Intern)
Supervisor:
Kiørboe, Thomas (Intern)
Main Supervisor:
Nielsen, Torkel Gissel (Intern)
Examiner:
Mariani, Patrizio (Intern)
Head, Erica (Ekstern)
Varpe, Øystein (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Local strenght - strengthening the rural areas, by adding competencies (39086)
The overall aim the project “Local strength” was to demonstrate how the supply of knowledge and skills to a rural area with low income, high unemployment and decreasing job opportunities can stimulate local industries and companies and thereby prepare it for the necessary development and adaptation into a national and international context. The objectives
of the project were based on innovation and change within the sustainable exploitation and production of shellfish in the western part of the Limfjorden because this part of the country is the main area for shellfish production. The specific objectives were: - To strengthen the overall shellfish industry through networking and joint activities within shellfish businesses and a R&D institution on common issues like e.g. food safety. - Adaptation of the shellfish fishery into a more sustainable and competitive fishery by developing new methods and forms of production, e.g. by the development of relay cultures, documentation of environmental impact and creation of buffer zones around eelgrass beds. - Develop cost-saving methods for mussel farming in relation to e.g. buoy handling, optimal stocking etc.- Creating added value through development of new mussel and oyster products. - Create broader revenue for the mussel farmers by development of new species e.g. seaweed. - Establish a generic branding of shellfish from the Limfjorden. This project was coordinated by DTU Aqua.

The project was funded by Danish Business Innovation fund, The North Denmark Region and Morsø Municipality.

National Institute of Aquatic Resources
Danish Shellfish Centre
Foreningen Muslingeerhvervet
Centraforeningen for Limfjorden
Muslingestrømpe Nykøbing ApS
Seafood Limfjord
Danish Aquaculture Association
Limfjords-Kompagniet A/S
Vilsund Muslingeindustri A/S
Period: 11/01/2010 → 31/10/2013
Number of participants: 5
Research areas: Shellfish and seaweed & Coastal Ecology
Project participant:
Nielsen, Carsten Fomsgaard (Intern)
Nielsen, Pernille (Intern)
Canal-Vergés, Paula (Intern)
Saurel, Camille (Intern)
Project Coordinator:
Petersen, Jens Kjerulf (Intern)

Arctic plankton in a changing climate (38783)
Climate change impacts the marine arctic environment through changes in ice cover, ice thickness, irradiance, freshwater outflow, concentrations of nutrients and CO2 and the stratification. These factors determine the production, seasonality and fate of the planktonic primary production in the marine ecosystem. Plankton is fueling stocks of fish, marine birds and mammals and through that constitutes the base of the Greenlandic economy.

The aim of the project was to gain knowledge about the interaction between climate, oceanography and plankton in the vulnerable Greenlandic marine ecosystem through field and laboratory experiments. The project was interdisciplinary and closely coordinated with the other projects under the Greenland Climate Research Centre.

The project was funded by the Commission for Scientific Investigations in Greenland (KVUG), Greenland Climate Research Centre, Danish Centre for Marine Research, and Carlsberg Foundation.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Aarhus University
Greenland Institute of Natural Resources
Period: 01/01/2010 → 31/12/2014
Number of participants: 7
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics
Project participant:
Jonasdottir, Sigrun (Intern)
Koski, Marja (Intern)
Dutz, Jörg (Intern)
Kjellerup, Sanne (Intern)
Swalethorp, Rasmus (Intern)
Munk, Peter (Intern)
Project Manager, academic:
Nielsen, Torkel Gissel (Intern)

**Bycatch and discards: Management indicators, trends and location (BADMINTON) (38714)**

In the EU there is intensive data collection of by-catch and discard onboard commercial vessels, but until now there have been few attempts to describe the general patterns in these data, and still less to understand the factors that determine what and how much is discarded. However, the latter step is key if we are to develop operational indicators and propose mitigation tools for fisheries management. There is especially a need to investigate the effectiveness of mitigation methods that have been implemented in the past, primarily as technical regulations, including gear modification. This has to be done at the scale of the fishery: many gear modifications showed to make a difference in field trials, however there have been few studies about the way fishers used these modified gears, and the real impact it had on catch and discards on the fleet scale.

The project developed along five main steps:
- A descriptive analysis of total catch in terms of species and size composition, based on the data collected onboard EU vessels under the Data Collection Regulation. This included a quantification of spatial and temporal distribution and abundance of discards.
- The development of indicators of discard issues: indicators of discard state (amounts and characteristics of discards), of the pressures that determine discards (selectivity of fishing), and of the management responses to this issue.
- An analysis of the factors that determine discard amounts, including environmental settings, year-class strength, community composition, and fishing practices. This included an examination of the efficiency of technical regulations currently in force, and retrospective analyses of the efficiency of such measures in the past.
- An analysis of socio-economic and institutional drivers and incentives that influence fishers’ behaviour in regard to selectivity and discard.
- Based on all previous steps, the elaboration of potential mitigation measures. Beyond technical measures, integrated approaches that will remove or at least reduce incentives to discard were explored.

The project was coordinated by Hellenic Centre for Marine Research, Greece.

The project was funded by EU, MariFish, ERA-NET.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Hellenic Centre for Marine Research
IFREMER
Wageningen IMARES
Instituto Español de Oceanografía
Cefas
Aalborg University

Period: 01/01/2010 → 01/04/2013
Number of participants: 1
Research area: Fisheries Technology

**Catch quota project 2010 (38787)**

The aim of the project is further development and test of Catch Quota Management (CQM) systems in Danish fisheries by the use of electronic monitoring systems. Furthermore, to test whether electronic monitoring – video and sensor recordings – can provide the necessary documentation to support a CQM system.

In addition the project will illustrate whether full documentation of catches can support implementation and certification and
traceability solutions which requires linkage to project dealing with these issues.

From January 2010 the European Council has adopted possibilities for EU Members States to conduct trials on catch quota management on cod in the North Sea, the Skagerrak and the Kattegat.

As the Danish Government has worked intensively for the implementation of CQM in the new Common Fisheries Policy (to be implemented from 2013 and onwards) the project should also facilitate international cooperation on European level to set up common standards for CQM data collection, data processing, data exchange and data base development.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Public Sector Consultancy

Danish Directorate for Fisheries

Archipelago Marine Research Ltd

Period: 01/01/2010 → 31/12/2011

Number of participants: 5

Research area: Fisheries Management

Project participant:

Olesen, Hans Jakob (Intern)

Jensen, Reinhardt (Intern)

Kirkegaard, Eskild (Intern)

Håkansson, Kirsten Birch (Intern)

Project Manager, academic:

Dalskov, Jørgen (Intern)

Centre for Macroecology, Evolution and Climate (CMEC) (38784)

This project investigated large scale patterns and variations of life in the ocean, focusing primarily on fishes. The theme used fishes to investigate how processes associated with climate change and human impacts (e.g., fishing and eutrophication) influence fish life histories, biodiversity and the dynamics of populations and species over large time and space scales. Studies have focussed on key processes affecting life histories and distribution of populations and species, including reproduction, mortality, and migration.

The project had one full-time PhD student, and 5 postdoctoral scientists. The relatively high number of postdocs in a short period was due to their success at finding permanent jobs as tenure-track assistant professors, or as research scientists or managers in either industry or academia.

Key results by DTU Aqua colleagues in the project include the following:

- A pan-Atlantic analysis and discovery of how temperature affects reproductive timing in cod, with evidence for local adaptation of cod thermal physiology and counter-gradient evolution. Our ongoing work is now investigating the consequences of this adaptation for match-mismatch of cod larval production with the timing of the peak production of major zooplankton prey species (e.g., Calanus finmarchicus, Pseudocalanus sp.).

- New estimates of the numbers, locations and volumes of the mesopelagic provinces of the world’s oceans, and based for the first time on the dynamics of ocean primary productivity, C sedimentation and photic zones. These new habitat descriptors of the mesopelagic ocean will provide new contexts for studies of ocean biodiversity, and the distribution and productivity of mesopelagic fishes and other biota.

- New models of fish lifetime reproductive output which demonstrated that a fish’s annual reproductive output was strongly related to maximum body size. Moreover, indeterminate spawners had ca. 10-fold higher reproductive output per unit weight than determinate spawners suggesting possible differences in survival rates among the early life history stages between these two groups of fishes.

- Estimates of how climate change will affect the spawning locations and timing for herring in the North Sea, based on climate change scenarios, lab studies of temperature effects on egg survival rate and substrate requirements for herring egg deposition.

- Global patterns in taxonomic and functional descriptors of fish biodiversity and how these are inter-related and affected by ocean conditions (e.g., primary production, ecosystem size). Ongoing work is relating these patterns to biodiversity protection (e.g., MPA coverage).

The project was coordinated by University of Copenhagen, Denmark. The project was funded by the Danish National Research Foundation.
Development and demonstration of Marine Strategy Framework Directive (MSFD) tools for harmonization of the initial assessment in the eastern parts of the Greater North Sea sub-region (HARMONY) (38894)

The HARMONY project has developed and made available a toolbox supporting national MSFD implementation with special focus on issues of a transnational relevance and importance. It builds on cooperation among member states sharing the Greater North Sea sub-region through active involvement in several OSPAR groups. The tools are based on respecting the needs for national flexibility, while ensuring the necessary regional harmonization of key elements under the marine strategies.

The project partnership met these challenges through four development/harmonization activities and a coordination and information activity:

1) To develop and demonstrate a tool supporting an analysis of essential features and characteristics leading towards an integrated assessment building upon the criteria identified in the Commission Decision, while ensuring the necessary linkage to existing work under the Regional Sea Conventions as well as existing EU legislation (WFD, Natura 2000).
2) To develop and demonstrate a tool (a pressure and an impact index) supporting an analysis of the predominant pressures and impacts on the ecosystems, including those impacts of human activities for the Greater North Sea Marine sub-region.
3) Provide examples on the linkage of effects and human pressures to informed ecosystem-based marine strategies (based on activities 1 and 2).
4) To establish and support the active cooperation among member states sharing the Greater North Sea sub-region enabling comparisons and harmonization, where relevant and possible, between national efforts in preparing the initial assessment, elaborate the criteria including identification of indicators and target setting, and further on, the preparation of the monitoring program and the program of measures within the Greater North Sea sub-region.

DTU Aqua has focused on biodiversity of fish and fish populations, mapping fishing pressures and ecosystem components of the project working area (North Sea).

The project was coordinated by Department of Bioscience, Aarhus University, Denmark.

The project was funded by the Danish Ministry of Environment.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Aarhus University
DHI Denmark
Climate and Pollution Agency
Norwegian Institute for Water Research
Institute of Marine Research
Havs- och Vattenmyndigheten
Swedish Meteorological and Hydrological Institute
**Development and test of a sorting grid for the fishery on Norway lobster (38742)**

Goal of the project was to develop and test a sorting grid for the Norway lobster fishery in Kattegat and Skagerrak, with the aim to improve both the size selectivity for Norway lobster and allow high escapement of cod. A second requirement was, that the sorting can be deployed from smaller vessels and is easy to handle.

Within the project, a flexible sorting grid was developed which can be hauled directly on the net-drum and can be handled on small fishing vessels. The grid was designed and tested with different set-up of bars and colors.

As an alternative for a sorting grid, a sorting frame was developed to be inserted in the upper panel of the cod end was tested in comparison.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

SINTEF

**DTU centre for recirculation technology (38159)**

Despite the obvious scientific relationship and correlation between recirculation technology, specifically biofiltration, and municipal waste-water treatment only limited scientific knowledge has been interchanged between these two areas.

DTU Environment has for many years been an internationally renowned actor within biofiltration processes and kinetics in waste water treatment. Combining this stronghold with the DTU Aqua expertise in recirculating systems is the basis for this project. Through project cooperation, student interchange and common research set-ups knowledge is exchanged and new insights developed.

In recirculation systems feed is the major input to the system, and the linkage between feed, water quality and system operation is important, yet missing knowledge, which will also be addressed by the group through a combined experimental and modeling approach.

Department of Environmental Engineering

National Institute of Aquatic Resources

Section for Aquaculture
Eco-certification of Danish fisheries (38885)
Danish Fishers PO had decided that all commercial fisheries in Denmark should, where possible, operate at the standard necessary to obtain MSC certification by 2012. This project was the third of a suite of EFF-financed projects supporting this challenge.

Of particular focus was the absence of management plan for plaice and sole in Kattegat-Skagerrak area, which is one of the prerequisite for certification. Sole stock is regularly assessed by ICES, implying that a management plan could potentially be established on a standard basis. But the situation was more problematic for plaice, which assessment suffered from a number of uncertainties and issues which could not be solved through a standard benchmark process. DTU Aqua was thus involved in order to clarify the biological knowledge base for this stock and contributed to suggestions for a more tailored approach to the assessment and management of plaice in Skagerrak.

The project resulted in significant changes in the perception of plaice population dynamics in the Skagerrak-Kattegat. An ICES workshop was convened in 2012 (WKPESTO) on the basis of the project, and a new basis for scientific advice was agreed. The scientific and advice outcomes of the project have been disseminated in a scientific publication by Ulrich et al. (2013), DOI: 10.1016/j.seares.2013.04.007

The research underlying this project was continued in project 39025 in 2013-2014.

The project was coordinated by Danish Fishermen's Producers' Organisation, Denmark.

The project was funded by the Danish Ministry of Food, Agriculture and the Fisheries and the European Fisheries Fund (EFF).

Electronic monitoring on smaller fishing vessels fishing with gillnets (38773)
The aim of the project is to examine whether electronic monitoring by the use of CCTV and sensor recordings can ensure full documentation of the fisheries carried out by smaller gillnetters, and whether the use of "pingers" (acoustic deterrent devises) can be more operational.

Furthermore, the project has the aim to proof that:
- A total recording of all catches of quota managed species and a reduction of “high-grading”
- Involvement of the fishing industry in collection of detailed data and thereby ensure industry involvement for joint responsibility for the collection of data to be used as the basis for the scientific advice
- An adequately documentation that can ensure that the fishery could be carried out sustainably in sensitive marine areas such as NATURA 2000 sites
- An improved economy for vessels that participate in fully documented fishery
- A documentation that can provide the basis for the marked to be able to evaluate sustainability of the fisheries.

The project is coordinated by DTU Aqua.
Energy efficiency in the aquaculture sector (38802)

The increased implementation of technologies for water recirculation and the purification, oxygenation and degassing of water used in aquaculture production, has caused the energy costs associated with fish production to dramatically increase. The current energy consumption for the production of 1 kilogram of rainbow trout is estimated at 1.7 kWh. This represents a challenge for the aquaculture industry because national and international ambitions strive for a general decrease in carbon dioxide emissions. The aim is to reduce the energy requirements for trout production to 1 kWh per kg.

With an annual production of 35,000 tons, this corresponds to an annual reduction in CO2 emissions of 13,400 tons, and a financial saving of DDK 17.1 million. The purpose of the project is to identify the most energetically efficient methods to oxygenate, degas and move water, or how to improve the efficiency of currently used methods, without compromising water quality parameters. Currently, the primary method for aeration, degassing and water movement is by use of air, using the so-called air lift pumps aka mammoth pumps.

The project will collect data on annual energy consumption from 4-8 selected recirculating aquaculture facilities and compare these values with feed use and fish production. The energy consumption is considered with reference to the technologies in use at a given facility and the construction of the facility. The primary purpose is to evaluate energy efficiency of air blowers currently in use, air delivery per unit of effect, efficiency in aeration and degassing, and variations in the requirement for aeration and degassing over the daily cycle. These results will enable the documentation of any correlations between energy efficiency, technology in use, methods of operation, and will serve in the further development of alternative solutions to aeration and degassing. Emphasis will be on the physical properties and placement of air diffusers in airlift pumps and the feasibility of using trickle towers for aeration, aeration with liquid oxygen or other alternatives. Experiments to determine energy use and efficiency of alternate oxygenation and degassing devices will allow the project to determine whether more suitable technologies exist and make an estimate of potential energy savings.

The project will terminate in a final report and a workshop where the results will be presented to stakeholders in the aquaculture industry (fish farmers, feed manufacturers and equipment suppliers). Suitable alternative technologies and methods for aeration and degassing will be presented in practice.

The project is coordinated by Danish Aquaculture Association, Denmark.

National Institute of Aquatic Resources
Section for Aquaculture
Danish Aquaculture Organisation
AquaCircle
Lokalenergi A/S
BioMar A/S
Danish Technological Institute
Nielsen Consult
Period: 01/01/2010 → 01/10/2012
Number of participants: 1
Research area: Aquaculture
Project Manager, academic: Skov, Peter Vilhelm (Intern)
Project

EU preparatory action on maritime spatial planning in the North Sea (MASPNOSE) (38895)

Several EU member states had been working on spatial plans for their part of the North Sea. However, most marine spatial planning was carried out on a national level and largely ignored the possible benefits of cross-border cooperation. Joining forces with neighboring countries could have been an efficient way forward. A first step in this direction was the EU MASPNOSE project that brought together spatial planning practitioners, stakeholders and researchers in order to deal with these bottlenecks. MASPNOSE was an EU project on ecosystem based Maritime Spatial Planning (MSP) in the North Sea, focusing on cross-border areas. The project focused on the southern North Sea with Belgium, Denmark, Germany
and the Netherlands as target countries.

To achieve this aim, MASPNOSE explored possibilities for cooperation among North Sea countries; established elements for a common agenda for cooperation of countries around the North Sea; tested the 10 key principles on Maritime Spatial Planning set up by the European Commission; and identified potential barriers and opportunities for cross border Maritime Spatial Planning.

The MASPNOSE project acknowledged the overarching importance of national authorities and other stakeholders (e.g. industries, NGO’s) in Maritime Spatial Planning. National governments had an advisory role in the project. Stakeholder participation was one of the focus points of the project and took place in the different case studies on a local scale. MASPNOSE could be seen as an experiment on how cross-border Maritime Spatial Planning could be carried out. This was based on two cross-border case studies in the North Sea: the Dutch-Belgian border and the Dogger Bank.

The project was coordinated by Wageningen University, The Netherlands.

The project was funded by EU, Call for tender (Preparatory Action for Maritime Spatial Planning).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Stichting DLO
Deltares
Johann Heinrich von Thünen-Institute

Ghent University
Period: 01/01/2010 → 31/05/2012
Number of participants: 3
Research areas: Ecosystem based Marine Management & Marine Living Resources & Coastal Ecology
Project participant:
Dinesen, Grete E. (Intern)
Egekvist, Josefine (Intern)
Project Manager, academic:
Sørensen, Thomas Kirk (Intern)
Project

European basin-scale analysis, synthesis and integration (EURO-BASIN) (38899)
EURO-BASIN was designed to advance our understanding on the variability, potential impacts, and feedbacks of global change and anthropogenic forcing on the structure, function and dynamics of the North Atlantic and associated shelf sea ecosystems as well as the key species influencing carbon sequestering and ecosystem functioning. Like the entire biosphere, marine ecosystems such as the North Atlantic and its associated shelf sea ecosystems can be characterized by emergent properties controlled by a dynamic network of interactions and relationships and not static entities. This system complexity is what Martin Luther King Jr. called "an inescapable network of mutuality" scientists today define as complex adaptive systems (CASs).

EURO-BASIN has represented the first attempt of creating future prognosis of marine ecosystem states sensitive to CAS dynamics using as its test case the North Atlantic. Long-term prediction of the status of these CAS systems, population dynamics of key species and hence management of marine systems requires the implementation and advancement of an ecosystem approach for the management of marine resources sensitive to CAS dynamics. What is the ecosystem approach? Unlike a single species approach, the ecosystem approach takes into account population and ecosystem responses to changes in the Earth's climate, fisheries, and interactions between them. In EURO-BASIN not only did we monitor and assess how North Atlantic marine ecosystems behaved in the past, but also predict how they will respond under possible future climate change scenarios. Hence, the results of this project have provided important recommendations for better marine resource management in the European Union.

The project had participants from 23 European universities and research institutions as well as collaborations with key institutions and Universities in the US and Canada.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Period: 01/01/2010 → 31/12/2014
Number of participants: 12
Research areas; Marine Populations and Ecosystem Dynamics & Oceanography & Marine Living Resources
Acronym: EURO-BASIN
Number of related Ph.D. students: 4
Contact person:
Grigorov, Ivo (Intern)
Project participant:
Andersen, Ken Haste (Intern)
Jonasdottir, Sigrun (Intern)
Kiørboe, Thomas (Intern)
Koski, Marja (Intern)
Munk, Peter (Intern)
Stæhr, Karl-Johan (Intern)
Visser, Andre (Intern)
Project Manager, organisational:
Köster, Fritz (Intern)
MacKenzie, Brian (Intern)
Project Manager, academic:
St. John, Michael (Intern)

Relations
Activities:
40th CIESM Mediterranean Science Commission Congress: Mediterranean Science Commission, Annual Congress
Publications:
Acclimation, adaptation, traits and trade-offs in plankton functional type models – seeking clarity in terminology
Fishing out collective memory of migratory schools
Winter–spring transition in the subarctic Atlantic: microbial response to deep mixing and pre-bloom production
Trophic position of coexisting krill species: a stable isotope approach
Spatially explicit estimates of stock sizes, structure and biomass of herring and blue whiting, and catch data of bluefin tuna
Size structures sensory hierarchy in ocean life
Physiological constrains on Sverdrup’s Critical-Depth-Hypothesis: the influences of dark respiration and sinking
Long-term changes of euphausiids in shelf and oceanic habitats southwest, south and southeast of Iceland
Krill diversity and population structure along the sub-Arctic Godthåbsfjord, SW Greenland
Interactive effects of temperature and light during deep convection: a case study on growth and condition of the diatom
Thalassiosira weissflogii
Identifying marine pelagic ecosystem management objectives and indicators
Gut evacuation rate and grazing impact of the krill Thysanoessa raschi and T. inermis
Effects of climate-induced habitat changes on a key zooplankton species
Distributions and seasonal abundances of krill eggs and larvae in the sub-Arctic Godthåbsfjord, SW Greenland
Comparative ecology of widely distributed pelagic fish species in the North Atlantic: Implications for modelling climate and fisheries impacts
Challenges in integrative approaches to modelling the marine ecosystems of the North Atlantic: Physics to fish and coasts to ocean
Bridging the gap between marine biogeochemical and fisheries sciences; configuring the zooplankton link
A resolution to the blue whiting (Micromesistius poutassou) population paradox?
A cascade of warming impacts brings bluefin tuna to Greenland waters
Effects of temperature and food availability on feeding and egg production of Calanus hyperboreus from Disko Bay, Western Greenland
Long-term retrospective analysis of mackerel spawning in the North Sea
Marine snow, zooplankton and thin layers: indications of a trophic link from small-scale sampling with the Video Plankton Recorder
The rise and fall of the NE Atlantic blue whiting (Micromesistius poutassou)
Spatial segregation within the spawning migration of North Eastern Atlantic mackerel (Scomber scombrus) as indicated by juvenile growth patterns

Patchy zooplankton grazing and high energy conversion efficiency: ecological implications of sandeel behavior and strategy

Population structure of Atlantic Mackerel (Scomber scombrus)

Distribution of phytoplankton functional types in high-nitrate low-chlorophyll waters in a new diagnostic ecological indicator model

Migration and fisheries of North East Atlantic mackerel (Scomber scombrus) in autumn and winter

Effects of a future warmer ocean on the coexisting copepods Calanus finmarchicus and C. glacialis in Disko Bay, Western Greenland

Pseudocollapse and rebuilding of North Sea mackerel (Scomber scombrus)

Press / Media items:

Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.

Project

Fisheries management in NATURE 2000 areas (38797)

Approximately 17% of the Danish sea territory is appointed as Nature 2000 areas. Many of these areas are also very important for fishery. To allow fishery to continue in Nature 2000 sites, it must be demonstrated that the fishery does not negatively impact the basis for appointment for the site. The project aims to establish the science base for development of a concept for Environmental Impact Assessments (EIA) for fishery and aquaculture in Nature 2000 areas, as well as establish interactions between the mussel fishery and the basis for appointment of Nature 2000 areas. The results generated will provide input to the EIA conducted by DTU Aqua and to other advisory issues related to mussel fishery, and to improve the environment in Nature 2000 areas. The approach is a combination of field experiments, model development and theoretical work. Through the project, knowledge will be generated on eelgrass, macrophyte and blue mussel ecology and abundance and interactions with mussel fishery. Development of the oyster fishery in the Wadden Sea will be developed with focus on the Nature 2000 site N89. Seabed mapping of the stone reefs in the Little Belt Sea will include an analysis of the impact of blue mussel fishery on these habitats. Finally the project will establish knowledge base for interactions between aquaculture and Nature 2000 areas.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Danish Shellfish Centre

Period: 01/01/2010 → 30/09/2012

Number of participants: 7

Research areas: Ecosystem Based Marine Management & Observation Technology

Project participant:

Dinesen, Grete E. (Intern)
Stage, Bjarne (Intern)
Lisbjerg, Dennis (Intern)
Rasmussen, Richard Skøtt (Intern)

Project Manager, academic:

Dolmer, Per (Intern)

Christoffersen, Mads (Intern)

Poulsen, Louise K. (Intern)

Project

Forage fish interactions (FACTS) (38781)

Removal of a forage fish has consequences for both predators and prey of forage fish. As everything is connected, every management action has a price which goes beyond the apparent, direct effect on the target species. The fishery on forage fish can therefore not be seen in isolation, as the immediate gain in profit from the fishery has to be discounted by the lowered potential for production of large piscivorous fish. Management actions on other species also influences forage fish, i.e. conservation efforts on marine mammals or sea birds have direct consequences for the predation pressure on forage fish.

The objective of the project was to provide insight and quantitative advice on the ecosystem wide consequences of management actions directly or indirectly related to forage fish.
The two overarching questions were:
- What are the consequences of forage fish fisheries on (a) predator growth and abundance, (b) economic output of fisheries on piscivorous species, and (c) ecosystem stability and the risk for regime shifts?
- What are the consequences of changes in predator populations on forage fish populations and fisheries?

The method was a combination of ecosystem models, of process studies aimed at feeding into the models, of economic models, and of data-analysis of existing data sources.

The project covered four ecosystems in detail: Norwegian-Barents Sea, Baltic Sea, North Sea and Bay of Biscay.

FACTS brought together leading European fisheries and university institutes working on creating the tools for ecosystem based management. The active involvement of the institutes in the current management has provided a means for the results of the project to feed into management. The project furthermore included a network component which has ensured a wider dissemination of methods and results within the marine scientific community.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Wageningen IMARES
Cefas
Marine and Food Technological Centre
IFREMER
University of Hamburg
Institute of Marine Research
University of Southern Denmark
Christian-Albrechts-Universität zu Kiel
Finnish Game and Fisheries Research Institute
Centre National de la Recherche Scientifique
University of Copenhagen
Leibniz-Institute for Baltic Sea Research
University of St Andrews
Spanish Institute of Oceanography

Period: 01/01/2010 → 31/12/2012
Number of participants: 4
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Ecosystem based Marine Management

Further development of Danish organic aquaculture (ØKOAKVA-1) (38806)

The first Danish organic rainbow trout with the Danish red Ø label was introduced to the market in 2005. The demand for organic trout is increasing and Danish trout farmers are currently converting to organic production. However, the development of organic trout production in Denmark has been challenged by a very strict national legislation for organic aquaculture production. However, by the coming into force of the EU regulation for organic aquaculture by 1 July 2010 equality was established between the European organic fish farmers, but new challenges were faced by the Danish organic farmers. Therefore, further development and establishment of sustainable organic fish production in Denmark required strengthened research efforts, i.e. nutritional and environmental aspects, farming conditions, health, green energy and water consumption to improve the competitiveness and efficiency in production.
The project aim was to facilitate the implementation of the EU regulation on Organic Aquaculture for the production of rainbow trout in fresh and sea water, organic production of line mussels and sea weed.

The project was coordinated by Danish Aquaculture Association, Denmark.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

**National Institute of Aquatic Resources**

**Section for Aquaculture**

**Danish Aquaculture Organisation**

**Danish Veterinary and Food Administration**

**Period**: 01/01/2010 → 31/03/2013

**Number of participants**: 1

**Research area**: Aquaculture

**Project Manager, academic**: Jokumsen, Alfred (Intern)

**Genetic and genomic approaches to the study of Atlantic eels: Speciation, genetic population structure and footprints of selection (38875)**

Anguillid eels, including European (Anguilla anguilla) and American eel (A. rostrata) have fascinated scientists for centuries. At the same time, their geographical distribution and life cycle make them highly suitable study objects to address fundamental issues in evolutionary biology related to speciation and adaptation.

In this project, we made use of unique samples of eel larvae collected in the Sargasso Sea during the Galathea 3 expedition. Novel genomic resources generated by 454 massively parallel sequencing and novel statistical methods were used for:

- testing if the two species represent sympatric speciation;
- analysing the demographic history of the species, comparing present declines to historical population declines;
- testing whether or not European eel is panmictic, despite widespread geographical distribution of adult eels in continental Europe and North Africa;
- testing whether the distribution of both species across subarctic to subtropical environments reflects extreme phenotypic plasticity or footprints of temperature-related selection is evident at the genomic level.

Scientific papers reporting results generated from this project include:

- Als, Thomas Damm; Hansen, Michael Møller; Maes, Gregory E.; Castonguay, Martin; Riemann, Lasse; Aarestrup, Kim; Munk, Peter; Sparholt, Henrik; Hanel, Reinhold; Bernatchez, Louis. 2011. All roads lead to home: panmixia of European eel in the Sargasso Sea. Molecular Ecology, Vol. 20, 1333-1346.

The project was coordinated by Department of Biological Sciences, Aarhus University.

The project was funded by the Danish Council for Independent Research.

**National Institute of Aquatic Resources**

**Section for Marine Living Resources**

**Aarhus University**

**Period**: 01/01/2010 → 31/12/2012

**Number of participants**: 3

**Research area**: Population Genetics

**Project participant**: Bekkevold, Dorte (Intern)

**Mensberg, Karen-Lise Dons (Intern)**

**Project Manager, academic**: Als, Thomas Damm (Intern)
**Geographical distribution of fish resources and optimizing of fishery practice in the north-eastern North Sea (RESOURCE)** (38878)

RESOURCE is a collaborative fishermen-scientist project in direct continuation of the REX projects in the north-eastern North Sea conducting small-scale scientific surveys, but only with one commercial trawler, encompassing also geographical distributional aspects as in OSKAR.

The REX project showed that changes in the biomass densities of cod differ between bottom types (and may depend on stock size) and the proportion of the cod population found on smooth bottoms is not constant. However, due to scaling problems and too short a time series the achieved results have so far had no impact on the assessment procedure or any (measurable) effect on the TAC’s (but the RAC discussions may have affected decisions by the European Commission). Continuation of the field work with the trawler in 2010-12 in the RESOURCE project should produce a sufficient time series for supplementing the abundance indices for the older ages in the assessment, which at present are based only on the catch rates in the international scientific surveys (IBTS). This total REX-RESOURCE time series will be used in the state space assessment of North Sea cod (SAM) and various other approaches applied to document how commercial CPUE may be used in the tuning procedure. Particular attention will be given to evaluate the size of the spawning stock of cod.

Mechanistic knowledge on vital rates together with REX, RESOURCE, OSKAR and IBTS (and possibly also UK) survey data will be used as input to the geostatistical tool GeoPop to estimate the temporal and spatial dynamics of the size distribution of the cod stock. This part of the project will represent a direct continuation of OSKAR principles including considerations to how to design an operational fishery-forecast system for North Sea cod.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography

Danish Fishermen's Association

**Helpdesk for aquaculture (HelpDesk)** (38696)

In the project different environmental issues related to regulation of aquaculture have been addressed according to specific needs and questions from the Ministry of Food, Agriculture and Fisheries and the Ministry of Environment.

Specifically, a calculation model for predicting waste generated from fish farming has been developed. This Excel-based model is able to calculate the waste generated by the fish depending only on the fish performance (FCR) and the composition and digestibility of the feed used.

The model, valid for rainbow trout up to 800 g/pcs in freshwater, was verified through various experiments using commercial feed types, and is now a central element in the regulation of the Danish freshwater trout farming industry. It is used throughout the industry and administration and has generated a common background and baseline for all stakeholders.
A group consisting of the Ministry for Food, Agriculture and Fisheries, the Ministry of Environment, the Danish municipalities’ organization Local Government Denmark was formed and acted as reference/steering group.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2010 → 30/11/2013
Number of participants: 3
Research area: Aquaculture
Project participant:
Dalsgaard, Anne Johanne Tang (Intern)
Pedersen, Per Bovbjerg (Intern)
Jokumsen, Alfred (Intern)

**Project Improvement of energy efficiency of fishing gear (38886)**

The project's aim is to demonstrate the best available technology in fishing gear and equipment, to lower the energy consumption and increase the profit of the vessels economy.

A typical fishing vessel from the Baltic area is used as demonstration platform. Change of trawl gear, doors and the additional rigging will be done. The trawl is constructed to give less water resistance. The doors to be used are pelagic doors, in contrast to the present doors that are typical bottom trawl doors. The lines and ropes are changed to the Dyneema material which has a higher braking point with a smaller diameter. Dyneema® is an UHMwPE fiber, DSM invented it 20 years ago and it's been in production since 1990, the fiber is incredibly versatile with virtually limitless applications. The fiber is manufactured by means of a gel-spinning process that combines extreme strength with incredible softness. High strength/low weight – Dyneema® is 15 times stronger than steel, and 40 % stronger than aramids on a weight-for-weight basis.

It is expected that the effect will reduce the energy consumption within 30-40 %. The results until now indicate that this goal can be reach.

Additional partners than the above mentioned: Five subcontractors.

The project is coordinated by Gemba Seafood Consulting, Denmark.

National Institute of Aquatic Resources
Public Sector Consultancy
Fishermen’s Association of Bornholm and Christiansø
Gemba Seafood Consulting
Espersen A/S

Danish Fishermen's Association
Period: 01/01/2010 → 31/12/2011
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Larsen, Erling (Intern)

**Project Improving the selectivity for cod in Danish trawl fisheries (38887)**

The aim of the project was to develop and test more selective fishing gear for three major Danish fisheries:
- The demersal trawl fishery in the North Sea (120 mm)
- The demersal trawl fishery in Kattegat and Skagerrak (90 mm)
- Improve the selection range (SR) in the BACOMA codend used in the Baltic Sea

The new and more selective fishing gears were developed under consideration of the economy in the fishery. The project delivered three new selective gear solutions of which two were tested during experimental fishery. Technical descriptions of the new designs were delivered. Furthermore, an economical model to quantify the economic consequences of using
Experiments were conducted in the Baltic Sea cod fishery demonstrating that the selection range (SR) could be reduced by using a larger diamond mesh in the lower sheet of the BACOMA design. Further the project demonstrated the efficiency of legal selective escape panels in Skagerrak/Kattegat and the effect of varying design parameters in both the panel section and the trawl body. Finally the project demonstrated that active stimulating fish behavior around selective escape panels significantly can improved the escape panels’ selectivity.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture, and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Johann Heinrich von Thünen-Institute

Danish Fishermen's Association
Period: 01/01/2010 → 31/12/2012
Number of participants: 4
Research area: Fisheries Technology
Project participant:
Karlsen, Junita Diana (Intern)
Feekings, Jordan P. (Intern)
Project Manager, academic:
Krag, Ludvig Ahm (Intern)
Herrmann, Bent (Intern)

Integrated management of agriculture, fishery, environment and economy – a strategic research alliance (IMAGE/MAFIA) (38772)

Background and Objectives
Management of terrestrial and aquatic ecosystems is legally defined in several European directives. The scientific basis for implementing the directives has been limited by insufficient models, deficiencies in terms of uncertainties, local and regional aspects and lack of knowledge on the interplay between agriculture, fishery, environmental qualities in all surface waters, and economy. The project aimed to establish an interdisciplinary and international approach designed to establish a body of knowledge to develop tools, models, scenarios and predictions in order to integrate science and management from agriculture, fishery, aquatic environments and economy into a common platform. The main aims were to link the complex interplay between land use in the drainage basins, the transport of nutrients to water bodies, biogeo-chemistry of freshwater and marine water, marine ecosystem dynamics and the removal of biomass and nutrients in marine fisheries all integrated into a management strategy evaluation (MSE) framework consisting of linked catchment area and river-run-off models, marine bio-geo-chemical models, end-to-end marine ecosystem models, fishery models, economic and cost-minimization models, and ecosystem services assessments models. Such a complex model and MSE framework could be used to assess effects of changing market conditions, changed agricultural and fishery support policies, as well as fulfillments of water related directives.

Tasks and Deliverables
The Danish Strategic Research Council financed project IMAGE was a strategic research alliance between central Danish and international fisheries and marine environment based university institutes. The project integrated, educated, and trained new researchers and private and public end-users to develop and work with a number of empirical and dynamic models and management tools, further developed into cross traditional media and science-based decision support systems, to strengthen national and international environmental management. The results published in a high number of scientific peer reviewed articles have provided major scientific progress. The results and research quality included analyses of novel processes and development of new and improved models, integrated prognoses and scenarios for the interplay between changes in the drainage basins and the ecological and economic consequences, and a number of science-based decision support tools. The work involved (i) identification of key elements and reduction of uncertainties in using complex models, (ii) designing, developing and integrating important new concepts in the models, (iii) linking models and evaluating their ability to detect and follow changes in terrestrial environments into ecological and economic consequences, and (iv) strengthened Danish research in linking science, modeling and management of the environment and economics and thereby consolidating a strong international position. The DTU Aqua has focused on further development, implementation and validation of advanced models and fisheries and ecosystem management evaluation tools: Development, calibration and implementation of the Baltic ATLANTIS end-to-end ecosystem and tropho-dynamic model linked to the HBM-ERGOM physical and bio-geo-chemical models and the FISHRENT fishery economic model; Further development and implementation of the bio-economic and individual vessel based multi-stock-multi-fleet DISPLACE simulation model; Dynamic coupling of the Baltic FLR multi-stock-multi-fleet bio-economic model to the SMS-Multi-Species model. The focus has been on biological interactions and integrated fisheries interactions.
Partners
The project had 12 project partners mainly from Danish universities (AU, DTU, KU, SDU) and national fisheries economics and fisheries research institutes (SMHI Sweden), but also from American, Swedish and Finnish universities as well as SMEs (e.g. DHI). The project was coordinated by Aarhus University. DTU Aqua was main project developer, WP4 leader and member of the Project Steering Group.
This project was funded by the Danish Council for Strategic Research.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2010 → 31/12/2015
Number of participants: 7
Research areas: Fisheries Management & Ecosystem based Marine Management
Project participant:
Bastardie, Francois (Intern)
Ross, Stine Dalmann (Intern)
Eigaard, Ole Ritzau (Intern)
Christensen, Asbjørn (Intern)
Palacz, Artur (Intern)
Andersen, Bo Solgaard (Intern)
Project Manager, academic:
Nielsen, J. Rasmus (Intern)

Integrative Fish Behavioural Neuroscience Network (BIFINE) (38812)
The aim of the network was to encourage exchange of ideas and stimulate collaboration across disciplines. A multitude of disciplines were represented, each offering distinct and powerful tools for the study of behavioral neuroscience of fishes.

The network included leading groups in Denmark, Norway, Sweden and Finland, representing the following research fields: general fish physiology (both at the phenotypic and genotypic level), genetic modification, genotype-phenotype interactions, molecular biology, biomedicine, evolutionary ecology, stress responses and neurotransmitter mechanisms, neuroanatomy and developmental neurobiology.

The integration of the above mentioned disciplines aimed at meeting the growing need to understand underlying mechanisms of fish behavior and how it is affected by environments change, including anthropogenic disturbance and climate changes and at improving our understanding and tackling of key issues associated with fish aquaculture, welfare, restoration and climate change.

The project was coordinated by DTU Aqua.

The project was funded by Nordforsk, Nordic Council of Ministers.
National Institute of Aquatic Resources
Section for Aquaculture
Norwegian School of Veterinary Science
Uni Research AS
University of Gothenburg
Uppsala University
Lund University
University of Helsinki
University of Bergen
Norwegian University of Life Sciences
Interaction in coastal waters: A roadmap to sustainable integration of aquaculture and fisheries (COEXIST) (38789)

The project aims to provide a roadmap towards improved integration, sustainability and synergies among different activities in the coastal zone.

The project will study interactions between capture fisheries and aquaculture, and evaluate mutual benefits and possible bottlenecks for concomitant development of these activities in the coastal zone within the context of the ecosystem approach to management.

The project will also develop and evaluate different forms of coastal aquaculture and fisheries at different scales and exploit mutual opportunities within a concept of competition for space by multiple users.

Furthermore, the project will address differences in acceptance of activities by society and develop a strategy for communication and involvement of stakeholder as well as for dissemination of results to general and targeted audiences. Six case studies are involved. Individual processes and their interaction will be investigated in each case study using spatial management tools and an array of models.

The project is coordinated by Institute of Marine Research, Norway.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Johann Heinrich von Thünen-Institute
University College Cork
IFREMER
National Institute of Biological Resources
Finnish Game and Fisheries Research Institute
Consiglio Nazionale delle Ricerche
Cefas
Wageningen IMARES
Aqua TT UETP Ltd
Finnish Environment Institute
Institute of Marine Research, Denmark

Wageningen University & Research
Period: 01/01/2010 → 31/12/2012
Number of participants: 7
Research area: Coastal Ecology
Project participant:
Støtrup, Josianne Gatt (Intern)
Stenberg, Claus (Intern)
Sørensen, Thomas Kirk (Intern)
Dinesen, Grete E. (Intern)
Nielsen, J. Rasmus (Intern)
Bastardie, Francois (Intern)
Project Manager, academic:
Dolmer, Per (Intern)
Migration and spawning behaviors of brackish water perch and pike (38413)

Brackish water populations of pike and perch have decreased severely along the coasts of the Baltic Sea. In Denmark a drastic decline in catches of brackish water pikes has been recorded during the last 30-40 years. Both brackish water pikes and perch are well estimated in angling and commercial fisheries on the brackish coastlines around the southern part of Zealand and the southern islands. Very little is known about their behaviour and life history, for instance the possible dependence of access to freshwaters to spawn. Obstacles in rivers and hereby blocking of migratory routes can therefore be crucial to reproductive success and survival of brackish fish populations along with deterioration of spawning areas in freshwater. In some areas perch is known to migrate into rivers to spawn in freshwater, but perch are also observed to spawn in brackish waters. In the Gulf of Bothnia perch have different spawning and migration strategies and some perch spawn in the bays with salinities of 6 ppt, whereas the upper limit of salinity tolerance during spawning is not known in Danish areas, where salinity is often 8-10 ppt.

The present project aims to initiate investigations of the dependence of perch for access to freshwater lakes and bogs for spawning. In particular it will be explored if it is possible to enhance brackish water perch recruitment by creating or reopening of access to lakes and bogs along a river system and this way to be able to re-establish or increase the brackish water perch fishery. This is highly relevant to local authorities that manage restoration of rivers and lakes. For this purpose the perch population of a large number of lakes and bogs along river systems with present or historical migration of brackish water perch will be monitored. Some of the lakes have connection to the river, some not, and in the latter a connection will be created afterwards. The fish population and recruitment of perch will be studied before and after the intervention. Scale chemistry will be explored and possibly this will be able to define whether large perch caught in the lakes and bogs during spawning actually had a brackish water life history. The project also aims to elucidate the salinity tolerance of perch under Danish condition to establish whether it is possible that some perch spawn along the coast and bays of southern Denmark. The project is done in close cooperation with municipalities around southern Zealand.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Aalborg University
Municipality of Næstved
Municipality of Vordingborg
Municipality of Guldborgsund
University of Copenhagen
Period: 01/01/2010 → 31/12/2016
Number of participants: 4
Research area: Freshwater Fisheries and Ecology
Project participant:
Berg, Søren (Intern)
Skov, Christian (Intern)
Aarestrup, Kim (Intern)
Project Manager, academic:
Jacobsen, Lene (Intern)
Project

Monitoring and modelling vertical movements of Greenland halibut in Disko Bay (38795)

The project measured and parameterized Greenland halibut behaviour in terms of vertical movement patterns by means of data storage tags. The tags were released (and recaptured) prior to the project period under another project, so that data was available at start of the project.

Previous measurements using Data Storage tags on halibut tagged in Disko Bay have shown that the halibut undertake distinct vertical migrations of several hundred meters at a time during a few hours.

The findings in the project from analyses of the previous tagging’s gave important biological information on the seasonal migration patterns for Greenland halibut in the West Greenland Fjords; icefjords are mainly preferred as wintering habitat for the fish while the outer parts of the fjord systems are summer habitats. Further, the study showed that halibut are fast vertical swimmers most likely when chasing pelagic prey fishes.

The project was coordinated by DTU Aqua.

The project was funded by the Commission for Scientific Investigations in Greenland (KVUG).
Open Minds (38782)
Open Minds is a user driven innovation process. The project includes three important Danish sectors, which is headed by the following research and GTS institutions:
- Building sector: Technology College, Aalborg, Denmark
- Food sector: Technical University of Denmark
- Experience sector: Alexandra Institutet, Aarhus, Denmark

More than 15 companies are affiliated the project and two organizations with more than 350 members are working within the project. The project is creating an innovation process by using representatives from the different sectors. The project is creating a forum where IBT technology providers (IBT: Information technology carrier) can meet the users, this forum is facilitated by the research and GTS institutions.

Physical oceanography in Greenland waters under climate change (38767)
Changing climatic conditions will have considerable effects on the seas around Greenland. Melting glaciers, the formation of sea ice, large scale circulation of the Atlantic Ocean as well as more local changes in weather patterns will have direct impact, with cascading effects to biological processes and sustainable harvesting of marine resources. The aim of this project is to prepare modeling tools and analyses to describe expected oceanic conditions around Greenland under climate change. Particular focus will be on coupling these models and process studies to biology, biogeochemical cycling, and sea ice processes, with eventual feed backs to climate itself.

The project is coordinated by DTU Aqua.
Production of mussels: Mitigation and feed for husbandry (MUMIHUS) (38790)

The concept of MuMiHus was to develop and document mussel farming as a means of mitigating effects of eutrophication of the coastal zone. Specific objectives of the project were i) to adapt known mussel farming techniques to production of maximal biomass at lowest possible costs; ii) to assess environmental impact of blue mussel extraction culture with special focus on benthic effects; iii) to integrate the results in an ecosystem based management model in order to make an overall assessment of environmental impact; iv) to assess effects of low salinity and cyanobacteria occurrence on growth of blue mussels through bioenergetic studies; v) to develop management tools for and economic analysis of extraction cultures as a mitigation measure; vii) to assess bioaccumulation of contaminants in blue mussels as a prerequisite for future use of mussels as feed in husbandry.

MuMiHus demonstrated that mussel farming may be an efficient means of mitigation in terms area efficiency and it was shown that more biomass could have been produced per area unit. Environmental impact studies and modelling showed that in highly eutrophic areas like Skive Fjord, negative environmental impact of mussel farming on the benthic environment are difficult to detect due to the already high organic loading to the sediment. It was further demonstrated that mussel farming might have a relatively higher effect on environmental quality indicators like water transparency compared to load reduction. Based on physiological studies and assessment of environmental conditions a number of coastal areas in Danish waters were appointed as suited for mitigation culture of mussels. Costs of nutrient removal through mussel farming were calculated and cost effectiveness of mussel farming was shown to be compatible to most of the remaining available land based abatement measures. Concentration of hazardous substances in the mussels was shown not to be in conflict with use of the produced mussels for feed or human consumption.

The project was coordinated by Danish Shellfish Centre.

The project was funded by the Danish Council for Strategic Research.

Reproduction of European eel: Towards a self-sustained aquaculture (PRO-EEL) (38793)

Reproduction of European eel (Anguilla anguilla) in culture has become a research priority area due a severe decline of natural stocks and an increasing interest to breed eels for a self-sustained aquaculture. As eels do not reproduce naturally in captivity, development of methodology and technology was needed for production of viable eggs and larvae from broodstock in a regular and predictable way.
Focus of PRO-EEL project was on the primary bottlenecks in a controlled reproduction of eels, which concern deficiencies in knowledge about eel reproductive physiology and methods applied to induce and finalize gamete development. During a 4-year period, the project significantly expanded current knowledge on the eel reproductive mechanisms and hormonal control of sexual maturation. The consortium developed standardized protocols for assisted production of high quality gametes (egg and sperm) and artificial fertilization, thereby obtaining a stable production of viable embryos. Furthermore, egg incubation procedures and culture of yolksac larvae were established for the first time for European eel, leading to the first feeding stage. The project disseminated novel literature on early life stages, including their ontogeny and requirements thereby describing egg and larval stages still unknown in nature and providing important information for future development of larval diets and rearing technology. Methodology and technology was established using small scale tests and validated in full scale experimental facilities managed by DTU.

The project was an international, EU-funded research project characterized by an integrative and multidisciplinary approach. The consortium brought together leading experts in eel reproduction complemented by expertise in disciplines filling gaps in knowledge and technology. The consortium included 15 partners, comprising European research institutes and industry partners as well as an international collaboration partner country (ICPC). Within DTU, the project involved DTU Food, Research Group for Bioactives – Analysis and Application, and several DTU Aqua research areas including Fish Biology, Aquaculture, Marine Populations and Ecosystem Dynamics, and Coastal Ecology.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Food Institute
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Wageningen IMARES
Leiden University
National Centre for Scientific Research "Demokritos"
Polytechnic University of Valencia
NOFIMA
Ghent University
University of Copenhagen
National Institute for Agronomic Research
Billund Aquaculture Service Aps
National Institute of Sciences and Technologies of the Sea
Institute of Marine Research
Norwegian University of Science and Technology
BioMar A/S
Period: 01/01/2010 → 31/07/2014
Number of participants: 9
Research areas: Fish Biology & Aquaculture & Marine Populations and Ecosystem Dynamics & Coastal Ecology
Project participant:
Butts, Ian (Intern)
Støttrup, Josianne Gatt (Intern)
Sørensen, Sune Riis (Intern)
Skov, Peter Vilhelm (Intern)
Steenfeldt, Svend Jørgen (Intern)
Hornum, Inger (Intern)
Project Manager, academic:
Tomkiewicz, Jonna (Intern)
Munk, Peter (Intern)
Krüger-Johnsen, Maria (Intern)
Project
**Restoration of fish habitats by recreation of biogenic reefs in Nørre fot (blue mussel reefs) (38788)**

The aim of the project was to improve fish habitats and fish populations in Nørre fot by restoring blue mussel reefs in the fjord. This was based on the assumption that blue mussel reefs would provide complex habitats for fish, and improve the conditions and availability of prey organisms and hiding places for both juvenile and adult fish in the fjord.

Blue mussels (~ 44 ton) were produced on ropes in the fjord from the indigenous mussel larvae stock in 2 years, 2010 and 2011. Harvested mussels were distributed on sandy-muddy seabed in a study area in the southern part of the fjord mainly by use of volunteer, local fishermen. The mussel reefs were laid out as small patches (3 m in diameter) with 5 to 7 m in between to increase the complexity of the fjord substrate and covered in total an area of 121,000 m². The design mimicked the observed distribution of existing mussel beds in the fjord. Different approaches for production of the mussels and deployment of the reefs were investigated to minimize costs and labor.

The production of blue mussels on suspended long lines/on hemp sacks was a more ecologically sustainable method compared to transplanting blue mussels by destructive dredging. Crowdsourcing allowed us to conduct the experiments cost-effectively although it did cause challenges in the planning and implementation processes.

A scientific monitoring program monitored the distribution of fish populations and prey organisms in the study area and a control area in 2010 and 2011, before and after the restoration of the mussel reefs in the study area. The establishment of blue mussel beds increased the abundance and diversity of fish on the mussel structures (Kristensen et al. 2015). Video observations revealed the presence of gobies were around the structures for extended periods but also larger fish such as cod, trout and flounder were observed near the established mussel beds.

The project relied on a strong stakeholder involvement and cooperation with the local fisheries association and local users of the fjord. Field work, including mussel production and deployment of the mussel reefs was carried out by volunteers from the local Fisheries Association supervised by the Nordshell consultant and DTU Aqua staff.

The project was coordinated by DTU Aqua.

The project was funded by the Fishery LAG Funen (established under the Rural District Program in EU Fisheries Development Program) and the Danish Ministry of Food, Agriculture and Fisheries.

**Selective trawls for the North Sea (38740)**

The goal of the project was to design, develop and test a selective trawl, which reduces the by-catch of cod, while still retaining high catch rates of flatfish, Norway lobster and anglerfish. A second requirement was that the trawl should be simple and fast to deploy and recover.

The project tested different possibilities to improve the selectivity of a cod end with a 140 mm sorting panel, as implemented in the fishing regulations. This included changes in mesh size of the panel and changes in panel position.

For different combinations of panel mesh sizes and panel positions, size selectivity functions were determined, to allow for designing the optimal configuration for different mixed fisheries.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
Sustainable shrimp fishery in Skagerrak (38994)
The main objective of the Norwegian-Swedish-Danish research project "Sustainable shrimp fishery in the Skagerrak" was to clarify whether there are one or more shrimp stocks in the Skagerrak. The management of shrimp fishing in the Skagerrak and Norwegian Deep is based on the perception of the shrimp resource as one large population. However, biological differences between shrimps (e.g., the size at sex change) indicate that there may be several stocks in the area. The question of one or more stocks was answered by collecting and genetically analyzing several thousand shrimp from Skagerrak and northern Kattegat, Norwegian Channel and the Norwegian fjords. The analyzed shrimps came both from research cruises and commercial fisheries. The kinship of the collected shrimp was examined with modern DNA technique and the results compared with existing knowledge of the biology of the species. This knowledge was obtained from scientific sources as well as from the fishing industry in terms of skipper interviews. The genetic analyses revealed that shrimps in Skagerrak and Norwegian Deep all belong to the same stock, but also that some of the fjord-populations are genetically distinct (can be considered separate stocks). These results are published in ICES Journal of Marine Science in 2015.

The fisher information collected in the project was not only focused on shrimp biology but also addressed economical and technical aspects of the shrimp fishery. In this way, scientists have gained an understanding of both how shrimp populations are structured and distributed in the Skagerrak and of the economic importance. The exchange of knowledge between researchers and fishers was an important aspect of the project and was facilitated by regular meetings and interview schemes in all three countries.

Another primary objective of the project was to improve the current assessment of the Skagerrak shrimp stock by developing a new length-based analytical model. DTU Aqua was in charge of this part of the project and in an assessment benchmark in 2012 the developed model was accepted.

The project was coordinated by Institute for Marine Research, Norway.

The projected was funded by EU, InterReg (regional collaboration).
Sustainable smolt production – an integrated approach (SMOLTPRO) (38876)
Salmonid fish is an important natural resource in Scandinavia. Anadromous salmon and brown trout are important natural resources for recreation and fishing and are a part of our cultural heritage. Human activities however, have impaired the natural production of salmonids considerably. Large numbers of hatchery salmonids are therefore released, to compensate losses in natural production caused by hydroelectric power exploitation and other environmental impact. However, conventionally reared hatchery fish have difficulties adapting to natural conditions and therefore perform poorly after release.

New research shows that modifications of the conventional hatchery environment can have positive effects on the development of hatchery reared fish, but their long-term effects on performance in nature are poorly known. Previous research in this area has been too scattered and limited by insufficient infrastructure to conduct large scale experiments over the full life cycle. SMOLTPRO integrated the competence and resources in this field of research using a multidisciplinary approach. We evaluated the effects of modified rearing methods on smolt migration and survival, and its socioeconomic value.

Experiments were conducted in a series of full-scale model systems to evaluate the generality of effects across the climate zones in the Baltic Sea, Kattegat and the North Sea. Following a dialogue with relevant stakeholders, the results will have been used to produce new guidelines for sustainable smolt production.

The project was coordinated by University of Gothenburg, Sweden.

The project was funded by the Swedish Research Council FORMAS.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
University of Gothenburg
Norwegian Institute for Nature Research
Period: 01/01/2010 → 31/12/2014
Number of participants: 1
Research area: Freshwater Fisheries and Ecology
Project Manager, academic:
Aarestrup, Kim (Intern)
Project

The Atlantic cod (Gadus morhua) in Greenlandic waters – past and future under climate change (38873)
This project aimed at understanding and predicting the population dynamics of Atlantic cod (Gadus morhua) in Greenlandic waters in response to climate change. This was achieved through biological, chemical and genetic analysis of unique cod otolith collections, generating historical time series on growth, food composition and genetic population structure. Relationships between environmental changes and the historical distribution, size and growth of individual cod populations was elucidated and used to predict their dynamics under different climate scenarios. The project generated fundamental insights, but also contributed significantly to proactivemanagement of cod in Greenland.

The project was coordinated by DTU Aqua.

The project was funded by the Greenland Climate Research Centre.

National Institute of Aquatic Resources
Section for Marine Living Resources
Aarhus University
Greenland Institute of Natural Resources
Period: 01/01/2010 → 31/12/2013
Number of participants: 2
Research area: Population Genetics
Project participant:
Therkildsen, Nina Overgaard (Intern)
The effect of habitats on the distribution and behaviour of flatfish and cod

National Institute of Aquatic Resources
Period: 01/01/2010 → 02/06/2016
Number of participants: 7
Phd Student:
Kristensen, Louise Dahl (Intern)
Supervisor:
Grønkjær, Peter (Ekstern)
Stenberg, Claus (Intern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)
Examiner:
Andersen, Niels Gerner (Intern)
Bergström, Lena (Ekstern)
Norderhaug, Kjell Magnus (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Towards an integrated marine and maritime science community (MARCOM+) (38881)
The Aberdeen plus interest group joined forces with the Venice Platform group to take further steps in integrating the marine, maritime and coastal research sectors in Europe. The goal is to establish a sustainable and long-lasting partnership forum (European Marine and Maritime Science and Technology Forum), based on shared interests and shared leadership, and to test it on regional seas and pan-European basis. The process will contribute to developing interactions between partners (the research community, industry, regional authorities, civil society and other stakeholders) starting from regional scales to broader issues shared with EU-neighboring countries.

In the project DTU Aqua is representing the European Fisheries and Aquaculture Organization (EFARO).

The project is coordinated by International Council for the Exploration of the Sea (ICES).

National Institute of Aquatic Resources
Research Secretariat
International Council for the Exploration of the Sea
Coastal and Marine Union
European Council for Maritime Applied R&D Association (representing the Waterborne Technology Platform)
Marine Board – European Science Foundation
European Aquaculture Technology and Innovation Platform
Hellenic Centre for Marine Research
Royal Netherlands Academy of Arts and Sciences (representing the European Network of Marine Research Institutes and Stations MARS)
Community of European Shipyards Associations
Mediterranean Science Commission
Period: 01/01/2010 → 15/04/2012
Number of participants: 2
Research area: Ecosystem Based Marine Management
Project participant:
Köster, Fritz (Intern)
Traceability in the Danish fish sector (SIF) (38883)

The development of an operative system to have full traceability in the Danish fish sector, started in 2009, with the first project SIF 1. This was a specification of what an IT program should contain to meet the demands of the sector. The actual software development took place in the next project SIF 2. Due to some political implications to finance SIF 2 it was divided in SIF 2.1 and SIF 2.2. SIF 3 had to start before SIF 2.2 was finished and some elements were transferred between the two projects.

SIF 3 has the Danish title of “Dataopsamling af sporbarhedsdata” (collection of traceability data). The main activities are to specify and build the access points to the database constructed in SIF 2.1 and extend the use to the processing industry and wholesalers. The overall aim is to construct a “single string system” that collects all relevant data. This last expansion has been done to meet the challenge from the EU Regulation 1224/2009 and the Commissions Regulation 404/2011, to have valid traceable data.

DTU Aqua’s part in SIF 3 has been concentrated on constructing a software program to be used on the fishing vessels to communicate with the fishery inspections IT based Logbook (E-Log) and the SIF-database. This has been done in close cooperation with DTU IMM (Institute for Mathematical Modeling), which have a software development group, originally coming from DTU Aqua. The developed program has been built partly on a previous program with the name of PIP – developed for the pelagic sector.

The project is coordinated by Danish Fishermen's Producers' Organisation, Denmark.

National Institute of Aquatic Resources
Public Sector Consultancy
Danish Fishermen's Producers' Organization
Lyngsoe Systems A/S
Pack & Sea

Ministry of Food, Agriculture and Fisheries
Danish Seafood Association
Period: 01/01/2010 → 31/03/2012
Number of participants: 1
Research area: Fisheries Management
Project Manager, organisational:
Larsen, Erling (Intern)
Project

Demography of fished Populations: Yield, Resilience and Evolutionary Change

National Institute of Aquatic Resources
Period: 01/12/2009 → 28/03/2012
Number of participants: 7
Phd Student:
Verdiell, Nuria Calduch (Intern)
Supervisor:
MacKenzie, Brian (Intern)
Vaupel, James W. (Ekstern)
Main Supervisor:
Andersen, Ken Haste (Intern)
Examiner:
Gislason, Henrik (Intern)
Caswell, Hal (Ekstern)
Rijnsdorp, Adriaan D. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Stipendie fra udlandet
Project: PhD
Modelling of fish communities with help of life history traits and size
National Institute of Aquatic Resources
Period: 15/09/2009 → 31/07/2011
Number of participants: 3
PhD Student:
Schrøter, Marie Louise (Intern)
Supervisor:
Rindorf, Anna (Intern)
Main Supervisor:
Gislason, Henrik (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Discard and identification of possible mitigation tools
National Institute of Aquatic Resources
Period: 01/08/2009 → 17/10/2012
Number of participants: 4
PhD Student:
Feeckings, Jordan P. (Intern)
Main Supervisor:
Madsen, Niels (Intern)
Examiner:
Wieland, Kai (Intern)
Kennelly, Steven James (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Eel Egg and Larval development in Relation to Bio-Physical Characteristics and Gamete Quality
National Institute of Aquatic Resources
Period: 01/07/2009 → 02/04/2014
Number of participants: 7
PhD Student:
Sørensen, Sune Riis (Intern)
Supervisor:
Bossier, Peter Georges Madeleine (Ekstern)
Munk, Peter (Intern)
Main Supervisor:
Tomkiewicz, Jonna (Intern)
Examiner:
St. John, Michael (Intern)
Geffen, Audrey Jaceline (Ekstern)
Vadstein, Olav (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Sexual selection in marine plankton
National Institute of Aquatic Resources
**In situ identification of marine organisms using High Frequence, wideband Ultrasound**

National Institute of Aquatic Resources  
Period: 15/06/2009 → 06/02/2013  
Number of participants: 7  
Phd Student: Pham, An Hoai (Intern)  
Supervisor: Jensen, Jørgen Arendt (Intern)  
Lundgren, Bo (Intern)  
Main Supervisor: Stage, Bjarne (Intern)  
Examiner: Thygesen, Uffe Høgsbro (Intern)  
Stepputtis, Daniel (Ekstern)  
Wahlberg, Magnus (Ekstern)  

**Financing sources**  
Source: Internal funding (public)  
Name of research programme: Institut stipendie (DTU) Samf.

**Relations**  
Publications:  
In-situ identification of marine organisms using high frequency, wideband ultrasound  
Project: PhD

**Predicting the consequences of global change for fish populations using genomic methods**

National Institute of Aquatic Resources  
Period: 01/06/2009 → 19/09/2012  
Number of participants: 6  
Phd Student: Therkildsen, Nina Overgaard (Intern)  
Supervisor: Hansen, Jakob Hemmer (Intern)  
Main Supervisor: Eg Nielsen, Einar (Intern)  
Examiner: Bekkevold, Dorte (Intern)  
Hansen, Michael Møller (Intern)  
Waples, Robin S. (Ekstern)  

**Financing sources**
Amino acid metabolism in gilthead seabream (Sparus aurata) - the fate of protein derived nitrogen

National Institute of Aquatic Resources
Period: 01/03/2009 → 06/02/2013
Number of participants: 8
Phd Student:
Ekmann, Kim Schøn (Intern)
Supervisor:
Campbell, Patrick James (Ekstern)
Dalsgaard, Anne Johanne Tang (Intern)
Holm, Jørgen (Ekstern)
Main Supervisor:
Skov, Peter Vilhelm (Intern)
Examiner:
Pedersen, Per Bovbjerg (Intern)
Damgaard Poulsen, Hanne (Ekstern)
Pereira de Oliva Teles, Aires Manuel (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Eksternt finansieret virksomhed
Project: PhD

Individual variation in developmental rate in rainbow trout larvae; implications for welfare and production aspects in modern aquaculture

National Institute of Aquatic Resources
Period: 01/02/2009 → 28/02/2013
Number of participants: 6
Phd Student:
Åberg Andersson, Madelene (Intern)
Supervisor:
Steffensen, John Fleng (Intern)
Main Supervisor:
Höglund, Erik (Intern)
Examiner:
Skov, Peter Vilhelm (Intern)
Metcalfe, Neil Benedict (Ekstern)
Winberg, Svante (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

The molecular basis of local adaptation in brown trout

National Institute of Aquatic Resources
Period: 01/02/2009 → 25/04/2012
Number of participants: 8
Phd Student:
Meier, Kristian (Intern)
Supervisor:
Als, Thomas Damm (Intern)
Hansen, Michael Møller (Intern)
Skov, Christian (Intern)
Advanced modelling tool for scenarios of the Baltic Sea ecosystem to support decision making (ECOSUPPORT) (38733)

The Baltic Sea is subject to several major human impacts, and three of the most important are fishing, eutrophication and climate change. Understanding and projecting how these impacts will affect the food web and its fish populations in future is therefore challenging, and requires modelling approaches which include climatic-hydrographic forcing, nutrient loading scenarios and likely fishing intensities.

ECOSUPPORT was a project whose objective was to develop an advanced modelling tool for conducting scenario simulations of how these human impacts affect the marine ecosystem and fish populations. The project coupled several different types of models so that end-to-end ecosystem models were developed which to understand how human impacts could influence the Baltic food web and fish populations. The models to be linked included regional climate models, oceanographic-lower trophic level ecosystem models (Nutrient-Phytoplankton-Zooplankton-Detritus) and fish population models. Key project results included new scenario simulations how regionally downscaled global climate model outputs would affect the development of Baltic cod populations under scenarios of climate change and seal (predator) population growth, and under different combinations of eutrophication, exploitation and climate change. These simulations included all key elements of the foodweb via an Ecopath model which included competitive and predatory interactions between the major fish species in the Baltic. The results demonstrated the vulnerability of the cod population to successful implementation of key ecosystem management policies for the Baltic Sea, including those related to exploitation and nutrient loading. Additional model scenarios focused on the sprat population which is a key intermediary link in the Baltic foodweb as prey and predator for cod and of zooplankton. These scenarios illustrated the range of future biomass and yields under assumed ranges of climate change and natural mortality.

One of the major novelties of the project was the availability of 3 different NPZD models, which enable estimation of output uncertainties to different model parameterizations and assumptions in the lower trophic levels and physical oceanographic processes, and to compare these with uncertainties due to fish population dynamics (e. g., recruitment variability). These comparisons suggest that the biological uncertainty associated with fish population dynamics was larger than that associated with the choice of the oceanographic NPZD model.

Partners in the project are the above mentioned and five other marine research institutes around the Baltic Sea.

The project is coordinated by Swedish Meteorological and Hydrographic Institute, Sweden.

The project was funded by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

National Institute of Aquatic Resources
Centre for Ocean Life
Swedish Meteorological and Hydrographic Institute (SMHI)
Leibniz-Institute for Baltic Sea Research
GKSS-Research Centre
University of Gothenburg
Stockholm University

Period: 01/01/2009 → 31/12/2011
Number of participants: 4

Research areas: Oceanography & Marine Populations and Ecosystem Dynamics & Ecosystem based Marine Management
Contact person:
MacKenzie, Brian (Intern)
Project participant:
Eero, Margit (Intern)
Animal welfare: social and environmental preferences of reared rainbow trout (38697)
The principle objective of this project is to evaluate the effect of rearing densities, current and cover on animal welfare. We will use preference test to investigate behavioral and environmental needs of farmed rainbow trout. Furthermore, for investigating the effects of not fulfilling these needs we will use neurophysiological and endocrine responses involved in the stress reaction as biomarkers for compromised welfare. The obtained knowledge is expected to contribute to a scientific based governmental guideline for welfare based intensive fish rearing.

National Institute of Aquatic Resources
Section for Aquaculture
Period: 01/01/2009 → 31/03/2013
Number of participants: 2
Research area: Aquaculture
Project participant:
Laursen, Danielle Caroline (Intern)
Project Manager, academic:
Höglund, Erik (Intern)

Baltic zooplankton cascades (BAZOOCA) (38584)
The alien ctenophore Mnemiopsis leidyi, notorious for wrecking havoc in the Black Sea, was recently introduced to the Baltic, where it thrives. As an enclosed brackish water system where many organisms live close to their tolerance thresholds, the Baltic is very sensitive to such disturbances. We aim to test the overall hypothesis that Mnemiopsis in the Baltic causes cascading effects throughout the pelagic food web, from gelatinous and top predators to microbes. Using field studies, experiments and modeling we will address a specific set of research aims (organized as work packages). We will consider these research aims within the natural spatial (Baltic proper, Bothnian Sea, Bothnian Bay) and environmental (oxygen, temperature, salinity, light, N, P) gradients in the Baltic. Understanding such food web effects and potential cascades is crucial given the overall stress from contemporary environmental challenges, e.g. eutrophication, increased maritime activities, and climate change. The results will be useful for both scientists and policy makers. The current regime shift towards more jellyfish is unprecedented in the Baltic. Its effects on this specific ecosystem cannot be forecast solely on the basis of lessons from other ecosystems.
The project is coordinated by University of Gothenburg, Sweden.

National Institute of Aquatic Resources
Centre for Ocean Life
University of Gothenburg
University of Kalmar
University of Bergen
University of Helsinki
Umea University
Period: 01/01/2009 → 14/07/2012
Number of participants: 2
Research area: Oceanography
Project participant:
Jaspers, Cornelia (Intern)
Project Manager, academic:
Kiørboe, Thomas (Intern)

Biocide: Biocide Resistance; An emerging threat to public health
Biocides are chemical substances capable of killing or inhibiting bacteria and their use have become an integrated part of the industrialized world. The potential negative effects of biocides on development of virulence and antimicrobial resistance in bacteria is to a large extent unknown. The purpose of this project is to determine the response of bacteria to selected biocides. The work will include studies of bacterial gene transcription, as well as determination of mutation-rates and horizontal gene-transfer when exposed to different biocides.
Building scenarios for marine ecosystems under anthropogenic and natural forcings (EuR-OCEANS Consortium) (38779)
The aim of the EUR-OCEANS Consortium was to favor joint initiatives between key Research Performing Organizations (RPOs) and Research Funding Organizations (RFOs) across Europe, to help the community make significant jumps in marine sciences during the next decades. This was implemented by organizing and sponsoring activities with a clear focus on relevant marine science “hot topics” leading to wider European (FP8, JPI) projects. These activities included Gordon-like conferences, flagship programs, foresight workshops and public outreach. The focus of the Consortium was on the impact of climate/global change on marine ecosystems, and the construction of scenarios relevant to the emerging International Platform on Biodiversity and Ecosystem Services (iPBes).

A number of activities were funded in EUROCEANS with major impacts in term of new scientific publications, international training networks and other EU and Nationally funded projects. The EUROCEANS Consortium merged with similar initiatives in other marine research fields (i.e., MARBEF+ and Marine Genomics) to establish first a Consortium for a Collective Support Action under the FP7 program (called EUROMARINE) and then the integrated European Marine Network : EUROMARINE covering research topics from genes to ecosystems under changing oceans.

The Consortium had over 25 European universities and research institutions covering all of Europe and a broad spectrum of marine ecology disciplines.

The project was coordinated by Institut de Recherche pour le Développement, France.

The project was self-funded.

Cardio-respiratory adaptations in cod feeding under hypoxic conditions (CarlsbergTorsk) (38851)
Employment of DataStorage Tags on individual Atlantic cod (Gadus morhua) in the Bornholm Basin has shown that some fish migrate towards the deeper basin centre, presumably to feed. During these voluntary dives, fish expose themselves to oxygen saturations as low as 10% and many individuals spend a third of their total time at oxygen saturation <50%. This behavior may either be a result of an optimum foraging strategy or a necessity due to limited or less accessible prey in the
Feeding induces several cardio-respiratory changes to enable the animal to efficiently digest, absorb, and redistribute the nutrients. Gastrointestinal blood flow (GBF) increases profoundly to facilitate digestion and absorption of the food. However, under circumstances of low oxygen availability, regional blood flow must be altered and in unfed fish there is a redistribution of bloodaway from the gastrointestinal area. If GBF is curtailed while the fish search for and ingest prey in the hypoxic water, this may implicate impaired digestive capacity following the return to well-oxygenated waters, either by prolonging gastric evacuation time or by reducing the assimilation efficiency. Furthermore, if the fish face the limitations of a reduced metabolic scope then the set of anaerobic energy production will result in an oxygen debt which has to be paid back with subsequent return to more well-oxygenated water. Using state of the art methods (including both ‘hardwired’ and biotelemetry equipped animals) the aim is to investigate whether (1) ingestion of prey and initiation of digestion in hypoxic water results in an oxygen debt which has to be paid back following return to more well-oxygenated water, and whether (2) GBF will be spared or curtailed under the same circumstances, and if the latter, whether this will influence the digestive processes subsequent return to normal oxygen conditions.

We found that fish after 48 hr of post-surgical recovery following surgical implantation of a dummy biotelemetry blood flow device had reduced gastric evacuation rate as compared to controls; 24-48 hr recovery is normal standard allowed for post-surgical recovery for fish when they are ‘hard-wired’. However, after ten days of recovery gastric evacuation rate was comparable to that of control fish – this long recovery time is possible only when using biotelemetry systems. Furthermore, if exposed to oxygen conditions simulating the low levels in the Bornholm Basin (the Baltic Sea) into which the fish voluntarily undertake feeding migrations, we found that GBF is not negatively impacted, as long as the fish subsequently is allowed to return to more well-oxygenated waters. We thus suggest that short feeding migrations into hypoxic bottom waters is a viable strategy under conditions where food is limited in the more well-oxygenated water layers.

The project was coordinated by DTU Aqua.
The project was funded by a research stipend from the Carlsberg Foundation to Jane W. Behrens (DTU Aqua).

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

University of Gothenburg
Period: 01/01/2009 → 31/05/2012
Number of participants: 4
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Marine Living Resources

Project participant:
Neuenfeldt, Stefan (Intern)
Thygesen, Uffe Høgsbro (Intern)
Mosegaard, Henrik (Intern)
Behrens, Jane (Intern)

Project Manager, academic:

Developing fisheries management indicators and targets (DEFINEIT) (38763)
DEFINEIT constructed operational models of fish stock dynamics explicitly taking into account exploitation and climatic conditions and combine these models with basic economic models. To ensure an outstanding scientific level in each of these areas, the project brought together key competences in operational multispecies modelling, stock recruitment relationships, population dynamics of non-target fish species and economic modelling of fisheries from a wide geographic area ranging from the Barents Sea to the North Sea. The project used multispecies models to investigate changes in predation induced by differences in the distribution and the amount of alternative food. Effects of technical interactions in the fishing process were considered to avoid delivering management advice for different stocks which is mutually inconsistent. Integrating the knowledge gained, the project suggested methods for estimating reference points. The project identified the main causes of variation in recruitment patterns between stocks as well as the key processes from spawning to recruitment of selected stocks. The consequences of using proxies to describe stock reproductive potential were determined and survival during early life stages was investigated in order to identify the role of the physical and biological environment. The improved understanding of recruitment variability was used in individual stock assessment and included in multispecies models to provide reliable predictions. The maximum level of fishing effort consistent with sustainment of susceptible species was estimated along with the effect of discard of by-catch on economic yield. The project developed resource indicators that combine economic, social and biological indicators and relate directly to the benefit for the society. Future stock dynamics limits to sustainable ecosystem exploitation and the fishing levels delivering maximum sustainable economic yield under selected climatic scenarios were analyzed in unison to ensure the delivery of mutually consistent management advice. General properties of the ecosystems were used to suggest rules of thumb for management in areas where the amount of data available is insufficient to construct similar models.

The project was coordinated by DTU Aqua.
The project was funded by EU, MariFish, ERA-NET.
Development of a method for long term spatially resolved management of the herring fishery in the North Sea and Illa taking the migration of the primary herring stocks, the fishery pattern and by-catch of mackerel into consideration (URSIN) (38731)

The overall objective is to develop a tool to create long-term management plans for the two main herring stocks in the North Sea and Illa, which may allow the industry an optimum use of the population under safe conditions relating to population maintenance and catch of mackerel.

The project will further develop, test and optimize a method for the quantification and prediction of herring stock spatial distribution in relation to life stages that is based on existing methods. This quantification of the migration patterns will provide more solid understanding of population development under various conditions. Moreover, the method will include a modeling of the herring fleet behavior, allowing for merging of herring spatial distribution in relation to life stage and hence potential economic value of fishing pattern. The historical and current behavior of the herring fleets will be quantified in collaboration with the industry. Similarly, mackerel skull occurrence will be mapped as it is of great importance for the herring fleet behavior, due to the economic incentives to minimize this by-catch.

The objective of the project is to generate a scientifically based tool for prediction of utilization of herring that can be used in future scientific advice to management, and information on optimal harvest strategies for the fishery in collaboration with the fishing industry. This is partly to increase the transparency and credibility of the scientific work and increase security in the input data and thus reduce uncertainty in the advice given in the end. Collaboration with industry includes Pelagic PO, Skagen PO and Esbjerg Fishermen and covers all types of fishing for herring (both industrial and human consumption).

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Pelagic Producers Organisation
Development of tools for logbook and VMS data analysis (38751)

Objectives and Background
The project “Development of tools for logbook and VMS data analysis” was an EU project under studies for carrying out the common fisheries policy (No MARE/2008/10 Lot2). The aim of the project was to develop a set of standard protocols for coupling and simultaneous analyses of EU fisheries logbook and VMS satellite vessel record data.

Tasks and Deliverables
The software for analyzing the data took the form of a fully documented package called vmstools, built using the freeware package, R (http://cran.r-project.org/). Once the data have been imported into R in the correct format, a series of R programs or ‘functions’, linked by ‘scripts’ enable all tasks necessary to be completed in a single software environment. The software can ‘clean’ data and format input data, estimate distances between VMS positions, and métiers can be identified objectively from species assemblages in catch data using multivariate statistical techniques.

Positions at sea, for example, can be distinguished from vessels in harbor or erroneous positions on land. Position registrations of vessels actually fishing can be separated from those engaged in other activities (e.g. steaming) using their speed in conjunction with other information such as vessel size and gear being used.

Logbook and VMS data can be merged such that high-resolution spatial maps of catches of various commercial species can be generated. Individual vessel tracks can be reconstructed for more realism through different interpolation techniques (both linear and non-linear, i.e. using Hermite spline functions). Further, all the fishing activity indicators required under the Data Collection Framework can be calculated using vmstools. The package can also be used to explore the impact of different spatial (grid size) and temporal aggregations (month, quarterly, annual) which need to be explicitly considered when assessing fishing impact on the sea floor. There are also scripts for displaying results using Google Earth which is a useful aid for dissemination.

The combination of all these routines ‘under one roof’ permitted and permits the construction of ‘Regional’ databases (i.e. FishFrame developed by DTU Aqua - a regional database hosted by one of the project partners) and scripts to produce output suitable for this are included with the vmstools package.

As proof of concept, all analyses performed within each work package have been tested, using the vmstools package, against national datasets with contributions from the French, Danish, Irish, UK and Dutch institutes. As an example, FishFrame has been populated with Dutch and Danish combined VMS and logbook data for 2005-2009.

The project demonstrated emphatically that logbook and VMS data from disparate countries with often different data collection regimens can be combined and compared using generic tools and that the output can be sent to regional databases permitting more holistic assessments of fishing activity.

The project has built further on the networks and platforms produced under EU FP6 EFIMAS Project coordinated by DTU Aqua, and the DTU Aqua team associated with the project has produced several peer reviewed journal papers under Lot 2.

The project is coordinated by Institute for Marine Resources and Ecosystem Studies (IMARES), Wageningen UR, The Netherlands.
This project is funded by EU, Framework Programme 7.

Software Engineering
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
**Effect of the Horns Rev 1 offshore wind farm on fish communities (38734 and 38735)**

The present project focuses on the fish community at the Horns Rev 1 Offshore Wind Farm. The objective of the present study was to document possible refuge effects or changes in local fish communities, seven years after the establishment of the wind farm at a time where wind farm effects on the physical and biological environment could be assumed to have stabilized. Fish communities and sandeel assemblages were compared inside and outside the wind farm area, with the null-hypothesis that the introduction of an offshore wind farm does not affect species composition, temporal or spatial distribution of species or relative abundance.

The project is coordinated by DTU Aqua.

**Environmental impact assessment of mussel dredging (38691)**

EU Habitats Directive Article 6 requires that if an activity in a habitat area or a nearby area can be expected to have an effect on habitat area, an environmental impact assessment (EIA) has to be conducted before permission is given. This Natura 2000 legislation was implemented in the Danish Fisheries Act at the last change which came into force on 1 July 2008. The Directorate of Fisheries, which is responsible for carrying out EIA’s, has requested DTU Aqua to conduct EIA’s of the fisheries.

The project aims to:
1) Develop a basic concept for use in future EIA’s of fishing activities in Natura 2000 areas
2) Prepare EIA’s of mussel fisheries in the Limfjord, Jutland's east coast, Isefjord and the Wadden Sea
3) Implement monitoring systems of mussel stocks in the Limfjord, Jutland's east coast, Isefjord and the Wadden Sea as input to EIS’s of mussel fishery.

The project is coordinated by DTU Aqua.
**Evaluation of harbour porpoise behaviour in relation to acoustic alarms (pingers) (38670)**

The project included four sub-projects that were all related to development of methods for mitigation of harbour porpoise by-catch. The first sub-project investigated the effective deterrent range for a commercial pinger and whether the range changed over time (habituation). This is important to know in order to be able to evaluate the effects if pingers are to be used in marine protected areas like the Natura 2000 areas. By deploying automated porpoise click loggers (C-PODs) in a grid around an active pinger, the effective range of the pinger was assessed. The set-up was deployed both in Denmark and in Scotland to also investigate possible regional differences in porpoise reactions to pingers. The second sub-project tested the alerting-hypothesis, i.e. whether it was possible to induce porpoises in the wild to use their biosonar against a target by having the target emit artificial porpoise click trains (alerting signals). Alerting signals have a number of advantages over traditional pinger signals, including that they will not lead to exclusion of porpoises from important habitats, that the risk of habituation is smaller because the porpoises will be able to learn from their experience with the alerting pingers, and that noise pollution will be considerably smaller because the sound level of alerting pingers is much lower than for traditional pingers. The third sub-project tested if pingers emitting alerting-signals could reduce by-catch of harbour porpoises in the commercial gillnet fishery. Alerting pingers were deployed on bottom-set gillnets in a fishery with a high by-catch rates, in a double-blind experiment. The fourth sub-project investigated the behaviour of free ranging harbour porpoises in relation to a gillnet. This included land-based tracking by theodolite of porpoises approaching a bottom-set gillnet to determine detection distances and avoidance behaviour.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

**Fehmarn Belt science provision project: Fehmarn Belt fish and fisheries and related environmental investigations (38669)**

Objectives and Background

The purpose of the project was to investigate main exploited fish stock and fisheries dynamics in relation to the marine environment with focus on the Fehmarn Belt area in the Western Baltic Sea, and to provide science and research based investigations and results, as well as reports and scientific peer reviewed journal papers on this. The work was associated to the scientific baseline investigations (2009-13) and impact assessment of the projection of the Fehmarn Belt Fixed Link between Denmark and Germany involving a science cooperation between DTU Aqua, Thünen-Institute and Femern Baelt A/S in order to generate knowledge on potential impacts of establishment of the fixed link. Focus was on the most important commercial fisheries and fish stocks in the area (cod, herring, and sprat, but also flatfish and eels).
Tasks and Deliverables
The work covered WP0: Prospecting, planning and development of the investigations, producing outline and main contents of the science provision contract and coordination of tasks hereunder with DTU Aqua as inter-national project coordinator; WP1: Review of knowledge: Review, provision of data, and analyses of selected historical data on fish stock and fisheries dynamics; WP2: Extension of existing, standard research surveys and linking to standardsurvey time series to detect potential effects on important fish stocks; WP3: Evaluation of potential integrated effects on important fish stocks and fisheries; WP4: Evaluation of potential effects of change and variability in hydrographic features and conditions on recruitment for important fish stocks (cod, herring, sprat); WP5: Evaluation of herring occurrences and migrations as well as separation of spring and autumn spawning herring stock components in the area.

WP1 included provision of state of the art knowledge from historical surveys and review of quality of survey indices, commercial fisheries data, and information on recruitment dynamics with emphasis on fluctuations in distribution and productivity with respect to environmental and anthropogenic drivers of change including species interactions and fisheries.

WP 2 included extension of existing standard surveys in the near field area and analyses of both the standard and extended time series with respect to variability in distribution, density and abundance patterns of relevant stocks, as well as developing advanced scientific survey evaluation models and methods for doing this.

WP 3 analyzed stock and fisheries dynamics by use and development of complex multi-fleet-multi-stock bio-economic management evaluation models performing analyses on a very high spatial and temporal resolution scale using integrated fisheries, stock and survey data. The models evaluated different management options and scenarios relevant for the establishment of the fixed link.

WP4 evaluated variability in recruitment and important spawning areas according to hydrographic features and in relation to impact of the fixed link among other by use and further development of complex hydro-dynamic models.

WP 5 evaluated herring stock occurrence and migration patterns in the Baltic areas by use of genetic identity markers, otolith micro-structures and information from fisheries and research surveys in order to evaluate impact of the fixed link. The project has besides a long row of project reports produced around 30 scientific peer reviewed journal papers where DTU Aqua are first author on more than half and co-author on more than 20 of the papers. The project was coordinated by DTU Aqua.

The project was funded by the 3 partners with external Funding from Femern Bælt A/S.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Johann Heinrich von Thünen-Institute

Femern A/S

Period: 01/01/2009 → 31/12/2013

Number of participants: 15

Research areas: Fisheries Management & Fish Biology & Marine Living Resources & Population Genetics

Project participant:

Worsøe Clausen, Lotte (Intern)
Bastardie, Francois (Intern)
Bekkevold, Dorte (Intern)
Huwer, Bastian (Intern)
Hüssy, Karin (Intern)
Storr-Paulsen, Marie (Intern)
Stærh, Karl-Johan (Intern)
Sparrevohn, Claus Reedtz (Intern)
Jepsen, Niels (Intern)
Lewy, Peter (Intern)
Kristensen, Kasper (Intern)
Dutz, Jörg (Intern)
Christensen, Asbjørn (Intern)
Geitner, Kerstin (Intern)

Project Coordinator:

Nielsen, J. Rasmus (Intern)

Project

Improving the knowledge of the biology and the fisheries of the new species for management (NESPMAN) (38689)

The NESPMAN (New Species for Management) project is meant to improve the knowledge of the biology and the fisheries of the new species for management. Apart from highly priced turbot, brill, striped red mullet and sea bass, these 12 species comprise also 3 gurnard species and 4 flatfishes. This report presents information for these 12 species that are
becoming increasingly important for fisheries in NW Europe, partly due to the generally poor state of some of the main commercial fish species.

DTU tasks in the project:
- Danish fishery for witch flounder: compilation of data and description.
- Assessment of the witch flounder stock in the North Sea and Skagerrak.

The project is coordinated by IMARES, Wageningen UR, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Institute for Agricultural and Fisheries Research
Cefas
Institute of Marine Research
Von Thünen Institut für Seefischerei (vT-SF)
IFREMER

Marine and Food Technological Centre
Period: 01/01/2009 → 31/12/2010
Number of participants: 1
Research area: Fisheries Management
Project Manager, organisational:
Munch-Petersen, Sten (Intern)

Living North Sea: Fish migration from sea to source (LNS) (38872)
The Living North Sea project aims to promote free fish migration from sea to source to keep our waters alive. It addresses three essential aspects about the management of migratory fish:
1) Migration routes
2) Threats such as man-made barriers and fish migration measures
3) Influencing future policy at a regional, national and international level and informing the general public.

The work on migratory routes will focus on sea trout, eel and salmon, but will be applicable to many other species. The partnership will carry out analysis and visualization of migratory routes, populations and consequences of management actions. New communication and mapping tools for working and sharing data between partners will be explored.

The second part involves the innovation of fish migration measures. In the North Sea Region some deltas and estuaries are closed to fish and many more have barriers such as dams and sluices throughout their system. This means that many fish species like the eel, salmon and sea trout cannot reach their spawning and breeding grounds. The partnership focuses on the development of better and innovative migration measures, such as passages or sluice management and the implementation of these in demonstration projects.

Last but not least, communication and the dissemination of our findings to policy-makers, local decision-makers and the public. The Living North Sea Project will place emphasis on promotion and publicity because the effect of barriers on fish populations is often not considered when dealing with flooding, drainage, or renewable power generation. Yet healthy fisheries are critical to sustainable development and good ecological status. Intensive communication actions intended to influence regional, national and European policies will be carried out. Creating new partnerships, sharing knowledge and achieving greater awareness and involvement are key elements in this project.

The project is coordinated by Association of River Trust, UK.

Section for Freshwater Fisheries Ecology
National Institute of Aquatic Resources
Association of Rivers Trust
Period: 01/01/2009 → 28/09/2012
Number of participants: 1
Research area: Freshwater Fisheries and Ecology
Project participant:
Aarestrup, Kim (Intern)
**Marine fish atlas of Denmark (38852)**

This project will produce an atlas of all the marine fish species found in waters around Denmark. The species occurrence data for the atlas will be based on all types of observational data, such as: fisheries research surveys, commercial fish landings data, recreational fishermen’s landings and diver observations. Users and target audience of the atlas are university and high school students and instructors, scientists, government officials, private companies, NGOs, and the wider Danish public. The atlas will be a reference for scientific outreach product and is a collaboration between DTU Aqua, the Zoological Museum of the Natural History Museum of Denmark and a small private consulting company operated by the former biologist of the Danish Fishermen’s Association. The atlas will contain photographs and maps of the distributional area each species and a short (3-5 page) text describing current knowledge of species’ biology and life history in Danish waters.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Centre for Ocean Life

University of Copenhagen

Krog Consult ApS

Period: 01/01/2009 → 31/12/2013

Number of participants: 3

Research area: Marine Populations and Ecosystem Dynamics

Contact person:

MacKenzie, Brian (Intern)

Project participant:

Støttrup, Josianne Gatt (Intern)

Hoffmann, Erik (Intern)

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**Marine invasive species impact on ecosystem structure and function (MARINVA) (38716)**

The project aims to investigate the structural and environmental impacts of invasive benthic fauna and algae in Danish waters. Focus is on three species: a macrophyte from Asia, a group of polychaete species from North America/Arctic and an oyster species from Japan. All three species are more or less well established in Danish waters and co-existing in the western Limfjord. Knowledge on these species is sparse, including their physiological and habitat requirements. We will study how and to what extent these species influence the community they have become a part of with particular focus on ecosystem nutrient and energy turnover. The approach is a combination of field and laboratory experiments at different scales (individual to population). DTU Aqua focuses on coexistence of Pacific oyster and blue mussels in relation to competition for food and space, and research include lab and field experiments, and observation of small and large scale distribution.

The project is coordinated by University of Copenhagen.

National Institute of Aquatic Resources

Roskilde University

University of Copenhagen

University of Southern Denmark

Period: 01/01/2009 → 31/12/2011

Number of participants: 2

Research areas: Coastal Ecology & Ecosystem based Marine Management

Project participant:

Dolmer, Per (Intern)

Christensen, Helle Torp (Intern)

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**Monitoring and evaluation of spatially managed areas (MESMA) (38871)**

The MESMA project focused on marine spatial planning and aimed to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluating and implementing Spatially Managed Areas (SMAs). The main tasks in the project were information analysis, the development of a generic framework, the testing and evaluation of this framework through case-studies and the development of a toolbox. A significant proportion of the effort was centered on the case studies within five geographical regions: the North Sea, Baltic, Mediterranean, Atlantic, and Black Sea. This
approach made it possible to compare pressures on an inter-regional level (e.g. offshore wind farms in the North Sea, Black Sea and Baltic), or a multi-pressure level for a specific region (e.g. SMA in fishing, wind-energy, geo-hazards and tourism in the Black Sea).

The project was coordinated by IMARES, Wageningen UR, The Netherlands.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
University College London
Senckenberg Gesellschaft für Naturforschung
Ghent University
Hellenic Centre for Marine Research
Bulgarian Academy of Sciences
Institute of Marine Research
University College Cork
National Research Council of Italy
Marine and Food Technological Centre
Polish Academy of Sciences
Ministry for Resources and Rural Affairs
Cefas
Heriot-Watt University
Deltares
Norwegian Institute for Water Research
Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
Institute for Agricultural and Fisheries Research
Johann Heinrich von Thünen-Institute

Management Unit of the North Sea Mathematical Models and the Scheldt Estuary
Period: 01/01/2009 → 31/12/2013
Number of participants: 4
Research areas: Ecosystem based Marine Management & Marine Living Ressources & Coastal Ecology
Project participant:
Christensen, Asbjørn (Intern)
Dinesen, Grete E. (Intern)
Egekvist, Josefine (Intern)
Project Manager, academic:
Sørensen, Thomas Kirk (Intern)

Relations
Publications:
Ecosystem-based marine spatial management: Review of concepts, policies, tools, and critical issues

Offshore wind farms and possibilities for aquaculture/farming of shellfish (38641)
Large areas of the sea across Denmark and rest of Europe expanded these years with offshore wind farms (OWF). OWF are more or less closed to fishing and have restriction in access. OWF has been proposed for multiple use, e.g. aquaculture and sea farming for shellfish. OWF often have reduced environmental requirements and utilization of these areas for aquaculture and sea farming for shellfish cannot be expected to be in conflict with nature conservation considerations.
This project aim is to investigate whether the production of shellfish can be combined with the operation of OWF. The Danish waters offer very different physical/biological environmental aspects, mainly because of a salinity gradient from the relative fresh Baltic Sea to the North Sea salts. Three OWF along this gradient are used as cases (Horns Rev 1 OWF, Anholt OWF and Nysted OWF) thus allowing general assessment of options for production of shellfish in OWF in Denmark.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Krog Consult ApS
Danish Fishermen's Association
Vattenfall Wind Power A/S

Period: 01/01/2009 → 31/12/2011
Number of participants: 3
Research area: Coastal Ecology

Reproduction of European eel in aquaculture: Consolidation and new production methods (REEL) (38398)

Project aim: Enhance methods and technology applied to produce and culture European eel larvae as basis for the development of a future self-sustained eel aquaculture.

Background: The severe decline of the European eel stock calls for conservation measures including national eel management plans and establishment of a self-sustained eel aquaculture. In 2005, DTU Aqua, University of Copenhagen and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture.

Two major projects: Artificial Reproduction of Eels II and III (ROE II and III) succeeded during 2005-2008 to produce viable eggs and larvae that lived up to 12 days. The larvae thereby accomplished the yolk sac stage and became ready to start feeding. The results were in particular promising because they evidenced that methods successfully applied to Japanese eel have a potential for application also to European eel. ROE II and III LC were supported by the Danish Ministry of Food, Agriculture and Fisheries and the Financial Instrument for Fisheries Guidance (FIFG) and RO III by the Danish Food Research Program 2006.

Results: The REEL project has accomplished through three series of experiments to consolidate previous results and extend the longevity of larvae from 12 to 20 days after hatch in first feeding experiments. Methods to induce maturation were further tested, and farmed and wild eel broodstocks and different treatments were compared. In particular, fertilization procedures to produce fertilized eggs and embryos and monitoring techniques were enhanced. The technology needed to culture embryos and larvae was substantially improved. The potential for new hormonal treatments was explored and recombinant eel hormones have been produced. New broodstock diets were developed with focus on the lipid composition essential for development and survival of fish larvae. In addition, the experimental facility established by DTU Aqua at Lyksvad Fishfarm was enhanced by improving the experimental and laboratory facilities. The REEL project has provided the basis for the establishment of an EU research project: Reproduction of European Eel: Towards a Self-sustained Aquaculture (PRO-EEL) (38793) coordinated by DTU Aqua. REEL included the partners DTU Aqua, the Danish Eel Producers Association, Billund Aquaculture, BioMar, Bioneer and Copenhagen University of which four are integrated in PRO-EEL.

The project was coordinated by DTU Aqua.

National Food Institute
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of Copenhagen
Bioneer A/S
Danish Eel Farmers Association
Billund Aquaculture Service ApS
BioMar A/S
Period: 01/01/2009 → 31/12/2010
Number of participants: 8
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology
Project participant:
Steenfeldt, Svend Jørgen (Intern)
Sørensen, Sune Riis (Intern)
Hornum, Inger (Intern)
Krüger-Johnsen, Maria (Intern)
Project Manager, academic:
Tomkiewicz, Jonna (Intern)
Munk, Peter (Intern)
Støttrup, Josianne Gatt (Intern)
Tybjerg, Lars (Intern)

Scaling of individual trout behaviour and life history to population dynamics

National Institute of Aquatic Resources
Period: 01/01/2009 → 25/04/2012
Number of participants: 7
Phd Student:
Boel, Mikkel (Intern)
Supervisor:
Aarestrup, Kim (Intern)
Skov, Christian (Intern)
Main Supervisor:
Koed, Anders (Intern)
Examiner:
Jacobsen, Lene (Intern)
Moore, Andy (Ekstern)
Thorstad, Eva B. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Study for the revision of the plaice box (PBox) (38647)
This project has attempted to evaluate the effectiveness of the fisheries management, measure known as the “Plaice Box” (PB) for the conservation of plaice and other species of marine organisms in the south-eastern North Sea. The study provides an inventory of existing information and collects new material on the effects of the PB on the conservation of plaice and the impact of the PB on various components of the commercial fishing fleets.

Based on an analysis of key processes that affect the impact of the PB, modifications were explored to improve the positive effect on the conservation of plaice and other species of marine organisms, including catches and bycatches of other marketable fish. An economic assessment of the consequences of those modifications, in terms of their cost-effectiveness, and implications for profitability of the activity was presented. Finally, the data requirements for future evaluations on the effects of the PB on conservation were discussed.

Stakeholder interest in the project has been high and they made extremely useful contributions to a workshop held in October 2009.

The project is coordinated by IMARES, Wageningen UR, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Test and demonstration of a selective topless trawl (38699-1)
The cod stock in Kattegat was at a critical level and ICES recommended a 0-TAC for cod. In the economically important fishery for primary Nephrops and flatfish in Kattegat cod were caught as by-catch. The aim of the project was to develop and test a cod selective topless trawl design in the Nephrops directed fishery in Kattegat to allow an economically feasible fishery with a minimal by-catch of cod. The design idea was based on utilizing behavioral differences between the species, specifically that most fish stay low in the trawl, whereas gadoids like cod raise further aft in the gear and therefore can escape above the cut-back headline. The top of the trawl was cut 10-20 meters back, which allowed cod to escape above the headline. The catch of flatfish and Nephrops were not expected to be affected by the change in design due to their strong preference for the lower part of the gear.
The results of the project led to the implementation of a topless trawl design into the technical legislation in Kattegat. The project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food Agriculture and Fisheries and the European Fisheries Fund (EFF).

Test and demonstration of a selective topless trawl in the North Sea (38699-2)
The aim of the project was to develop and test a selective topless trawl to improve selectivity of cod in the demersal mixed species fishery in the northern North Sea.
The design idea was based on utilizing behavioral differences between the species, specifically that most fish stay low in the trawl, and that gadoids, like cod, raise further aft in the tapered section of the gear and can escape above the cut-back headline. An improved species selectivity of cod in the North Sea can allow and economically feasible mixed fishery without further exhausting the cod stocks.
In addition to the topless design, a SELTRA sorting box was installed in codend to compare the selective effect between a relatively large design modification in the forward part of the trawl with a relative small change in codend where the behavioral differences between species is less expressed.
The project is coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
The shore crab and its parasites in Limfjorden. A model study of a marine invasive species in its home range (38870)
The purpose of the DTU Aqua part of the project is to collect and analyze data for a quantitative description of the population and parasite structure of the shore crab (Carcinus maenas) in Limfjord in Denmark. This includes quantitative information on the species’ geographical distribution in the Limfjord as well as estimates of abundance. The abundance estimates will be based on mark-recapture experiments and trawl survey data. Geographical distribution and year to year fluctuation in abundance of the shore crab will be related to key parameters such as salinity, depth and temperature. The project is coordinated by University of Copenhagen, Denmark.

Feeding ecology of gelationous plankton
National Institute of Aquatic Resources
Period: 15/12/2008 → 27/06/2012
Number of participants: 6
Phd Student:
Jaspers, Cornelia (Intern)
Supervisor:
Nielsen, Torkel Gissel (Intern)
Main Supervisor:
Kiørboe, Thomas (Intern)
Examiner:
Brander, Keith (Intern)
Acuña-Fernández, José Luis (Ekstern)
Costello, John H. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD
Individual based modelling of growth and survival of cod and sandeel larvae

National Institute of Aquatic Resources
Period: 15/12/2008 → 22/04/2013
Number of participants: 5
Phd Student:
Gürkan, Zeren (Intern)
Main Supervisor:
Mosegaard, Henrik (Intern)
Examiner:
Hüssy, Karin (Intern)
Gaard, Eilif (Ekstern)
Skogen, Morten Dahlberg (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Torskens populationsdynamik i Nordsøen

National Institute of Aquatic Resources
Period: 15/12/2008 → 27/06/2012
Number of participants: 6
Phd Student:
Höffle, Hannes (Intern)
Supervisor:
MacKenzie, Brian (Intern)
Main Supervisor:
Munk, Peter (Intern)
Examiner:
Brander, Keith (Intern)
Gallego, Alejandro (Ekstern)
Grønkjær, Peter (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 DTU-stip, 2/3 FUR/andet
Project: PhD

Behaviour of lake-dwelling fish

National Institute of Aquatic Resources
Period: 01/12/2008 → 19/09/2012
Number of participants: 10
Phd Student:
Baktoft, Henrik (Intern)
Supervisor:
Aarestrup, Kim (Intern)
Berg, Søren (Intern)
Koed, Anders (Intern)
Skov, Christian (Intern)
Svendsen, Jon Christian (Intern)
Main Supervisor:
Jacobsen, Lene (Intern)
Examiner:
Rasmussen, Gorm (Intern)
Cooke, Steven J. (Ekstern)
Lucas, Martyn Charles (Ekstern)

Financing sources
Habitat structure of blue mussel, Mytilus edulis, beds in a bottom culture perspektive

National Institute of Aquatic Resources
Period: 01/10/2008 → 21/11/2012
Number of participants: 6
Phd Student:
Christensen, Helle Torp (Intern)
Supervisor:
Hansen, Benni Winding (Ekstern)
Main Supervisor:
Dolmer, Per (Intern)
Examiner:
Nielsen, Torkel Gissel (Intern)
Kamermans, Pauline (Ekstern)
Maar, Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Reproductive Ecology: Effect of dietary fatty acids on ovarian maturation, spawning time and quality of eggs and larvae in Eastern Baltic cod

National Institute of Aquatic Resources
Period: 01/10/2008 → 27/06/2012
Number of participants: 6
Phd Student:
Røjbek, Maria (Intern)
Supervisor:
Jacobsen, Charlotte (Intern)
Tomkiewicz, Jonna (Intern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)
Examiner:
Grønkjær, Peter (Ekstern)
Kraus, Gerd (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Stereology as a tool to assess reproduction strategy and fecundity of teleost fishes

National Institute of Aquatic Resources
Period: 01/10/2008 → 29/01/2014
Number of participants: 7
Phd Student:
Bucholtz, Rikke Hagstrøm (Intern)
Supervisor:
Andersen, Johnnie Bremholm (Ekstern)
Nyengaard, Jens Randel (Ekstern)
Main Supervisor:
Tomkiewicz, Jonna (Intern)
Examiner:
MacKenzie, Brian (Intern)
Kjesbu, Olav Sigurd (Ekstern)
Nielsen, Karsten (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Local adaption in Baltic Sea small pelagic fishes
National Institute of Aquatic Resources
Period: 01/09/2008 → 28/03/2012
Number of participants: 8
Phd Student:
Limborg, Morten (Intern)
Supervisor:
Hansen, Michael Møller (Intern)
MacKenzie, Brian (Intern)
Eg Nielsen, Einar (Intern)
Main Supervisor:
Bekkevold, Dorte (Intern)
Examiner:
Mosegaard, Henrik (Intern)
Hauser, Lorenz (Ekstern)
Vasemägi, Anti (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut, samfinansiering
Project: PhD

Improved vaccination strategies in marine aquaculture
Section of Fish Diseases
Division of Poultry, Fish and Fur Animals
National Veterinary Institute
National Institute of Aquatic Resources
University of Copenhagen
Danish Aquaculture Association
Aller Aqua A/S
Fishlab
AquaSearch Vet
Schering-Plough A/S
Period: 01/04/2008 → 30/09/2012
Number of participants: 15
Project ID: 22452
Project participant:
Rasmussen, Jesper Skou (Intern)
Lorenzen, Ellen (Intern)
Olesen, Niels Jørgen (Intern)
Buchmann, Kurt (Ekstern)
Madsen, Simon B. (Ekstern)
Melingen, Geir Olav (Ekstern)
Project Manager, organisational:
Lorenzen, Niels (Intern)
Advancing understanding of Atlantic Salmon at sea: Merging genetics and ecology to resolve stock-specific migration and
distribution patterns (SALSEA-Merge) (38282)

Over the past two decades, an increasing proportion of North Atlantic salmon are dying at sea during their oceanic feeding
migration. The specific reasons for the decline in this important species are as yet unknown, however, climate change is
likely to be an important factor. In some rivers in the southern part of the species range, wild salmon now face extinction.
This is in spite of unprecedented management measures to halt this decline. Arguably the greatest challenge in salmon
conservation is to gain insight into the spatial and ecological use of the marine environment by different regional and river
stocks, which are known to show variation in marine growth, condition, and survival. Salmon populations may migrate to
different marine zones, whose environmental conditions may vary. To date it has been impossible to sample and identify
the origin of sufficient numbers of wild salmon at sea to enable this vital question to be addressed.

The aim of SALSEA-Merge was to provide the basis for advancing our understanding of oceanic-scale, ecological and
ecosystem processes. Such knowledge is fundamental to the future sustainable management of this key marine species.
Through a partnership of nine European nations the program delivered innovation in the areas of: genetic stock
identification techniques, new genetic marker development, fine scale estimates of growth on a weekly and monthly basis,
the use of novel high seas pelagic trawling technology and individual stock linked estimates of food and feeding patterns.
In addition, the use of the three-dimensional Regional Ocean Modeling System, merging hydrography, oceanographic,
genetic and ecological data, provided novel stock specific migration and distribution models.

This widely supported project provided the basis for a comprehensive investigation into the problems facing salmon at
sea. It also acted as an important model for understanding the factors affecting survival of many other important marine
species.

The project was coordinated by Institute of Marine Research, Norway.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Behavior and recruitment biology of lake trout with special emphasis on the effect of cormorant predation on smolt survival (38271)

The scope of this study is to investigate the movement behavior in brown trout, *Salmo trutta*. Movements between Lake Hald and its two major tributaries and outlet are monitored by the use of passive telemetry. Juvenile and adult trout, caught in the tributaries, have been tagged with passive integrated transponder (PIT) tags and subsequently their passages at automated listening stations have been registered. The trout population is per definition landlocked, as barriers allow only for out-migration and prohibit the return of anadromous individuals. The movements in this semi-closed system allowed surveillance of general migration patterns and identification of within-population variations in life history strategies (stream resident, lake resident and migratory). A number of trout have been caught, sampled and released and use in retrospective evaluation of physiology. Measured variables from blood and gill samples were used to identify physiological differences that had discriminatory power between the three identified life history strategies. Additionally, the movements of lake resident spawners will also be looked upon in this study.

The trout population has been in decline for the last decade. This coincides with the establishment and growth of a cormorant colony on the lake shore. Furthermore, a heron colony close by has likewise grown in this period. Hence, trout which reside in tributaries and lake are subjected to predation from nearby cormorant and gray heron. The accumulation of PIT tags has been monitored with high temporal resolution, revealing the periods of peak predation pressure and the overall annual minimum predation. This, combined with PIT records, will reveal the habitat a trout has been predated in and hereby expose temporal vulnerabilities of lake and tributaries.

The project is coordinated by DTU Aqua.
**Period:** 01/01/2008 → 31/03/2013  
**Number of participants:** 2  
**Research area:** Freshwater Fisheries and Ecology  
**Project participant:**  
Boel, Mikkel (Intern)  
Project Manager, academic:  
Koed, Anders (Intern)  
Project

**Behaviour of lake-dwelling fish: natural and fishery induced impacts (38270)**  
The project focuses on establishing new and comprehensive knowledge on behavior of lake dwelling fish and the impact of human activities, which can eventually enhance management of freshwater fish populations. The study is based on an acoustic telemetry system, which facilitates fine scale 3D positioning of fish several times a minute with sub meter accuracy. The system has been deployed in a small lake for five consecutive years and has generated data sets on pike, perch and roach behavior with unprecedented details, e.g. activity levels and habitat choice on a diel and seasonal basis coupled to environmental factors such as establishment and break of thermoclines. For instance, studies on pike winter behavior during ice cover have generated new insights and added to the increased consciousness of the importance of year-round knowledge on lake ecology processes. The remote sensed monitoring of the tagged fish without presence of personnel has allowed for comparison of fish behavior in situations with and without human disturbances, e.g. fishery-related activities. This way a distinct and instantaneous impact of boating on fish behavior has been revealed and the impact of catch and release angling has been addressed. Finally, the system has facilitated studies extending laboratory findings to behavior in the field. For instance, findings of physiological (metabolic rates) and behavioral properties of individual fish in the lab have been linked with behavior of the same individuals in nature by subsequent tagging and release in the lake.

Several issues have been studied concurrently the last years and will be continued: A principal focus area has been striving to establish which factors impact and confine natural pike populations. The majority of larger pike in the study lake have been followed for more than three years, which has provided a detailed picture of pike behavior and individual variation. The interactions between pike size groups and whether the behavior of smaller pike is controlled by larger individuals has been studied and has revealed differences in both activity patterns and habitat choice ruled by the largest pike, as well as uncovered extensive cannibalism among large individuals. Pike exploitation of various spawning habitats has been assessed and a genetic analysis of pike individuals and pike eggs will be explored, possibly facilitating assessment of the individual contribution to the population and thus enabling a cross-discipline approach to explore how behavior and reproductive fitness is related.

The studies on winter biology are not only covering pike, but are incorporating the entire fish community adding further insights to the limited overall knowledge on winter lake ecology. Further, while simultaneous tracking several species the system allows for studies of predator-prey and species interactions, shoaling etc. in a natural system.

The project was coordinated by DTU Aqua.  
National Institute of Aquatic Resources  
Section for Freshwater Fisheries Ecology  
Fisheries and Oceans Canada  
Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin  
**Period:** 01/01/2008 → 31/12/2016  
**Number of participants:** 4  
**Research area:** Freshwater Fisheries and Ecology  
**Project Manager, organisational:**  
Baktoft, Henrik (Intern)  
Skov, Christian (Intern)  
**Project Manager, academic:**  
Jacobsen, Lene (Intern)  
Berg, Søren (Intern)  
**Project**

**Bridging the gap between science, stakeholders and policy makers (GAP 1 & GAP 2) (38133 & 38860)**  
Stakeholders and scientists involved in GAP1 initiated cooperative research by making plans to combine knowledge in participatory research through a series of European and regional workshops. GAP1 represented phase 1 of a three-phase program that aimed to explore the complementary nature of alternative knowledge and investigate how to combine it in ways that will enhance understanding and management of natural resources. Tied to knowledge, GAP1 was an evidence-based approach that used participation as the vehicle to improve understanding on fisheries research and management.
issues of common concern to stakeholders, scientists and policy makers. Through initiation of cooperative research and facilitating the building of the capacity of stakeholders to engage in participatory research, GAP1 contributed towards the wider aspiration of the Science in Society program. In particular, enhancing the democratic debate with a more engaged and informed public, thus providing better conditions for collective choices on scientific issues relating to sustainable management, conservation of ecosystem integrity and biodiversity of the marine environment.

GAP2 was about making a difference to an issue of significance to the whole of society; the wellbeing of the marine environment and the sustainability of fisheries upon which society depends for food. It continued the relationships, processes and plans made in GAP1 by enabling Mobilization and Mutual Learning (MML) actions that promoted stakeholder participation in the debate and development of research knowledge and structures relevant to emerging policy on fisheries and the marine environment. The aims were to promote and enable processes for open and effective participation of stakeholders in research and management, demonstrated through specific examples and critical evaluation the role and value of stakeholder driven science in the governance of fisheries and the marine environment. DTU Aqua was the case study leader of one of the selected cases of GAP2.

Find full list of participants at the website of GAP2.

These projects were coordinated by the Centre for Environment, Fisheries and Aquaculture Science, UK.

The projects were funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Living Resources
Cefas
Universidade da Coruña
Aalborg University
University of Tromsø
Swedish Board of Fisheries
Istituto Superiore per la Protezione e la Ricerca Ambientale
Pelagic Regional Advisory Council
Baltic Sea Regional Advisory Council

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<th>Period: 01/01/2008 → 31/12/2015</th>
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<td>Number of participants: 4</td>
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<tr>
<td>Research areas: Marine Living Resources &amp; Population Genetics &amp; Fisheries Management</td>
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Project participant:
Mosegaard, Henrik (Intern)
Ulrich, Clara (Intern)
Berg, Casper Willestofte (Intern)

Project Manager, organisational:
Worsøe Clausen, Lotte (Intern)

Development of a lighter mussel dredger for blue mussel fishery (38692)
Mussel fishery has been identified as a possible treat to fulfilling the aims of habitat protection in specific sites. Also in the Limfjord during the last 10-15 years, the mussel population together with the landings has declined significantly. An explanation for this decline has been that the fishery removes stone and hard substrate reducing recruitment potential for newly-settled mussels. The project’s aim was to develop a lighter gear for blue mussel dredging that may have lower impact on removal of hard substrate, and be more in line with requirements for habitat protection. The development of this gear will be based on experience and technological innovation in connection with the development of a box-dredger for oyster fishery and by modification of existing gear. International experience from other mussel fisheries will also be incorporated. This aim was achieved and the lighter gear implemented by mussel fishers. Further, the project documented the environmental impact of the new gear and showed that the lighter mussel dredge had an increased catch efficiency of mussels when compared against the Dutch mussel dredge, whilst the amount of mud stirred was considerably lower. The report concluded that the lighter dredge was therefore less detrimental to the environment than the Dutch dredge, whilst maintaining a high catch per unit effort for mussel fishery.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Central Association for the Limfjord
Danish Fishermen's Association
Danish Shellfish Centre
Period: 01/01/2008 → 31/12/2010
Number of participants: 3
Research area: Fisheries Technology
Project participant:
Poulsen, Louise K. (Intern)
Eigaard, Ole Ritzau (Intern)
Project Manager, academic:
Dolmer, Per (Intern)
Project

Development of fisheries with minimized emission of greenhouse gases (38688)
Identification of methods and prioritization of areas for actions of minimizing greenhouse gas emissions, optimizing fuel consumption and, thus, improve the economy and reducing the environmental effects of fishing on marine habitats. The focus is on fishing with trawls. Two different strategies (work packages) are considered in the project:

1) Development of new and more energy efficient trawls: This work package targets the development of trawl design with improved relationship between capture efficiency and/or catch value in relation to energy use for towing the gear. In this work package we apply an internationally developed computational model based on fluid mechanics and finite element methods and models to predict the capture efficiency of trawl. Through computer simulations we investigate the predicted ratio between catch value and fuel consumption for different trawl designs. These simulations are accordingly applied to identify the most favorable trawl design with optimized value of the catch in relation to the fuel consumption to tow the trawl. Through international cooperation, we also experimentally examine the consequences on catch efficiency of applying high strength thin twine netting with low drag in sections of trawls.

2) Fisheries tactics and management in relation to energy efficiency in fisheries effort allocation for different fisheries: This work package analyze management options for different types of fisheries, to investigate opportunities and incentives to achieve the same value (and catch) in fisheries with less effort or re-allocation of effort and consequently less fuel consumption. Advanced computer based bio-economic fisheries simulation models are developed and used in fleet and stock-based scenario analyses for energy efficiency in fishery by integrated evaluation of fishing effort, catch, catch composition and utilization, economics, and fuel consumption under given effort allocation schemes. This involves development and implementation of a generic bio-economic Individual Based Model (IBM) that works on individual vessel basis and which can simulate multi-stock-multi-fleet (mixed) fisheries and evaluate on a scale of very high resolution in time and space. This computer based management evaluation tool and simulation model can evaluate economic cost-benefits, biological impacts according to fish stock sustainability, as well energy efficiency according to catch in weight and value per fuel volume consumed and/or in relation to total fuel costs for different management scenarios. The implementation of the IBM model involves additionally development of advanced statistical and computer based models and methods for coupling information from logbook databases with information from VMS tracking (satellite monitoring) databases on vessel and fishing trip basis. Furthermore, it involves development of a web-based questionnaire and platform to obtain information from the Danish fishery on cost dynamics with focus on fuel costs and effort allocation.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
IFREMER
Johann Heinrich von Thünen-Institute
Technical University of Denmark
Period: 01/01/2008 → 31/12/2012
Number of participants: 7
Research area: Fisheries Technology & Fisheries Management
Project participant:
Krag, Ludvig Ahm (Intern)
Bastardie, Francois (Intern)
Andersen, Bo Sølgaard (Intern)
Eigaard, Ole Ritzau (Intern)
Madsen, Niels (Intern)
**Edible-, slaughter- and health quality of exercised rainbow trout (38395)**

In Danish aquaculture the production of rainbow trout (*Oncorhynchus mykiss*) in intensive, recirculating systems has increased over the years and this tendency is expected to proceed. Intensive systems are characterized by their potential to apply relatively high water velocities that can be of importance to fish farmers since water currents in earlier studies have been shown to stimulate fish growth. A large part of the growth potential of modern trout strains has however been exploited through breeding and this makes it uncertain to what extent and how modern trout strains respond to increased water velocities in terms of growth. Quality is also a significant parameter in that regard. Fast growth in intensive rearing systems may have implications on trout quality through increased propensities to stimulate lipid depositions in edible parts of the fish and in buccal cavities with concomitant effects on sensory parameters and slaughter yields.

The aim of the project is to study how exercise of rainbow trout may influence their growth and quality. Through collaboration with external partners and internal collaboration in DTU Aqua that has been stimulated through the research area “Individual Biology” numerous competences are involved. The project addresses important aspects of muscle physiology, hormonal control, enzymatic activities, fatty acid metabolism, overall fish growth and industrial fish quality. More specifically, by use of different exercise levels, fish growth and feed and protein utilization is monitored by changes in weights and lengths of the fish together with differences in feed intake. Growth rates are evaluated together with blood plasma content of IGF-1. Furthermore, measurements of plasma cortisol levels together with feed shares indicate the impact on fish welfare. Slaughter yields are determined under common production conditions in industry. Changes in chemical proximate composition of fillets are studied together with fatty acid profiles and the particular change in healthy n-3 fatty acids. Muscle fiber growth and other characteristics in the swimming musculature are studied by use of histological techniques involving light microscopy as well as electron microscopy. Changes in gene expression for mTOR (the mammalian target of rapamycin) are studied for their potential role in muscle fiber hypertrophic or hyperplastic growth and proteom analyses considering other key proteins of importance to both growth and quality are also undertaken. Changes in the calpastatin/calpain system measured as gene expression and/or electrophoretic are considered important for development of fillet texture that is measured instrumentally. Fillet texture is additionally considered by a trained sensory panel focusing on taste, odors, texture characteristics and appearance of the fish fillets. The results obtained so far have proven positive with regards to applying exercise in rearing of modern rainbow trout strains. Negative aspects only seem to manifest when strenuous exercise levels are applied. Exercise has the potential to stimulate overall growth and reduce size differences within a stock supposedly owing to less aggression when feeding. Through several changes in muscle physiological components brought about by exercise the fillet texture may increase and there are furthermore indications that fish welfare may be improved.

The project is coordinated by DTU Aqua.

National Food Institute
Section for Aquaculture
National Institute of Aquatic Resources
Aarhus University
University of Tasmania
Danforel A/S
**Period:** 01/01/2008 → 31/12/2011
**Number of participants:** 2
**Research areas:** Aquaculture & Fish Biology

**Effects of new-developed lowland lakes on salmonid populations (38265)**

Development of artificial lakes is a management tool to reduce nutrient runoff to coastal waters. Denmark has restored more than 10,000 ha of wetlands and lakes in the last 14 years in consequence of “Action Plans for the Aquatic Environment”, that aim to meet the demands of the European Union’s Water Framework Directive. Juvenile, seaward migrating salmonids (smolts) are highly affected by impounded waterbodies, as they are subjected to extraordinary high mortalities due to predation and altered habitat. Pike and birds have been demonstrated to be major predators on brown trout and salmon smolt in rivers and reservoirs. Migration delay of smolts in lakes may cause desmoltification. The objective of this project is to evaluate the effect of lake development on the salmonid smolt run in restored rivers and wetlands. This knowledge is important not only from a scientific perspective, but also in relation to DTU Aqua’s ongoing recommendations and advice given to counties and Ministry of Foods, Agriculture and Fisheries of Denmark on restoration.
projects.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Freshwater Fisheries Ecology

Council of Aarhus

Period: 01/01/2008 → 31/12/2016
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project participant:
Schwinn, Michael (Intern)
Koed, Anders (Intern)

Project

Environmental impact assessments of mussel and oyster fishery in Natura 2000 sites (39241)

Annual Environmental Impact Assessments (EIA) are conducted for each Natura 2000 site and in the Limfjorden in general before fishery on wild beds of mussels or oysters can be initiated. The Danish mussel and oyster fishery is managed by several regulations both implemented by government institutions as well as internal regulations within the fisheries associations. The overall framework was implemented in 2012 as "The mussel policy", which states that the fishery should be sustainable and in accordance with the EU Habitat Directive. Furthermore, four key ecosystem components (eelgrass, blue mussels, macro algae and benthos) are designated in The Mussel Policy. For blue mussels, macro algae and benthos 15% cumulative area impacted by fishery is accepted, whereas for eelgrass it is 0%.

DTU Aqua performs annual surveys determining blue mussel and flat oyster abundance and biomass, regular surveys of eelgrass and macroalgae in all relevant Natura 2000 areas. Data are used for impact assessment of fishery and contain sustainable quotas of either mussel or oysters, protected areas for eelgrass and an assessment of the effects of fishery on the species included in the Natura 2000 plan. Furthermore, the cumulative area affected by fishery is calculated by analyzing black box data. The black box data show where the fisheries have taken place and how large areas that has been affected by logging the position of the vessels every 10 seconds and register any activity by the winch (starting or ending of fishing time).

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark.

National Institute of Aquatic Resources

Danish Shellfish Centre

Period: 01/01/2008 → …
Number of participants: 4
Research areas: Coastal Ecology & Shellfish and Seaweed
Project participant:
Canal-Vergés, Paula (Intern)
Nielsen, Carsten Fomsgaard (Intern)
Nielsen, Pernille (Intern)
Petersen, Jens Kjerulf (Intern)

Project

Enzymes in fish feed: Optimization of protein digestibility in fish production (38396)

The demand for aquaculture products is increasing globally and is expected to keep increasing in proportion with the growth in the global human population. A limiting factor for the expansion of the aquaculture industry is the dependency of fish meal, which is the primary protein source in feed for carnivorous fish (trout, salmon, turbot, cod etc.). Increasing world market prices on quality fish meal is reflected in the price of fish feed, and has intensified the international competition for finding ways to optimise the use of alternative plant-based proteins in fish feed.

Enzymes are catalysts that increase the speed of the processes in which they are involved. A high degree of specificity makes enzymes an excellent tool for increasing specific reactions, e.g. the degradation of complex feed ingredients to digestible nutrients. The addition of enzymes to fish feed has the potential of improving the nutritional value of the feed,
reducing production costs and loss of valuable nutrients to the environment. Enzymes are already widely used in feed for broilers and pigs, while only phytases have been approved for commercial fish production.

The objective of this project was to promote the use of industrial enzymes in fish feed as a means to improve the utilization by the fish of existing and/or alternative protein sources. The project consisted of four work packages: 1) Identification of relevant enzymes and feed ingredients; 2) Feed production; 3) Test of feed quality in a digestion model; 4) Data analyses, reporting and preparing publications. Low-grade soybean cake, sunflower cake and rapeseed cake were chosen as alternative plant-based protein sources in three diets. The effects of three exogenous enzymes in liquid form (Ronozyme®VP (β-glucanase, pectinase), Ronozyme®WX (xylanase) and an experimental protease) on nutrient digestibility was examined. The study showed that Ronozyme®VP and the experimental protease were able to significantly improve the nutrient digestibility primarily in the soybean cake diet at doses of 150-300 mg kg⁻¹. No clear effect of RONOZYME®WX on nutrient digestibility was observed with any of the ingredients tested. The overall conclusion of the project was that Ronozyme®VP and the experimental protease have potential to increase the nutritional and energetic value of proteinaceous plant-based feed ingredients in fish feed.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Aquaculture
BioMar A/S
Novozymes A/S
DSM Nutritional Products

Period: 01/01/2008 → 31/12/2010
Number of participants: 6
Research area: Aquaculture
Project participant:
Pedersen, Per Bovbjerg (Intern)
Poulsen, Erik (Intern)
Larsen, Ole Madvig (Intern)
Sproegel, Ulla (Intern)
Frandsen, Dorthe (Intern)
Project Manager, academic:
Dalsgaard, Anne Johanne Tang (Intern)

Establishment and testing of area-based management models for North Sea sandeel fisheries (ETOMTOBIS) (38588)
The goal of this project is to investigate the effects of area-based management for sandeel stocks and the fisheries. Objectives include developing for optimal area-based management of sandeel fisheries in the North Sea. The tools will first be tested through computer simulations and the experience gained will be used to develop a revised management model at the end of the project.

The project will also help fisheries managers to act proactively to other marine management initiatives. In connection with the implementation of the EU Habitat Directive in the North Sea, EU coastal states appoint Natura 2000 areas by 2010. Area based analysis of population dynamics is therefore necessary to quantify the effect of fishing at the local level, and subsequently assess whether fisheries are affecting the habitat. Additional field-based analysis will be valuable in assessing interaction of the sandeel fishery with potential Natura 2000 areas. Spatial management is not only intended to restrict fishing. A description of the consequences for fisheries and sandeel population dynamics are important in assessing the benefits and drawbacks of introducing area-based management of sandeel fisheries in the North Sea. Currently the sandeel fishery is managed under the assumption that there is one population of the sandeel (Ammodytes marinus) in the North Sea, in spite of this, the North Sea sandeel stock can be divided into several sub-populations. Based on recent research there is now a strong wish from ICES (see eg. ICES 2007 and 2008) and from the EU (see eg. STECF 2005), to introduce area based management of the sandeel fisheries, in order to adjust fishing to a level defined as sustainable for each of the local sub-populations.

Sandeel stocks in the North Sea will be divided into separate management units, each of which can be regarded as sub-populations who have little or no mutual exchange of both sand eel fry and adult sandeels, as presented in the final report of the project TORTN (project 38128). An assessment model will be developed to analyze sandeel population dynamics for each of the identified management units. A forecast model based on the relevant scientific surveys will predict the actual size of the sandeel recruitment in each of the management areas. Finally a tool will be developed that calculates the catch of sandeels in each of the management areas in a number of scenarios that include output of maximum sustainable yield, the most stable catches, and optimal fisheries management.

The project also includes a field sampling module, using two different methods, pelagic larval and demersal 0-group sampling, associated with a tool technological module for this collection to measure the size of the sandeel recruitment. The purpose of the field collection is to continue and analyze existing time series of field data to further develop area based recruitment indices. Field data should also be used as a fishery independent index of the sandeel stock size in the...
developed assessment model. The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen’s Association
Period: 01/01/2008 → 31/12/2010
Number of participants: 5
Research area: Marine Living Resources
Project Manager, academic:
Mosegaard, Henrik (Intern)
Vinther, Morten (Intern)
Rindorf, Anna (Intern)
Christensen, Asbjørn (Intern)
Jensen, Henrik (Ekstern)

European eel: Investigation and assessment of their decline (EELIAD) (38410)
The EELIAD project was a research initiative to investigate the ecology and biology of European eels during their marine migrations, and how these relate to eel condition and population of origin. The information has been integrated into models to determine the most important factors that influence silver eel production and migration success. The fulfillment of this objective will provide a means to evaluate the likely success of the EU eel recovery plan, to enable management actions to be most effectively directed to enhance and conserve eel stocks across Europe, and to determine the dynamics of eel population structure and reproductive success.

To achieve this aim we undertook a large-scale field program to determine the migration routes and behavior of silver eels during their spawning migration, and to determine ecological factors that influence the number and quality of silver eels leaving river catchments.

These field studies were supported by the use of cutting edge biotechnological analyses to determine population structure and innovative modeling approaches aiming to incorporate these data into fishery management models. In addition, these different studies were linked to studies and observations undertaken in other cooperative projects such as INDICANG which is a network of monitoring programs that report on the status and the development of eel populations over a large area (e.g. Atlantic Area).

The knowledge gained from the EELIAD research, aside from its scientific significance, have been of direct use to the conservation of eel stocks because it helps to clarify the reasons for the recent decline in the stock. This information will then be used to change and improve the way that eel fisheries and habitats are managed across Europe, and to help ensure that enough silver eels migrate to their spawning grounds to reproduce and sustain the species.

The project was coordinated by Centre for Environment, Fisheries and Aquaculture Sciences (CEFAS), UK.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Cefas
Norwegian Institute for Nature Research
Marine Institute
IFREMER
Centre for Agricultural and Environmental Engineering Research
Swedish Board of Fisheries
Museum National d’Histoire Naturelle
Université de Pau et des Pays de l’Adour
Laboratoire de Biologie et d’Ecologie Tropicale et Méditerranéenne
Consejo Superior de Investigaciones Científicas
Evaluation of the National Salmon Management Plan (38257)
A National Management Plan (MP) for the (endangered) remaining Danish populations of Atlantic salmon was issued in 2004. The plan includes stocking, fishing regulations and massive habitat/connectivity improvements, but no monitoring plan to evaluate the effect and assess the current status of the populations/runs in the 4 rivers covered by the MP.

This project will seek to close the information gap and provide basic information on the salmon runs to enable proper management decisions. Every year monitoring will be carried out in one or two of the 4 rivers covered by the MP, so each river will be surveyed every 2 or 3 years.

Number of spawners
Intensive electrofishing from boat is carried out just after the season closure (October) in the main river and in some tributaries, where all salmon are measured (TL, sex) and PIT tagged. In November during the regular electrofishing for broodstock, the proportion of tagged individuals gives a measure of the sampling efficiency and provides basis for an estimation of population size. The composition in terms of size, sex and origin (stocked fish are fin-clipped) can also be estimated.

Spawning areas
In each of the 4 rivers the most important/preferred spawning areas were identified using radiotelemetry. Both present and potential spawning and rearing habitat will be assessed by standard monitoring and electro-fishing for juveniles in order to judge the present production in relation to the potential production. Naturally spawned fry will be genetically analyzed to assess the number of families present on each spawning area (redd). The presence of several families indicate a well-functioning and well-visited spawning area, whereas few or single families indicate lack of spawners.

Annual reports from the project are used for adaptive management measures like quota setting, season and stocking.

The project is coordinated by DTU Aqua.
This is funded by the Danish Rod and Net Fishing Licence Funds.

Fish populations and traceability (FishPopTrace) (38283)
The underlying rationale of FishPopTrace was to assess and address challenges arising from the development of traceability tools within a forensic framework for four judiciously chosen target species: cod (Gadus morhua), hake (Merluccius merluccius), herring (Clupea harengus) and sole (Solea solea). Previous information on levels of population structuring in traits such as life histories, morphometrics, genetics and physiology was used to inform sample choice. The new data was restricted to markers at two levels:
- Routine screening: selection of markers that exhibit maximal discriminatory power to identify populations, though with discrete and controlled variance enabling validation (single nucleotide polymorphisms (SNPs) and otolith microchemistry and morphometrics). Data from DNA based methods provided a mechanism for traceability throughout the food supply chain (“fish to fork”) and indicated discrete spawning populations, whereas otoliths aimed at providing an independent onboard traceability system of fish provenance.
- Testing of novel tools: additional tools were tested on a selection of populations to assess validity and potential for traceability and validation, including fatty acid analysis, proteomics, gene expression analysis and the generation of high-throughput microarray platforms for SNP genotyping.
Thus, FishPopTrace provided information relating to geography ("population tag"), as well as regional signatures that indicate biological differentiation in relation to spawning identity. The project was coordinated by University of Wales Bangor, UK. The project was funded by EU, Framework Programme 7. The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources
Section for Marine Living Resources
Bangor University
University of Padua
Universidad Complutense
Katholieke Universiteit
University of Bologna
University of Bergen
European Commission - Joint Research Center
University of Bremen
Wildlife DNA Services
Département Sciences & Techniques Alimentaires Marines
National Agricultural Research Foundation
Spanish National Foundation of Fish and Seafood Processors
Aarhus University

The Centre of Molecular Genetic Identification, VNIRO
Period: 01/01/2008 → 31/12/2011
Number of participants: 3
Research area: Population Genetics
Project participant:
Hansen, Jakob Hemmer (Intern)
Project Manager, academic:
Eg Nielsen, Einar (Intern)
Bekkevold, Dorte (Intern)

Influence of ecological dynamics and climate change on the marine environment in Danish waters (ECODYN) (38136)
The environment in the open Danish waters is controlled by a complex interplay between physical and biological processes, and it is therefore difficult to determine the exact cause of changes in the environment. This is also the situation for hypoxia, which is caused both by nutrients from sources ashore, by ecological dynamics of the waters, and by the flow in Kattegat and the Belts. This project examined the marine environment through three-dimensional numerical models which describe both physical and biological processes. In parallel, laboratory experiments clarified how temperature affects the biological rates at or near the sea floor. This was used to model the response of the ecosystem to the temperature increases which are expected as a result of climate change, and the future consequences for the marine environment were analyzed.

Through model simulations and oxygen measurements from ships and buoys, the biological processes leading to hypoxia were determined with the so far highest resolution in time and space; this contributed significantly to the understanding of the functioning of the ecosystem in this area.

The connection between the state of the marine environment and the abundance of fish was analyzed, focusing on the distribution and spawning regions of cod, in relation to the oxygen conditions in the inner Danish waters and in the Baltic Sea. Thereby, the project provided a description of interconnections between the ecosystem, the water flow, and the effects of a changing climate.

The project was coordinated by Department of Bioscience, Aarhus University, Denmark.

The project was funded by the Danish Council for Strategic Research.
Judgement and knowledge in fisheries involving stakeholders (JAKFISH) (38132)

JAKFISH aimed at developing institutions, practices and tools for dealing with scientific support to European Marine policy under high uncertainty. The objectives of JAKFISH are: (i) to examine and develop these institutions, practices and tools that allow complexity, uncertainty and ambiguity to be dealt with effectively within participatory decision-making processes, (ii) to examine how scientific information is used and what types of roles scientists play in the formulation of policies, (iii) to study how the current scientific processes take into account the multi-objective nature of fisheries management, and (iv) to synthesize the obtained views and to redefine the institutional role of science in EU polices to improve the overall governance in CFP.

Two parallel tracks were followed: First, a number of case studies involving participatory modeling processes with stakeholders involvements were developed, for support in policy decision-making: Western Baltic herring, Central Baltic herring, North Sea nephrops and Mediterranean swordfish. Second, sociological analyses of the practices and institutional forms that can most effectively involve the wider community in debates over developing science-based policies were carried in various regions both within Europe (North Sea, Baltic, Mediterranean) and outside (USA, Australia). Ultimately, both tracks were linked into a single synthesis.

The project was coordinated by IMARES, Wageningen UR, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Cefas
Institute of Marine Research
Aalborg University
Hellenic Centre for Marine Research
University of Tartu
University of Helsinki
University of Portsmouth
Dialogik gemeinnützige Gesellschaft für Kommunikations- und Kooperationsforschung mbH
Period: 01/01/2008 → 31/12/2011
Number of participants: 5
Research area: Fisheries Management
Contact person:
Mosegaard, Henrik (Intern)
Project participant:
Worsøe Clausen, Lotte (Intern)
Payne, Mark (Intern)
Nielsen, Anders (Intern)
Marine ecosystem evolution in a changing environment (MEECE) (38131)
In order to advance our understanding and the predictive capacities necessary to resolve how marine ecosystems will respond to global change MEECE employed a combination of data synthesis, numerical simulation and targeted experimentation to further our knowledge of how marine ecosystems will respond to combinations of these climate change and anthropogenic drivers.

A key objective of MEECE was to advance model coupling across trophic levels and create concepts and infrastructure to enable end-to-end modeling, from physics to fish, which has empirically been difficult due to different space and time scales involved, as well as relative emphasis of statistical and mechanistic aspects. Finally MEECE integrated modeling advancements with fishery management perspectives.

The project was coordinated by Plymouth Marine Laboratory, UK, and had 21 partners from the EU.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Marine Living Resources
Period: 01/01/2008 → 15/10/2012
Number of participants: 11
Research areas: Marine Living Resources & Marine Populations and Ecosystem Dynamics & Fisheries Management
Acronym: MEECE
Contact person:
Christensen, Asbjørn (Intern)
Project participant:
Vinther, Morten (Intern)
Neuvenfeldt, Stefan (Intern)
MacKenzie, Brian (Intern)
Nielsen, J. Rasmus (Intern)
Eero, Margit (Intern)
Andersen, Ken Haste (Intern)
Bastardie, Francois (Intern)
Neumann, Viola (Intern)
Grigorov, Ivo (Intern)
Project Manager, academic:
Köster, Fritz (Intern)

Relations
Publications:
Should “Citizen Scientists” play with climate & ecosystem models?
Project MyOcean (38134)
The project advanced and coordinated European scientific and technical infrastructure in the European operational oceanography community, for collecting and distributing ocean observations and ocean forecasts. DTU Aqua contributed by developing an integrated system for forecasting of sandeel fisheries in WP3 and in WP18 as reference intermediate user (RIU), for integrating operational oceanography products in marine resource management.

The project was coordinated by Mercator Ocean, France and had 52 partners from the EU.

The project was funded by EU, Framework Programme 7.

National Institute of Aquatic Resources

Section for Marine Living Resources
Period: 01/01/2008 → 15/05/2012
Number of participants: 2
Research areas: Marine Living Resources & Oceanography
Project participant:
Optimizing the exploitation of fishery resources in Skagerrak (OSKAR) (38720)

The purpose of this project was formulated in 2008 to establish knowledge on the geographical distribution of target species in Skagerrak, which enables the fishermen to plan and execute sustainable fisheries on these species with a minimum of discard and unwanted by-catch of cod, and without drastically reductions or unjustified closure of areas.

OSKAR was a collaborative fishermen-scientist project building on the experience from the REX-project conducting small-scale scientific surveys with commercial ships.

To separate control issues of the mixed fishery of Skagerrak from the issues of using fishermen’s and scientists’ combined knowledge and experience to produce more selective fisheries, some of the key questions addressed were:
- Is it feasible to predict the size distribution of cod on a small spatial scale (single trawl haul) from surveys?
- How important are the seasonal changes for the spatial distribution of cod in Skagerrak?
- Can fishermen’s anecdotic knowledge on the distribution of cod be used?
- Which role does mechanistic process knowledge play in determining critical spatial dynamics of cod?
- Taking also gear technology into account then how can we best produce e.g. a useful cod avoidance tool?

A new advanced geostatistical tool GeoPop was introduced in order to use all available survey data in the maximum likelihood estimation of temporal and spatial dynamics of the size distribution of the stock. Real time closures, future disallowance of discards etc. put the perspective of OSKAR into focus.

The development of GeoPop in this fishermen-scientist project has proven valuable (see Jansen et al 2016, Fish. Res. 179: 156-167 and refs herein). The method was published in 2013 (Kristensen et al 2013, Can. J. Fish. Aquat. Sci. 99: 1-19). Particular attention in GeoPop is paid to correlation between size classes within each trawl haul due to clustering of individuals with similar size. Extracting this nugget effect produces clearer population signals and allows e.g. following cohorts in space and time and determining stock structures. Although GeoPop today is fully TMB operated it is the present computer capacity which sets the limits to exploring e.g. the impacts of spatial heterogeneity on fishery stock assessment.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
Period: 01/01/2008 → 31/12/2011
Number of participants: 4
Research areas: Marine Living Resources & Marine Populations and Ecosystem Dynamics & Fisheries Technology & Fisheries Management
Project participant:
Andersen, Niels Gerner (Intern)
Pedersen, Eva Maria (Intern)
Project Manager, organisational:
Wieland, Kai (Intern)
Project Manager, academic:
Beyer, Jan (Intern)

Population development of sea trout after removal of migration obstacles (38259)

Generally, the size of a sea trout population is under the influence of a number of bottlenecks’ in the life cycle. Reduced spawning- and nursery habitat, as a consequence of sand walk and adjustments of streams, is one of the major obstacles. Another important factor is obstacles in connection with migration. A very important obstacle during migration is the passage of weirs which deny the fish access to important habitats, both when it comes to downstream and upstream migration. The weirs’ negative effect on the population of migrating fish is well-documented (Aarestrup et al. 2003; Aarestrup et al. 2006a, b, c; Baktoft et al. 2007). It has lead to a number of model reflections on the impact on the fish stock if the weirs are removed (Olesen & Aarestrup 2006). However this model has not been validated. The possibility of such a validation now exists in the River Villestrup, where the original model was developed. In this comprehensive restoration project, the plan is to remove all weirs in the main stream. This gives a unique chance to test the size in the stock of migrating fish before and after the removal of the weirs.
The study aims at estimating the spring run of smolt and kelts in a number of defined years before and after the removal of the dams. The restoration project was in 2011. The run has been estimated in 2008 and 2009 before weirs were removed and again in 2015-2017 after the completion of the restoration project and allowing for juvenile cohorts to develop. The estimated smolt run before the removals was around 5000 smolt migrating into Mariager Fiord. In 2015 the smolt run was estimated to app. 20000 smolts. The project provides us with valuable information on the potential for optimizing the fishstocks without releases.

The project is running concurrently with project 38258 “The marine life and survival of sea trout” and with the EU funded project 39301: “Expertise in marine and aquatic ecology and genomics for sustainable management of fish and shellfish in Skagerrak-Kattegat-Øresund (MarGen)”. MarGen is an interregional management project with a specific aim to increase scientific and management competencies of marine resources in Kattegat/Skagerrak including understanding of fish migration.

This project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Freshwater Fisheries Ecology

Period: 01/01/2008 → ...
Number of participants: 1

Research area: Freshwater Fisheries and Ecology

Project Manager, academic:

Aarestrup, Kim (Intern)

Project

Rekruttering af brisling

National Institute of Aquatic Resources

Period: 01/01/2008 → 22/08/2012
Number of participants: 6

Phd Student:

Frisk, Christina (Intern)

Supervisor:

Kraus, Gerd (Intern)

Main Supervisor:

Andersen, Ken Haste (Intern)

Examiner:

Andersen, Niels Gerner (Intern)

Jørgensen, Christian (Ekstern)

Peck, Myron A. (Ekstern)

Financing sources

Source: Internal funding (public)
Name of research programme: Offentlig finansiering
Project: PhD

Survey of existing bio-economic models (38569)

The project “Survey of existing Bio-Economic Models (S12.507729)” is an EU Lot-5 project under studies for carrying out the common fisheries policy (No MARE/200707 Lot5) which reviews and evaluates a long row of the most important European bio-economic fisheries evaluation models. In particular the models reviewed are: EIAA, TEMAS, MOSES, BEMMFISH, BIRDMOD (Including Aladym), MEFISTO, AHF, EMMFID, SRRMCF, COBAS, ECOCORP, ECONMULT and FLR under EFIMAS. The review is done in two parts. Firstly a revision framework based on some specific and general tables is created in order to facilitate the comparison as well as the selection of the model for completing a specific task. Secondly a report of each model including model generalities, specific issues and implementation details, is produced. The structure of the review as well as the revision framework is based on the existing literature (reports and scientific papers including EFIMAS ECOKNOWS work and platforms), and after a feedback process among the group.

BEMs are used to understand the feedback between human activity and natural resources. When a model is built initial attention must be given to the fishery management problem. The simulation of fisherman behavior is not extensively included in the models. A trade-off between simplicity and usefulness emerges when integrated models are used. New research questions will stimulate the development of new models. The lessons learned from a review of thirteen existing European bio-economic models used in the evaluation of EU policies are produced. How these models compare and differ in terms of their biological and economic components, the integration between the components, which indicators are selected and how they are used, are described and analyzed. The publications from the project conclude that the multitude of construction differences reflects the necessity of adapting the modelling approach to answer different questions. Since real life questions in fisheries are so diverse, answering them requires a diversity of models.
The project has built further on the networks and platforms produced under EU FP6 EFIMAS Project coordinated by DTU Aqua, including the EFIMAS ECOKNOWS (Economist Knowledge System). The DTU Aqua team associated to the project has produced 1 peer reviewed journal paper, 1 conference proceeding and a consolidated report under the Lot5 project.

The project is coordinated by Marine and Food Technological Centre (AZTI), Spain.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Marine and Food Technological Centre
University of Copenhagen
Wageningen IMARES
Cefas
Istituto Ricerche Economiche Pesa e Aquacoltura
Period: 01/01/2008 → 31/12/2010
Number of participants: 3
Research area: Fisheries Management
Project participant:
Eigaard, Ole Ritzau (Intern)
Andersen, Bo Sølgaard (Intern)
Project Manager, academic:
Nielsen, J. Rasmus (Intern)
Project Sustainable fisheries, climate change and the North Sea ecosystem (SUNFISH) (38135)
Global climate changes will seriously challenge the governance of fisheries in the North Sea and elsewhere. Changes in temperature, wind conditions, river runoff and currents will affect primary and secondary production, the distribution, feeding, growth and survival of commercially exploited fish at all stages of life. Without improved knowledge about the effect of climate on the basic biological processes involved in fish production, it will be increasingly difficult to separate the effects of fishing from those of environmental fluctuations and change, identify biological reference points, and to develop management strategies for sustainable fisheries. By combining models of the effects of climate on the hydrographical and biological processes important for fish production with models of fish stock dynamics and fishing, the project provided a basis for improved predictions of the effects of climate change on the sustainable exploitation and maximum yield of North Sea fish stocks. The dynamics of cod (a top predator), herring and sandeel (two important prey for fish), seabirds and marine mammals were studied in detail. Their spawning, egg and larval drift, juvenile and adult distribution, growth and survival were investigated through experiments, statistical analyses of collected data and advanced bio-oceanographic models. The sustainability of exploitation under changing climate conditions were examined by modifying an existing stochastic multispecies fisheries model to make it account for climate effects on fish ecology. The project provided an integrated modelling framework for developing sustainable fisheries management strategies superior to using simple extrapolations of observed historical trends to predict the likely outcome of climate change on the North Sea ecosystem.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Council for Strategic Research.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
Aarhus University
Danish Meteorological Institute
Marine Scotland
University of Hamburg
Period: 01/01/2008 → 01/09/2012
Number of participants: 6
Research areas: Ecosystem Based Marine Management & Marine Living Resources
Project participant:
Munk, Peter (Intern)
The biological pump in the Nordic seas: Copepods and appendicularians as producers and consumers of sinking particles (BIOPUMP) (38757)

BIOPUMP is a research network investigating the vertical flux, its production and consumption, and how it is affected by the climate change. The main activities of the network are annual research workshops concentrating on diverse aspects of vertical flux, such as the role of different zooplankton groups in producing and degrading of sinking particles, and how will the changing temperature and CO2 concentrations of the ocean influence the dynamics of these groups. BIOPUMP is also involved in organizing a Nordic PhD course on vertical flux and factors influencing it.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
University of Tromsø
University of Bergen
University of Oslo
University of Gothenburg
Stockholm University
Greenland Institute of Natural Resources
National Environmental Research Institute
University of Copenhagen
Period: 01/01/2008 → 01/05/2013
Number of participants: 3
Research area: Oceanography

The marine life and survival of sea trout (38258)

Considering the importance of the species and the fact that it is spending most of its time in the sea, it is striking that the knowledge on the survival and whereabouts of the sea trout in the marine areas is so limited. This is mainly due to technical barriers. The development within telemetry has made it possible to study the behavior of the sea trout by means of electronic tags. By using the so-called pit tags and acoustic tags it is possible to monitor the fish when it passes a given place - typically at the outlet of the stream, the river or similar. At the same time new types of marks, the so-called DST-marks and the acoustic oxygen transmitter, make it possible to register information about the surrounding environment of the fish with a so far unprecedented accuracy.

In the last few years, DTU Aqua has investigated the behavior and survival of postsmolts and kelts in the initial estuarine phase after exit from the river. The results show that wild fish have a relatively high degree of survival after emigration (Aarestrup et al. 2014; 2015). Meanwhile, further studies of survival and behavior in other systems are necessary in order to make any conclusions - as well as the rest of the survival and behavior of the sea trout in the sea that is not yet clarified.

This project aims at obtaining information on the behavior of the marine phase of the sea trout. Besides valuable information on the marine life of the sea trout, the project will also give detailed information on the survival in salt water, survival of spawning, survival of repeat spawners as well as a lot of other information such as the time of entering fresh water to spawn and the time of returning to the sea. In some rivers part of the population are said to have an alternative life history strategy and these fish are called “fjord trout”. Rumor has it that sea trout with this particular life history only wander into the fjord and not to the sea. Furthermore it has a number of morphological differences compared to the sea trout. The project will try to determine if there actually exist two life history strategies in the form of fjord- and sea wandering trout.
The project is running concurrently with project 38259: “Population development of sea trout after removal of migration obstacles” and both collaborates with the EU funded project 39301: “Expertise in marine and aquatic ecology and genomics for sustainable management of fish and shellfish in Skagerrak-Kattegat-Øresund (MarGen)”.

MarGen is an interregional management project with a specific aim to increase scientific and management competencies of marine resources in Kattegat/Skagerrak including understanding of fish migration.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Aalborg University
Period: 01/01/2008 → 01/01/9999
Number of participants: 1
Research areas: Freshwater Fisheries and Ecology & Coastal Ecology
Project Manager, academic:
Aarestrup, Kim (Intern)

Nutritional Immunology
National Food Institute
Department of Systems Biology
National Institute of Aquatic Resources
Period: 04/01/2007 → 31/12/2011
Number of participants: 10
Project participant:
Wilcks, Andrea (Intern)
Bergström, Anders (Intern)
Andersen, Jens Bo (Intern)
Metzdorff, Stine Broeng (Intern)
Fink, Lisbeth Nielsen (Intern)
Nielsen, Nina Skall (Intern)
Project Manager, organisational:
Licht, Tine Rask (Intern)
Frekær, Hanne (Intern)
Hellegren, Lars (Intern)
Jacobsen, Charlotte (Intern)

Financing sources
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 3,250,000.00 Danish Kroner

Detection of strongly histamine-producing and psychrotolerant bacteria in seafood
Postdoc project in collaboration between the Predictive Microbiology group at DTU Aqua and DTU Systems Biology.
Funded by the Danish Research Council for Technology and Production Sciences

National Food Institute
Division of Industrial Food Research
Section for Aquatic Microbiology and Seafood Hygiene
Period: 01/01/2007 → 31/03/2010
Number of participants: 2
Acronym: Hiproba
Project participant:
Emborg, Jette (Intern)
A framework for fleet and area based fisheries management (AFRAME) (38110)

Basing advice on fleets or fisheries requires switching focus from a biological unit (a fish stock) to a social one (a fleet or fishery). This is a major shift away from the current TAC-dominated, stock-based approach. The general objective of the AFRAME project was to develop an operational area- and fleet-based framework that integrates single-species assessment and advice. The framework must be robust to uncertainty caused by, for instance, lack of discard data. Work also included development of indicators as a basis for setting management targets, as well as the analysis of stakeholder perspective in relation to these developments.

Three case studies of mixed demersal fisheries were included focusing on areas where the need for a fleet-based management is particularly urgent: (i) The North Sea, (ii) The Western Waters in ICES areas VII & VIII (Celtic Sea to the Bay of Biscay), and (iii) the Eastern Mediterranean.

The AFRAME project has been particularly successful in developing a simple and operational approach for mixed-fisheries advice. This approach is now integrated as part of the ICES Advice for the North Sea, through the setup of a dedicated working group applying this approach on a routine basis.

The project was coordinated by Marine and Food Technological Centre (AZTI), Spain.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Marine and Food Technological Centre
Wageningen IMARES
Cefas
IFREMER
Institute of Marine Research
University of Copenhagen
Aalborg University
Marine Scotland Science
Hellenic Centre for Marine Research

Artificial reproduction of eels: Phase III (ROE III) (38187)

The steady decline of the European eel stock has adverse consequences for the Danish eel aquaculture as all eel farming is at present capture based relying on wild caught glass eels. In 2005, DTU Aqua, University of Copenhagen and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture.

The focus of ROE III was to follow up the pioneering work on artificial reproduction of European eels performed in the preceding pilot projects ROE I and II. The projects ROE II and III were a collaboration among DTU Aqua, University of Copenhagen, and the eel aquaculture industry.
Copenhagen and the eel aquaculture industry following up an initial survey ROE I of suited methodology lead by University of Copenhagen.

ROE III comprised the following activities:
(i) Experimental series with different treatment schemes and hormone dosage to improve the maturation process and optimize gamete quality;
(ii) Development of methods to monitor the maturation process on individual level using ultrasound scanning technology and ovary biopsy;
(iii) Analysis of broodstock fishes and improvement of the dietary fatty acid composition;
(iv) Investigation of parameters determining egg quality during incubation;
(v) First-feeding trials with eel larvae testing both artificial and live feed.

Three experimental series were completed focusing on methods for broodstock enhancement, maturation and fertilization plus culture of eggs and larvae. Already during the first experimental series, larvae accomplishing the entire yolk sac stage were achieved for the first in history for European eel. The yolksac larvae developed successfully during the period were they entirely depend on nutrition sources i.e yolk and lipid of maternal origin. The larvae were ready to start feeding day 12 post hatch. During the second experimental series, larval longevity was extended to 18 days during first feeding experiments. These recent results are a major breakthrough because they show for the first time that artificial hormone treatment can lead to viable offspring in European eel. Eggs and yolksac larvae were obtained from different hormonal treatments and mass hatchings were regularly obtained. Larval feeding using live and artificial larval feeds developed in collaboration with the food company BioMar were developed towards the end of the experiments and are ready for testing in new and coming projects.

The success of this project on improved methods, quality criteria and larval survival has led to form the basis of the project: Reproduction of European eel in aquaculture: Consolidation and new production methods and later (REEL) (38398) and later the EU FP project: Reproduction of European eel in Aquaculture: Towards a self-sustained aquaculture (PRO-EEL) (38793).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of Copenhagen
Bioneer A/S
Danish Eel Farmers Association
Billund Aquaculture Service Aps
Period: 01/01/2007 → 31/12/2009
Number of participants: 9
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology
Project participant:
Steenfeldt, Svend Jørgen (Intern)
Sørensen, Sune Riis (Intern)
Hornum, Inger (Intern)
Krüger-Johnsen, Maria (Intern)
Jarlbæk, Henrik (Intern)
Project Manager, academic:
Tomkiewicz, Jonna (Intern)
Munk, Peter (Intern)
Støttrup, Josianne Gatt (Intern)
Tybjerg, Lars (Intern)

Automated fish ageing (AFISA) (38111)
Most of European fish stocks are assessed using age-based models, the cost of the acquisition of age data from otolith readings raises several million euros annually. Low uncertainty in age estimation is however reached for only 25 % of fish stocks under ICES advising process. The impact of ageing errors on stock assessment is obvious though obscure. In this context, automated ageing systems would provide a mean to standardize ageing among laboratories and to control ageing consistency while reducing the cost of the acquisition of age data. No such system is currently available, although preliminary results provide the basis for such developments.

This two-year project aims at developing fully automated and robust systems for routine ageing. It will comprise four work
packages in addition to project management (WP0): the collation of the otolith material and the creation of bases of annotated otolith images (WP1), the development of algorithms for fish ageing automation from otolith features (WP2), the implementation these automated ageing modules in a software platform dedicated to otolith imaging (WP3), the cost-benefit analysis of the proposed automated ageing systems (WP4).

The whole processing chain from the acquisition of otolith data to the actual ageing issue using pattern recognition or statistical inference will be coped with. The demonstration component will include the demonstration of the degree of automation of the proposed systems and a cost-benefit analysis of these automated solutions for three case studies: cod from Faeroes, North Sea and North East Arctic, plaice from the Eastern English Channel (VIIId) and Iceland, and anchovy from the Bay of Biscay. The focus will be on demonstrating the consistency of automated age estimation with respect to the major steps of the processing chain and to the joint analysis of ageing precision and acquisition costs with respect to stock assessment objectives.

The project is coordinated by Institut Francais de Recherche pour l'Exploitation de la Mer (IFREMER), France.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
IFREMER

Marine and Food Technological Centre
Cefas

Institute of Marine Research
Marine Research Institute

Polytechnic University of Catalonia

Period: 01/01/2007 → 31/12/2009
Number of participants: 5

Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology

Project participant:
Christensen, Asbjørn (Intern)
Lewy, Peter (Intern)
Worsøe Clausen, Lotte (Intern)

Project Manager, academic:
Mosegaard, Henrik (Intern)
Hüssy, Karin (Intern)

Project

Development and performance test of method for establishing an area based recruitment index for North Sea sandeels (TORTN) (38128)

The project's overall objective is to establish a recruitment index for sandeel in the North Sea, for use in preparation of the scientific advice for North Sea sandeel fisheries. It is also an objective that this index should be developed in collaboration with the fishing industry. This is partly to increase the transparency and credibility of the scientific work but also to reduce the cost of setting up the necessary information to as low as possible.

It is of significant interest to be able to subdivide North Sea sandeel habitats based on well-founded biological and physical principles in order to provide spatial explicit stock assessment and advice on local fishing potential. Using hydrographic modeling and field sampling during the fishing season the coupled larval drift and population model (SPAM) will be validated.

The North Sea wide collection of winter hibernating sandeels from the seabed with the modified scallop dredges will be continued and the time series of abundance data will be analyzed. The project will further create a database of VMS, data corresponding to Danish vessels fishing for sand eels (defined by logbook database). From this data fishing effort, a fishing ground level will be estimated through the use of VMS and log book data. Using sandeel samples from the fishery area-based age-length keys will be developed using a continuation logit statistical approach. Combining recruitment data from population analysis and fisheries independent data on 0-group, the project will further develop, test and optimize a method for calculating the recruitment of 0-year-old sandeels to the North Sea stock. Real-time Monitoring of the sandeel fishery, which is the present basis for in season advice on fishing opportunities (applied 2004-2009), earliest establish the same basis by May i.e. in the middle of the fishing season. The new procedure developed in the project makes it possible to provide the scientific advice used in fisheries management in January, more than 2 months before the start of fishing season. Thus the procedure will allow the development of area based recruitment indices to manage the sandeel fishery in accordance with principles that ensure a more optimal utilization of sandeel stock and also reduces the risk of local overfishing.
The project is coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
Period: 01/01/2007 → 31/12/2008
Number of participants: 4
Research area: Marine Living Resources
Project Manager, academic:
Mosegaard, Henrik (Intern)
Christensen, Asbjørn (Intern)
Rindorf, Anna (Intern)
Jensen, Henrik (Ekstern)

Fisheries induced evolution (FinE) (38279)
The project is set up to investigate the prevalence of fisheries-induced evolutionary changes in life-history traits of exploited fish stocks in European and North American waters. The aims are to unravel the underlying mechanisms of change ranging from the phenotypic to the genetic level, to evaluate their consequences on population and fisheries dynamics, and to provide recommendations for evolutionarily enlightened management. This objective necessitates the development and application of novel methodological tools for investigating field data both at phenotypic and genetic levels, together with the setup of relevant experiments on model species and the careful construction of theoretical models suitable for complementing field data analyses and for evaluating managerial options. Earlier investigations have focused on specific aspects such as the analysis of long-term trends in phenotypic data, the investigation of temporal changes in neutral genetic markers, artificial fishing experiments, or the modeling of fisheries-induced evolutionary changes in life-history traits and their demographic consequences for exploited stocks. However, a comprehensive investigation of fisheries-induced evolution at the phenotypic and genetic level and of consequences on fish stocks dynamics are still largely missing, mostly because of the wide range of scientific expertises and approaches required for tackling these challenges. This project aims at combining fields of expertise as diverse as population genetics and quantitative genetics, life-history theory, population dynamics, evolutionary theory, and fisheries science.

The project is coordinated by International Institute for Applied Systems Analysis, Austria.
National Institute of Aquatic Resources
Section for Marine Living Resources
International Institute for Applied Systems Analysis
Institute of Marine Research
IFREMER
Catholic University of Leuven
University of Wales
Marine Scotland
University of Tromsø
Netherlands Institute for Fisheries Research
University of Oslo
Spanish National Research Council
Finnish Game and Fisheries Research Institute
Federal Research Centre for Fisheries
Period: 01/01/2007 → 31/12/2010
Number of participants: 3
Research area: Population Genetics
Project participant:
Hansen, Jakob Hemmer (Intern)
Therkildsen, Nina Overgaard (Intern)
Project Manager, academic:
**Improved methodology for cod age estimation (DECODE) (38120)**
The objective of this project is to develop and implement an objective method for the age-determination of Eastern Baltic cod. The assessment for Eastern Baltic Cod (Sub-divisions 25-32) has presented a number of problems in recent years. The key problem is the severe inconsistencies in age determination which affect both the catch-at-age and the survey data. The methods to be developed within this project are based on the use of otolith biometrics. This procedure has proven successful in other stocks with age-reading problems. The data series on commercial and survey catch length distributions, otolith biometrics and biological parameters (collected for ICES Study Group on Ageing Issues in Baltic Cod (SGABC)) will be extended back as far as 2000. Mixture and conditional models to estimate age structure for a given component in stock assessment will be developed as statistically robust approaches to age-determination. Based on this new method, the historic catch and survey data will be reconstructed. The primary focus is on data for routine single-species assessments, but data for multi-species assessments will also be updated where possible.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Bundesforschungsanstalt für Fischerei
Swedish National Board of Fisheries
Morski Instytut Rybacki w Gdynia
Latvian Fish Resources Agency
Cefas
Period: 01/01/2007 → 31/12/2009
Number of participants: 5
Research area: Marine Living Resources

**Modelling the impact of hydrography and lower trophic production on fish recruitment (MODREC) (38114)**
The recruitment of fish stocks is strongly influenced by fluctuations in climate and physical environment leading to strong and seemingly unpredictable year-to-year variations in year class strength. The aim of this project is to develop a model framework for conducting detailed recruitment studies on fish stocks. The framework will be applied for two commercially important fish stocks: sprat and sandeel, in order to improve the understanding of climate effects via bottom-up control and explain the observed high variability in reproductive success in these stocks. The framework will be built on existing hydrographic models by adding descriptions of primary and zooplankton production.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Aarhus University
Danish Meteorological Institute
Period: 01/01/2007 → 31/12/2009
Number of participants: 5
Research area: Marine Populations and Ecosystem Dynamics

Project participant:
Christensen, Asbjørn (Intern)
Frisk, Christina (Intern)
Munk, Peter (Intern)
**Resolving climatic impacts on fish stocks (RECLAIM) (38109)**

Climate change will impact fisheries resources and challenge managers to develop sustainable exploitation strategies. Knowledge on the impacts of climate on fisheries resources is still fragmentary.

RECLAIM will summarize current knowledge, test process understanding, improve predictive capacity and formulate future research hypotheses by examining trophic processes, geographical distributions and essential habitat requirements for marine and shellfish in the NE-Atlantic.

A conceptual framework will be developed to distinguish between processes acting on individual (physiology, behavior), population (predation, competition) and ecosystem (physical habitat qualities, biological productivity, trophic coupling) levels. The framework structures a literature review to detects gaps in knowledge and, where possible, distinguishes between climate and anthropogenic influences.

A comparative analysis follows quantifying climate variability and changes in distribution and productivity of (i) individual species, (ii) selected fish and shellfish communities, and (iii) ecosystem structure and functioning.

Target species represent different commercially important resources, ecosystem components (pelagics, demersals), and play key trophic roles (wasp-waist, apex predators) within NE-Atlantic ecosystems.

Changes in ecosystem structure and functioning will be analyzed from fisheries and scientific survey data including planktonic, benthic and fish production and consumption in relation to climate forcing and fishing. Relevant spatial and temporal scales of climate change and variability will be explored using time series analyses, spatial statistics and coupled 3-D hydrodynamic ecosystem models.

Using a variety of approaches, RECLAIM will both hind cast as well as forecast the effects of climate change on the productivity and distribution of fish and shellfish stocks to formulate hypotheses and research needs to be addressed in future EU research.

The project is coordinated by IMARES, The Netherlands, and has nine partners from the EU.

National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography

Period: 01/01/2007 → 31/12/2009

Number of participants: 12

Research area: Marine Populations and Ecosystem Dynamics

Contact person:
Christensen, Asbjørn (Intern)
Neuenfeld, Stefan (Intern)
MacKenzie, Brian (Intern)
Andersen, Ken Haste (Intern)
Huwer, Bastian (Intern)
Payne, Mark (Intern)
Brander, Keith (Intern)
Gürkan, Zeren (Intern)
Mosegaard, Henrik (Intern)
Geitner, Kerstin (Intern)
Jensen, Henrik (Ekstern)
Köster, Fritz (Intern)

**Science and policy integration for coastal systems assessment (SPICOSA) (38180)**

The objective of SPICOSA was to develop a self-evolving, holistic research approach, for integrated assessment of Coastal Systems so that the best available scientific knowledge could be mobilized to support deliberative and decision-making processes towards improving the sustainability of Coastal Systems by implementing Integrated Coastal Zone Management policies. Based on a System Approach, a multidisciplinary assessment framework was developed with a

The System Approach Framework (SAF) developed in the project was then used to explore dynamics of Coastal-Zone Systems and potential consequences of alternative policy scenarios in 18 different Study Sites. We demonstrated that achieving this objective required a restructuring of the science needed to understand the interactions between complex natural and social systems at different spatial and temporal scales including the overall economic evaluation of alternative policies. The software used for the modeling was furthermore developed with the aim to support transfer of scientific products to policy decision-makers, stakeholders and end-users. The SAF Portfolio consisted of generic assessment methodologies, specific tools, models and model blocks and new knowledge useful for ICZM provided in a user-friendly manner and updateable for future CZ researchers and professionals. In addition SPICOSA generated new training curricula, training modules and training opportunities for academics and professionals involved in Sustainability Science and ICZM implementation.

The project was organized into 5 Nodes with DTU Aqua leading one of these 5 Nodes.

In total the project had 54 partners from 22 EU countries.

The project was coordinated by University of Western Brittany, France, Institute of Coastal Marine Environment of CNR, Italy and French National Institute of Marine Research (IFREMER), France.

The project was funded by EU, Framework Programme 6.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2007 → 31/12/2011
Number of participants: 3
Research areas: Coastal Ecology & Ecosystem based Marine Management
Project participant:
Dinesen, Grete E. (Intern)
Geitner, Kerstin (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)

Scientific advice concerning the impact of the gears used to catch plaice and sole (GUPS) (38115)
The aim of the project was to:
- collect information on the fishing fleets that target plaice and sole in the North Sea
- collect information on the main fish stocks and ecosystems impacted by these fleets
- evaluate the performance of these fleets in terms of economic, ecological and social sustainability
- list the problem fisheries-list alternatives that reduce adverse impacts
- estimate the improvement in economic, ecological and social terms caused by adopting these alternatives.

The work program was structured into four tasks:

In Task 1, basic data were collected on fleets and effort, fish stocks, discards and selectivity. The scientific and grey literature, project reports and existing databases was consulted to collect the basic information. This information was aggregated along a common methodology. Sub-fleets or métiers were defined and an evaluation was made of the performance of the different fleets in economic, ecological and social terms.

In Task 2, the critical effects on the marine environment was identified for the different fisheries evaluated in Task 1. Based on comparative indicator tables, the problem areas were listed in order to best focus the review and selection of alternative gears and vessels.

In Task 3 a review was made of possible ways to reduce the adverse effects by fisheries selected in Task 2. These were technical alterations to existing gears, alternative fishing methods for vessels designed for a specific method or fishing methods not yet applied on a large scale in the North Sea.

In Task 4, predictions were made on the effects of a possible modification of existing sole and plaice fisheries in the North Sea based on the following criteria:
- possible reduction in discards through an improved selectivity-benefits for the spawning stock biomass and the landings
- reduction in the environmental impact of the fishing activity
- improvement of the socio-economic performance of fishing fleets.

Based on the results obtained in Task 4, conclusions and recommendations were formulated on the feasibility and effectiveness of the alternatives for existing fisheries targeting sole and plaice in the North Sea.
The project was coordinated by Institute for Agricultural and Fisheries Research (ILVO), Belgium.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Institute for Agricultural and Fisheries Research
Cefas
Wageningen IMARES

Agricultural Economics Research Institute
Period: 01/01/2007 → 31/12/2009
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Madsen, Niels (Intern)

Strategies to improve health and welfare in rainbow trout farming (38193)
The main aim of the project is the developing of sustainable strategies for improving the health, welfare and quality of cultured rainbow trout by implementing three interrelated approaches: management, immune prophylactics, and selective breeding. The management approach determines how increased water current at given rearing densities and water temperatures can reduce the stress of trout. The immune prophylactic approach determines the relationship between immune response profiles and induction of protective immunity at different water temperatures and hereby establishing efficient strategies for use of vaccination and feed stimulants in prevention of diseases. The selective breeding approach determines how physiological and immunological traits can improve the genetically basis for resistance of trout to stress and disease.

The project is coordinated by DTU Aqua.
National Veterinary Institute
National Institute of Aquatic Resources
Section for Aquaculture
University of Copenhagen
Aarhus University
Period: 01/01/2007 → 31/12/2010
Number of participants: 5
Research area: Aquaculture
Project participant:
Höglund, Erik (Intern)
Larsen, Bodil Katrine (Intern)
Skov, Peter Vilhelm (Intern)
McKenzie, David D. (Ekstern)
Project Manager, organisational:
Jokumsen, Alfred (Intern)

Sandeel Dredge Survey (39064)
The scientific sandeel dredge survey is carried out each year in November/December and it covers the most important sandeel fishing banks in the North Sea.

The aim is to collect the sandeels when they are buried in the seabed and compare the catches (number and age composition) with the previous year's collections. The specific year class strength of sand eels is assessed for the different areas adopted by ICES in 2009.

Data from the dredge survey is the basis for calculating an index, which is used in the stock assessment.

This project is coordinated by DTU Aqua.
National Institute of Aquatic Resources
Control of Foodborne Pathogenic Bacteria by Cleaning and Disinfection

National Institute of Aquatic Resources
Number of participants: 6
Phd Student:
Kastbjerg, Vicky Gaedt (Intern)
Supervisor:
Vogel, Birte Fonnesbech (Intern)
Main Supervisor:
Gram, Lone (Intern)
Examiner:
Licht, Tine Rask (Intern)
Knechel, Susanne (Intern)
Webber, Mark (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Anden EU-finansiering
Project: PhD

Elucidating the structure and functioning of marine ecosystems through synthesis and comparative analysis (META-OCEANS) (38154)
This project was an EU Marie Curie Early Stage Training PhD network. The project was designed to improve and apply meta-analytical methods to oceanographic and fishery research questions.

There are significant gaps in knowledge regarding the structure of marine food webs, the ecological roles of taxa of different sizes and the factors controlling linkages between different functional groups. Moreover, marine ecosystems continue to suffer from the impacts of human society superimposed on naturally and anthropogenically induced climate variability. These impacts include exploitation, eutrophication, pollution, species transfers and habitat alteration; they cause changes in the structure, function and biodiversity of marine ecosystems. However, the ability of marine scientists to predict the magnitude and direction of how marine taxa, functional groups and entire ecosystems respond to these changes, remains fragmentary. As a result, when asked by society for advice about how marine ecosystems will respond to different kinds of perturbations (including management actions), the marine science community can often only provide answers with high levels of uncertainty.

Students were trained in the use of meta-analysis techniques for marine ecological problems. The statistical methods were comparative and involved regression analysis, time series analysis, Bayesian analysis and trophic modelling. Students attended seminars organized by network scientists and visited scientists in partner institutes to attain additional training.

Meta-analyses approaches make use of existing data, produced in the context of different specific analyses, but which gain new value when assembled and re-analysed in a broader perspective. Meta-analyses involve several stages: (1) data mining; (2) quality control, (3) data analysis, and (4) validation. Students were trained in all these steps.

DTU Aqua had two PhD students involved in the project. These projects used Bayesian and meta-analytical methods to show that standardized estimates of maximum population growth rate for all assessed cod stocks vary spatially across the Atlantic and in a dome-shaped relationship with temperature, and that extremely good or bad recruitment occurs in years
with extreme temperatures. In addition, new time series-based ways of forecasting cod population dynamics under climate change-exploitation scenarios were developed and the role of a trawling ban on a local cod population was shown to override temperature or other climate effects on stock productivity. Both projects produced papers in high impact journals (2 in Proc. Roy. Soc., 1 in PNAS), as well as in other leading fishery-marine ecology journals (MEPS, ICES, JMS, etc.).

This project was coordinated by AZTI Tecnalia, Spain.

This project was funded by EU, Marie Curie.

National Institute of Aquatic Resources
Centre for Ocean Life
AZTI-Tecnalia
Plymouth Marine Laboratory
National Center for Scientific Research
CSIC

University of Bergen
Period: 01/03/2006 → 09/12/2011
Number of participants: 3
Research areas: Oceanography & Marine Populations and Ecosystem Dynamics
Phd Student:
Lindegren, Martin (Intern)
Mantzouni, Irene (Intern)
Project Manager, academic:
MacKenzie, Brian (Intern)

**Capacity, F and Effort (CAFE) (38100)**

The CAFE project was designed to investigate the links between the fleet capacity, the fishing effort of those fleets and the fishing mortality that results from that effort, so as to facilitate the development of a fishing management strategy.

The fishing effort was considered as the amount of time a given fishing capacity was deployed in a fishery. Therefore, engine power could be seen as a capacity measure and kilowatt hours as the expression of the effort from that capacity. This estimate allowed for capacity and effort to be directly linked within the project.

CAFE proved that relating higher capacity and/or effort to higher fish mortality was a common misinterpretation. Thus, the project aimed to test the hypothesis that there was a quantifiable relationship between the capacity and effort by particular fleets and the fishing mortality imposed on the various commercial stocks.

The project covered six different case studies (the North Sea, the Bay of Biscay and the Mediterranean) accounting, both pelagic and demersal fisheries and single and multi-species fisheries.

A combination of models and metrics was subsequently employed to quantify the links between capacity, effort and fishing mortality. External factors which affected the fishers' choices were also identified. The modelling approach used both statistical and mathematical modelling techniques.

The models and the understanding gained through them were subsequently used to examine the response of the system to a range of management measures for controlling capacity and effort. A series of simulations were performed to examine the fisheries' response to limitations of capacity, effort or other measures. Several of the models were run using data of different case studies to test the general applicability of the approaches and observe existing differences between individual countries.

The project was coordinated by IMARES, Wageningen UR, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Cefas
University of Portsmouth

University of Copenhagen

Institute for Research in Economics and Business Administration

IFREMER

Marine Scotland

Spanish Institute of Oceanography

Marine and Food Technological Centre

IRD

Hellenic Centre for Marine Research

European Commission - Joint Research Center

Period: 01/01/2006 → 31/12/2009

Number of participants: 2

Research area: Fisheries Management

Project participant:
Andersen, Bo Sølgaard (Intern)
Eigaard, Ole Ritzau (Intern)

Project Development of cultural banks to produce mussels in the Limfjord (3418)

The aim of the project is to initiate a targeted research and development of cultivation of blue mussels in bottom cultures, by use of relaying and transplanting techniques, as this area-intensive form of production in the future will be the most productive and sustainable methodology. It will be tested whether bottom cultures can be established by stimulating natural spat fall by improving the substrate. The knowledge generated will partly facilitate the optimization of production methods and partly form the basis for developing a management plan for mussel production, including bottom culture cultivation.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Danish Fishermen's Association

National Environmental Research Institute

Danish Shellfish Centre

Period: 01/01/2006 → 31/12/2007

Number of participants: 2

Research areas: Coastal Ecology & Shellfish and seaweed

Project participant:
Kristensen, Per Sand (Intern)

Project Manager, academic:
Dolmer, Per (Intern)

Project Development of fishing gears with reduced effect on the environment (DEGREE) (38222)

The DEGREE project main objectives were to (i) develop new gears and fishing techniques with a lower impact on benthic habitats, (ii) to quantify the potential reduction of the physical impact as well as the negative effects on benthic communities caused by the innovations and (iii) to weigh the socioeconomic consequences of these changes against those of alternative management measures, such as the closing of areas. The project consisted of six work packages (WPs), focusing on management and coordination, modelling and quantification of benthic impacts, otter trawl modifications, beam trawl and dredge modifications, economics, dissemination and implementation of knowledge. The DEGREE project fulfilled its primary objectives and combined expertise of the technology, biology and economy sectors.

A number of alternative fishing gears and gear modifications were developed, with the potential to lower mortality of benthic invertebrates and non-target demersal fish. The bottom impact of the new gear designs and practices were assessed by modelling effects on sediments, comparative fishing experiments, observing tracks made on the sea bed. The economic consequences of using the new gear were analyzed for a number of cases. Among the gears tested and demonstrated to have reduced seabed impact were otter trawls with light weight doors and low impact ground gear, pulse
trawls, light beam trawls and low impact oyster dredges. It was recommended to further work on the project findings through the development of innovative tools to enable an integrated evaluation of ecosystem effects of the developed alternative fishing gears, which were designed to decrease the impact on marine ecosystems and contribute to sustainable fisheries.

The project was coordinated by IMARES, Wageningen UR, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Cefas
Marine Scotland
IFREMER
Institute of Marine Research
An Bord Iascigh Mhara
Centre for Agriculture research – Sea Fisheries Department
University of Aberdeen
University of Portsmouth
Institute of Marine Sciences, Marine Fishery Section
University of Liverpool
Period: 01/01/2006 → 31/12/2009
Number of participants: 3
Research area: Fisheries Technology
Contact person:
Eigaard, Ole Ritzau (Intern)
Project participant:
Frandsen, Rikke (Intern)
Dolmer, Per (Intern)

Project Development of selective trawls for important Danish fisheries (4313)
The project was structured in following sub-projects:
1) Development of a North Sea haddock trawl: to design a trawl with reduced by-catches of cod.
2) Improved size-selection of the Norway lobster trawl used in Kattegat: to reduce the catch of undersized Norwegian lobster.
3) Improved species-selection in Norway lobster trawl used in Kattegat: to design a trawl that selectively catches Norway lobsters while letting cod and other unwanted by-catch escape.
4) Improved size selection in Baltic cod trawls: test of T90 meshes in the cod end in comparison to BACOMA trawl.

The cod stock in the North Sea is on a low level, with little signs of recovery during the most recent 20 years. By-catch of cod in different fisheries is a problem at this low stock size and therefore technological modifications of gears used in fishing fleets with significant by-catch of cod are requested. Sub-project 1 aimed at the development of a haddock trawl with reduced catchability of cod. Making use of the different behavior of haddock and cod during the catching process, modifications of the trawl groundrope were tested for their effect on cod catchability.

The Norway lobster population in the Kattegat is doing well, and the Norway lobster fishery is the most economically important fishery in the Kattegat. However, there is a substantial catch of undersized Norway lobster in the fishery and improving the size selectivity of the trawl in use was the goal of sub-project 2. This included designing and testing of different mesh sizes and sorting mechanisms.

In contrast to Norway lobster, the cod population in Kattegat has declined severely in the last 20-30 years. Without reducing the by-catch of cod through a more selective trawl, the Norwegian lobster fishery would have to be reduced significantly in order to protect the cod. Within sub-project 3, the aim was to develop a trawl with significantly improved selectivity, allowing enhanced escapement of cod. The traditional round cod end was replaced with a cod end shaped like a square mesh box. This box proved to be more stable in the water enabling to take advantage of the different behavior of cod and Norwegian lobster. While cod tend to move up-wards in the tunnel of a cod-end, Norwegian lobster remains passive at the bottom. Placing a 180 mm escape panel into the upper panel of the box, allowed to improved escapement of cod.

A simple way to increase the mesh opening in a cod-end is to turn the mesh 90° (T-direction, henceforth T90) because the knots will determine the initial mesh bar angle. A T90 cod end was introduced in the legislation for the Baltic Sea cod fishery and the aim of sub-project 4 was to test for differences in cod selectivity in comparison to the standard BACOM (having a sorting window in the top-panel of the cod end).
The project was coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
Different fishing companies and net producers
Period: 01/01/2006 → 31/12/2008
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Madsen, Niels (Intern)
Project

ERFA-MUS (38615)
Within the last 8 years a number of mussel farms have been established. A significant growth and development in the seafood industry can be expected if the industry offers support in relation to research and development. The research is primary focused on testing different farming methods in collaboration between a number of research institutions and aquaculture organizations. Also at the level of individual mussel farms, methods are developed to improve growth by adapting cultivation techniques to local environmental conditions and to improve harvest techniques. These developments which take place in individual farms promote diversification of methods. The aim of the project is to collect and compile this body of information, in order to disseminate the knowledge to other farmers. The farms will thus have the opportunity to evaluate and use the best possible production methods in relation to the production conditions their production area offers.

The project is coordinated by DTU Aqua.
National Institute of Aquatic Resources
Association of Mussel Farmers
Danish Shellfish Centre
Period: 01/01/2006 → 31/12/2007
Number of participants: 3
Research area: Shellfish and Seaweed
Project participant:
Christensen, Helle Torp (Intern)
Geitner, Kerstin (Intern)
Project Manager, academic:
Dolmer, Per (Intern)
Project

Incorporating extrinsic drivers into fisheries management (IN EX FISH) (38188)
The overall aim of the IN EX FISH project is to increase the responsiveness of fisheries management to a range of anthropogenic and non-anthropogenic forcing factors. This will be achieved through a systematic review of the factors influencing fish stock dynamics in European Seas and by developing a suite of management tools. These management tools will use robust metrics of ecosystem state, and will provide varied management responses depending on the ecosystem state compared to a historic reference condition. The framework will be developed specifically to be integrated into European fishery management processes and will be based on the geographical areas defined by the regional advisory councils (RACs).

A holistic ecosystem approach will be used to assess the effects of anthropogenic and non-anthropogenic factors on the main functions of the biological cycle of exploited fish species and the ecosystem that supports them. The IN EX FISH project recognizes that humans are part of the marine ecosystem and that some are dependent upon it for their livelihoods. The project will validate its management recommendations through consultation with stakeholder groups and incorporate their feedback into the project outputs.

The IN EX FISH project has four specific and verifiable scientific and technical objectives. These are (i) To provide a state of the art review of the impact of anthropogenic and non-anthropogenic factors on the dynamics of fish stocks; (ii) To develop a framework for the systematic evaluation of the impact of anthropogenic and non-anthropogenic factors on the dynamics of exploited fish species; (iii) To develop criteria for the selection of appropriate metrics, to review available metrics of ecosystem status, to select those that match the criteria and establish reference levels in four geographic regions for these metrics and (iv) To incorporate IN EX FISH knowledge of anthropogenic and non-anthropogenic effects into fisheries management.
The project is coordinated by School of Biological Science, University of Liverpool, UK.

National Institute of Aquatic Resources
University of Liverpool
Instituto Português de Investigação das Pescas e do Mar
Marine Research Institute
Wageningen IMARES
Heinrich-Heine-Universität Düsseldorf
Sea Fisheries Institute
University of Bari

Stockholm University

Period: 01/01/2006 → 31/12/2008
Number of participants: 4
Research area: Ecosystem Based Marine Management

Project participant:
van Deurs, Mikael (Intern)
MacKenzie, Brian (Intern)
Jensen, Henrik (Ekstern)

Project Manager, academic:
Dolmer, Per (Intern)

Indicators for fisheries management in Europe (IMAGE) (38225)
The Common Fisheries Policy (CFP) requires the progressive implementation of an ecosystem-based approach to fisheries management (EBFM). To implement effective management, it is essential to develop a framework that allows for the evaluation of different management strategies based on indicators. Indicators can support the decision making process by (i) describing the pressures affecting the ecosystem, the state of the ecosystem and the response of managers, (ii) tracking progress towards meeting management objectives and (iii) communicating trends in complex impacts and management processes to a non-specialist audience. The aim of this project was to develop an indicator-based operational framework that can support ecosystem-based management, and also show how this can be applied to test and evaluate different management strategies or sampling programs.

The principal objectives of IMAGE were:

- To develop an operational framework of candidate indicators (ecological, economic, social) that can support ecosystem-based fisheries management at the regional and pan-European scale
- To elaborate these indicators in comprehensive dashboards (e.g. current values, trends, reference levels)
- To develop methodology to integrate this information into tools supporting the decision-making process
- To develop a framework that can evaluate management strategies based on indicators
- To advise on how indicators can be used to support EBFM in selected regional case studies based on the RAC areas.

The project consisted of a conceptual phase where the operational framework was designed. This was followed by a phase of methodology development, an implementation phase consisting of regional case studies linked to the RACs and finally a pan-European evaluation and synthesis of the projects results. The results of this project contribute to the development of an effective EBFM in the context of the CFP, while also contributing to the applied science needed to support the emerging European Marine Strategy and Maritime Policy.

The project was coordinated by Institute for Marine Resources and Ecosystem Studies (IMARES), The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Cefas
IFREMER
Aalborg University
COISPA Tecnologia & Ricerca
University of Tartu
Period: 01/01/2006 → 31/12/2009
Number of participants: 11
Research area: Ecosystem Based Marine Management
Contact person:
Nielsen, J. Rasmus (Intern)
Köster, Fritz (Intern)

Project participant:
Jarre, Astrid (Intern)
Bastardie, Francois (Intern)
Andersen, Ken Haste (Intern)
Sørensen, Thomas Kirk (Intern)
Mosegaard, Henrik (Intern)
Thomsen, Kirsten (Intern)
Tomczak, Maciej (Ekstern)
Jacobsen, Jonathan Broch (Ekstern)

Project Manager, academic:
Eero, Margit (Intern)

Management plans and Danish fishery (2245)
The objectives of the project were with reference to the EU Commissions proposals on multi-annual management plans, to deliver high quality advice on management of the fishing effort in Danish fisheries in the Baltic Sea, the North Sea, the Skagerrak and the Kattegat.

To be able to deliver the advice the project addressed the need for detailed and accurate data on catches, effort and economical performance in the main demersal Danish fisheries in the concerned areas and the need for accurate stock assessment of the economically most important fish and shellfish stocks. The project also developed a systematic method to give a qualified prediction of the selectivity of a trawl based on information on the trawl design.

The project included seven work packages: (i) Description of development in catches, fishing effort and economical performance of the main demersal Danish fisheries including creation of a single database; (ii) Develop a reference fleet system to collect detailed information on catches and fishing effort; (iii) Development of a software to be used to simulate trawl selectivity; (iv) Establish a fisheries independent monitoring survey on Norway lobster in the Skagerrak and the Kattegat; (v) Provide advice on a fishing effort management system for the demersal fisheries in Kattegat including proposal for enhancement of the cod selectivity in trawl fisheries; (vi) Provide advice on fishing effort in form of days at sea by métier; and (vii) Evaluate the impact of the effort management system in the Baltic Sea on the Danish fishery and the stocks.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
Period: 01/01/2006 → 31/12/2008
Number of participants: 13
Research areas: Fisheries Management & Fisheries Technology
Project participant:
Munch-Petersen, Sten (Intern)
Madsen, Niels (Intern)
Bastardie, Francois (Intern)
Pedersen, Eva Maria (Intern)
Christensen, Steen (Ekstern)

Project Manager, academic:
Kirkegaard, Eskild (Intern)
Andersen, Bo Selgaard (Intern)
Jørgensen, Ole A. (Intern)
Herrmann, Bent (Intern)
Storr-Paulsen, Marie (Intern)
Dalskov, Jørgen (Intern)
Spatially-explicit management methods for North Sea cod – a Danish fishermen-science collaboration (REX, REX II, REX III) (38430, 38431, 38541)

The REX project started in 2006 as a protest from the Danish Fishermen Association because fishers had a less pessimistic perception of the status of the cod stock in the North Sea than ICES, and they considered the agreed TAC levels far too low. In particular the fishermen considered the scientific surveys as inappropriate due to extremely low catches of large cod because of wrong gear and fishing on smooth bottom only. This seemed to call for more spatially-explicit oriented approaches and REX was born with an aim of getting closer to a common understanding of the true number of adult cod in the North Sea by focusing on communication and collaboration in developing and implementing a scientifically sound and robust survey strategy with commercial ships in a north-eastern area selected by the Danish Fishermen Association using three vessels presenting different fishing methods (flyshooter, trawler and gillnetter).

The development of the fishermen-scientists collaboration with mutual respect has increased the understanding on both sides. In particular the emphasis on defining common goals, facing and solving conflicts immediately and extending thorough collaboration from survey planning, conducting of field work to interpretation of results during workshops have contributed to bridging the communication gab.

A better understanding of cod biology has also been a focal point in these projects through the new field studies incorporating fishermen's knowledge. This includes distribution and migration, feeding behavior and importance of Hot-Spots (e.g. ship wrecks). Electronic tags were applied to learn about migration also in the Baltic. Together with the aim of continuing to obtain better assessments of the stocks such more mechanistically oriented studies are needed to answer two apparently simple questions “Where are the cod and why?”

The REX projects have strengthened the scientific collaboration with fishermen and produced several results and types of knowledge that will influence future work on developing spatial explicit management tools. REX also represents capacity building for DTU Aqua’s interdisciplinary field research and monitoring towards the spatial dynamics of cod.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
Period: 01/01/2006 → 31/01/2010
Number of participants: 17
Research area: Marine Living Resources
Project participant:
- Pedersen, Eva Maria (Intern)
- Olesen, Hans Jakob (Intern)
- Andersen, Ken Haste (Intern)
- Thygesen, Uffe Høgsbro (Intern)
- Kristensen, Kasper (Intern)
- Berg, Casper Willesstofte (Intern)
- Storr-Paulsen, Marie (Intern)
- Vinther, Morten (Intern)
- Christensen, Per (Intern)
- Jensen, Rasmus Frydenlund (Intern)
- Pedersen, Jan (Intern)
- Grønby, Søren Larsen (Intern)
- Thaarup, Flemming (Intern)
Project Manager, organisational:
- Neuenfeldt, Stefan (Intern)
Project Manager, academic:
- Beyer, Jan (Intern)
- Andersen, Niels Gerner (Intern)
- Wieland, Kai (Intern)
The distribution of Danish freshwater fishes (38269)
The objectives of this project are, for the first time in almost 100 years, to produce and in a book present an updated distribution map of all freshwater fishes found in Danish fresh waters. The results will act as a reference point when analyzing both previous and future changes in the distribution of freshwater fishes in Denmark, e.g. related to climatic changes.

Until the beginning of this project the geographic distribution of freshwater fishes in Denmark was not known in detail. For many species we only knew in which part of the country and maybe in which river system they live now or had lived earlier. Thus, our knowledge was incomplete and in general fragmented and consequently hard to find. In addition much of the existing information was old and newly arrived alien species had not been registered correctly. Thus, there was a need for a complete and updated status on the distribution of freshwater fish. Such a status will be a milestone in Danish inland fisheries research and management. Its value in relation to research and management as well as providing public access to correct information will be high. As an example the database has been used to revise the red data list for freshwater fishes in Denmark.

In this project we have 1) collected existing data on the occurrence of freshwater fish from public and private institutions and 2) gathered information from the public on catches and other observations of freshwater fish. As supplement we have 3) made targeted surveys to fill gaps and improve knowledge on rare species. All this information have been 4) combined in a GIS-based database. Finally we have 5) presented the complete set of information on geographical distribution of freshwater fishes in Denmark in a book also containing detailed information on the biology and ecology of all species (native and alien) present in Denmark.

The book was published in 2012 and contains 700 pages. It is written in Danish and illustrated with a large number of high quality photos of all species. It is written by 5 main authors (two of which are from DTU Aqua) and a few guests (one from DTU Aqua). Even though written to a broad audience, it is fully documented with references in the text. Due to private funding it has been possible to distribute the book at a very low price, 399 DKK (ca. 53 €). The revenue from the sale is reserved for a future revision and re-publishing of the book.

The project was coordinated by Natural History Museum of Denmark, University of Copenhagen, Denmark.

The project was funded by Aage V. Jensen's Charity Foundation.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
University of Copenhagen
Period: 01/01/2006 → 30/12/2012
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project Manager, academic: Rasmussen, Gorm (Intern)
Berg, Søren (Intern)

Understanding the mechanisms of stock recovery (UNCOVER) (38104)
The UNCOVER project has produced a rational scientific basis for developing Long-Term Management Plans (LTMP) and recovery strategies for 11 of the ecologically and socioeconomically most important fish stocks/fisheries in the Norwegian and Barents Seas, the North Sea, the Baltic Sea and the Bay of Biscay and Iberian Peninsula.

UNCOVER's objectives were to:
(i) identify changes experienced during stock depletion/collapses,
(ii) to understand prospects for recovery,
(iii) to enhance the scientific understanding of the mechanisms of fish stock/fishery recovery, and
(iv) to formulate recommendations how best to implement LTMPs/recovery plans.

The project recommends that such plans ideally should include:
(i) Consideration of stock-regulating environmental processes,
(ii) Incorporation of fisheries effects on stock structure and reproductive potential,
(iii) Consideration of changes in habitat dynamics due to global change,
(iv) Incorporation of biological and technological multispecies interactions,
(v) Integration of economically optimized harvesting,
(vi) Exploration of the socio-economic implications and political constraints from existing and alternative recovery plans,
(vii) Investigations on the acceptance of plans by stakeholders and specifically incentives for compliance by the fishery, 
(viii) Agreements with and among stakeholders.

UNCOVER has provided imperative policy support underpinning the following fundamental areas:
(i) Evolution of the Common Fisheries Policy with respect to several aims of the ‘Green Paper’;
(ii) Contributing to the Marine Strategy Framework Directive with respect to fish stocks/communities;
(iii) achieving Maximum Sustainable Yield (MSY) for depleted fish stocks. This has been done by contributing to 
LTMPs/recovery plans for fish stocks/fisheries, demonstrating how to shift from scientific advice based on limit reference 
points towards setting and attaining targets such as MSY, and furthering ecosystem-based management through 
incorporating multispecies, environmental and habitat, climate variability/change, and human dimensions into these plans.

The project was coordinated by Institut für Ostseefischerei, Bundesforschungsanstalt für Fischerei, Germany.

National Institute of Aquatic Resources
Section for Marine Living Resources
Bundesforschungsanstalt für Fischerei

Marine Research Unit, Marine and Food Technological Centre
Cefas
University of Portsmouth
Marine Laboratory
Instituto Español de Oceanografía
Aalborg University
Leibniz Institut für Meereswissenschaften, Universität Kiel
IFREMER

Institute of Marine Research
Sea Fisheries Institute
Knipovich Polar Research Institute of Marine Fisheries and Oceanography
Nederlands Instituut voor Visserij Onderzoek b.v.

University of Aberdeen
University of Bergen

University of Hamburg
Period: 01/01/2006 → 31/12/2010
Number of participants: 14
Research areas: Marine Living Resources & Fish Biology
Contact person:
Köster, Fritz (Intern)
Project participant:
Tomkiewicz, Jonna (Intern)
Vinther, Morten (Intern)
Payne, Mark (Intern)
Munk, Peter (Intern)
Støttrup, Josianne Gatt (Intern)
Storr-Paulsen, Marie (Intern)
Eg Nielsen, Einar (Intern)
Brander, Keith (Intern)
Andersen, Ken Haste (Intern)
Huwer, Bastian (Intern)
Bastardie, Francois (Intern)
Project Manager, academic:
Neuenfeldt, Stefan (Intern)
MacKenzie, Brian (Intern)
Interactions between Pathogenic Bacteria and Eukaryotic Cells

National Institute of Aquatic Resources
Period: 01/09/2005 → 24/02/2010
Number of participants: 6
Phd Student:
Gottlieb, Caroline Trebbien (Intern)
Supervisor:
Ingmer, Hanne (Ekstern)
Main Supervisor:
Gram, Lone (Intern)
Examiner:
Molin, Søren (Intern)
Knøchel, Susanne (Intern)
Roche, Sylvie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU-lønnet stipendie
Project: PhD

Baltic Sea management: Nature conservation and sustainable development of the ecosystem through spatial planning (BALANCE) (38432)

BALANCE aimed to develop transnational marine spatial planning tools and an agreed template for marine management planning and decision-making. It was based on four transnational pilot areas demonstrating the economical and environmental value of habitat maps and marine spatial planning (exemplified through two zoning plans). The tools and zoning plans integrated biological, geological and oceanographic data with local knowledge from stakeholders. A "blue corridor" concept was developed and promoted, i.e. between protected sites adding spatial development dimensions to the implementation of EU Directives. As a part of this work it was assessed if the Baltic marine Natura 2000 network is ecologically coherent and adequately represents and protects a continuum of habitats. A communication strategy was developed for stakeholder involvement to ensure that objectives and decisions address local stakeholders’ needs.

Spatial planning tools included Baltic Sea marine landscapes presented in GIS maps, a holistic approach to marine habitat mapping integrating data on benthic, pelagic and fish habitats in four transnational pilot areas, development of habitat models for areas with little biological information, templates for zoning plans in two pilot areas, including planning guidelines and criteria to evaluate management success, meta-database for Baltic Sea marine data, outlining data formats, techniques and data availability for use by stakeholders in future planning, development of agreed protocols for habitat mapping based on intercalibration of existing national protocols, ensuring compatible data for future transnational mapping.

DTU Aqua was mainly involved in habitat modelling (coastal and pelagic fish habitats) and in development of marine spatial planning and management frameworks.

In addition to DTU Aqua, 23 partners were involved in the BALANCE project, i.e. representing governmental and non-governmental organizations and research institutes from the entire Baltic region in the fields of biology/ecology, fisheries and geology.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2005 → 31/12/2007
Number of participants: 8
Research area: Ecosystem Based Marine Management
Project participant:
Sørensen, Thomas Kirk (Intern)
Geitner, Kerstin (Intern)
Sparrevohn, Claus Reedtz (Intern)
Hüssy, Karin (Intern)
Köster, Fritz (Intern)
Bank resolved prognoses of sandeel fishing potential in the North Sea (38563)

Sandeel stocks in the North Sea have experienced successive recruitment failures within the last 5 years. There is an urgent need to develop management tools that may contribute near and long term planning of the sandeel fishery and understand the reasons behind recent recruitment failures.

The project has three main goals:
(i) To fill some of the current knowledge gaps in the biology of North Sea sandeels and evaluate the North Sea sandeel stock via monitoring programs;
(ii) To demonstrate by combining advanced modelling with biological knowledge, that it is possible to generate fishing potential prognoses for sandeel spatially resolved at bank levels, just like ubiquitous whether forecasts, which at sight may be incorporated in the fishery management process;
(iii) To develop the collaboration with the Danish Fishermen's Association (DF) and foster a sustainable sandeel fishery based on increased self regulation within the fishery.

The scientific activities in this project relate developing the necessary components, which are a premise for generating fishing potential forecasts. This encompasses computer model code writing and data collection. The efforts have been very successful and a first generation fishing potential forecast has been generated as final products of this project. On the modelling side two model components has been developed. The first is the larval module that describes hydrodynamical transport of sandeel larvae which is determining next year's recruitment. The second component is the population model which combines the hydrodynamical transport output with available biological data and knowledge into a spatially explicit sandeel stock model. Two fishing vessels take part in the project.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Meteorological Institute
Danish Fishermen's Association
Period: 01/01/2005 → 31/12/2007
Number of participants: 3
Research area: Marine Living Resources
Project participant:
Mosegaard, Henrik (Intern)
Jensen, Henrik (Ekstern)

BLUE REEF (38179)

The overall project objective was to restore a rare marine habitat at a strategically important locality (Læsø Trindel) with the purpose of conservation of marine biodiversity.

The more specific objectives include:
- Stabilization and restoration of a cave-forming stone reef to favorable conservation status.
- Conservation and proper management of a reef donor area (larval dispersal) for the oxygen depleted inner Danish waters.
- Implementation through dissemination and cross-sectoral co-operation among authorities and local stakeholders.

Offshore boulder reefs have a high biodiversity and are a biologically important reef type at national and European level. At national levels these reef types are rare and Læsø Trindel constitutes one of 51 reef areas included in the Danish Natura 2000 network. In Denmark, shallow water boulder reefs have been extensively exploited for about a century, targeted for their easily accessible large boulders for constructing sea defenses and harbor jetties. A cautious estimate is that at least 34 km² of boulders from predominantly shallow cavernous reefs have been extracted from Danish waters and national monitoring programs indicate that only around 5 ha of the total original cavernous reefs have been left untouched.
The field experimental work was based on baseline surveys to be followed up by a survey 4 years after the deployment of the boulders; i.e. a “Before-After” approach. One role that DTU Aqua had in the project was to participate in the design of the restoration together with the other project partners. Based on the results from the multi-beam echo-sounder survey of the area conducted by GEUS in 2005, the reef restoration design was developed through several meetings between engineers and biologists/ecologists (Støttrup et al. in prep.). DTU Aqua’s main role in the project, however, was to document the ecology and biodiversity status of Læsø Trindel with focus on fish and shellfish assemblages before and after the restoration (Støttrup et al. 2014; Kristensen et al. 2 papers close to submission). This work was carried out in close collaboration with Aarhus University who is responsible for monitoring bottom fauna and flora. The baseline study has been carried out in 2007, just before the deployment of the boulders that should stabilize the remains of the original reef and restore its earlier shallow-water cavernous reef function. In 2012 the area was revisited using the same methodology and sampling program as in the baseline study.

The project was coordinated by Danish Nature Agency.

The project was funded by EU LIFE.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Nature Agency
Aarhus University
Geological Survey of Denmark and Greenland
Period: 01/01/2005 → 01/07/2012
Number of participants: 2
Research areas: Coastal Ecology & Marine Living Resources
Project participant:
Stenberg, Claus (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)
Project

Coastal habitats (3117)
The aim of the project was to characterize coastal habitats based upon their function as optimal areas for stock enhancement projects, where artificially reared individuals are released with the purpose of increasing local stock sizes.

Towards this aim, the basic criteria for stocking were reviewed and discussed (Støttrup & Sparrevohn, 2007). Habitat suitability was examined (Carl et al. 2008) and methods for estimating mortality of newly released fish were developed together with means of securing the highest possible survival after release (Sparrevohn & Støttrup, 2007).

The potential of linking available prey items to growth of released individuals was examined together with potential for this linkage as a parameter to identify areas suitable for stock enhancement (Sparrevohn & Støttrup, 2008). Predation impact was explored through field experiments (avian predators; Sparrevohn & Støttrup, 2007; Støttrup & Sparrevohn, 2007) and theoretically using ecosystem modeling (Dalsgård et al. 2008 and Nielsen et al., 2008 (both reports).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Local fishermen associations
Danish Organization for Amateur Fishermen
Aarhus University
Wageningen IMARES
Period: 01/01/2005 → 31/12/2010
Number of participants: 4
Research area: Coastal Ecology & Danish Shellfish Centre
Project participant:
Sparrevohn, Claus Reedtz (Intern)
Nicolajsen, Hanne (Intern)
Nielsen, Anders (Intern)
**Comparative evaluations of innovative solutions in European fisheries management (CEVIS) (38105)**

CEVIS is an FP6 project that assessed potential innovations for European fisheries management regimes with respect to four general management objectives: biological robustness, economic efficiency, the cost effectiveness of management activities, and social robustness. CEVIS examines four types of regime-level innovations: the use of participatory approaches to fisheries governance, rights-based regimes, effort-control regimes and decision rule systems. These innovations are assessed in respect to four general management objectives: biological robustness, economic efficiency, the cost effectiveness of management activities, and social robustness. The four regime level innovations measured against the four general management objectives define the CEVIS research’s conceptual framework. The conceptual framework is tested against four European test cases. However, before these case studies begin, the research will take a close look at international cases of innovative fisheries management in other developed countries. Visits will be made to four places outside the EU that have similar fisheries and have implemented these four types of innovations.

The project has built further on the networks and platforms produced under EU FP6 EFIMAS project (38094) which DTU Aqua coordinated, and the DTU Aqua team associated to the project has produced several peer reviewed journal papers under CEVIS and been co-authors to a book published by Elsevier in relation to CEVIS. Besides this, CEVIS has two final products. The first is an Innovation Evaluation Framework made up of indicators of inputs and outcomes in relation to the four general management objectives. This is an aid to fisheries managers wishing to assess the suitability of possible changes in EU fisheries management practice. The second is a report based on the case studies that evaluates this specific set of potential regime-level innovations for use in EU fisheries management. The developed framework makes it possible for managers to evaluate the extent to which any given management system will contribute positively to attaining Common Fisheries Policy objectives. A range of options for implementing cost-effective and participatory management systems have been provided and finally, the CEVIS project helps fishery managers to be better informed about the ecological, social and economic consequences of implementing any particular management regime.

The project was coordinated by Innovative Fisheries Management (IFM), Aalborg University, Denmark.

**National Institute of Aquatic Resources**

Section for Ecosystem based Marine Management

Aalborg University

University of Copenhagen

Marine Scotland

University of Tromsø

Lulea University of Technology

Institute of Marine Research

European Commission - Joint Research Center

Sea Fisheries Institute

Marine and Food Technological Centre

Öko-Institut

Netherlands Institute for Fisheries Research

Period: 01/01/2005 → 31/12/2009

Number of participants: 5

Research area: Fisheries Management

Project participant:

Bastardie, Francois (Intern)

Ulrich, Clara (Intern)

Baodrun, Alain (Ekstern)

Sparre, Per J. (Ekstern)

Project Manager, academic:

Nielsen, J. Rasmus (Intern)

Project
Improved advice for the mixed herring stocks in the Skagerrak and Kattegat (ICES area IIIa) (2011)

The ICES working group on Herring Assessment for the Area South of 62ºN (HAWG) has not been able to provide an advice applicable for the stock components in area IIIa due to limited resources to explore on the matter intersessionally. In previous years, the TAC for the fleets fishing herring in area IIIa have been decided by managers according to recommendations for the North Sea Autumn Spawners (NSAS), raised according to the historical fraction of NSAS in the catches by these fleets. The recommendation for the NSAS was guided by the need to rebuild that stock. By now, the NSAS stock has recovered and the main concern is for the Western Baltic Spring Spawners (WBSS) stock. The HAWG used a simple procedure in 2004 to find the highest total catch by fleet in area IIIa that would be compatible with a precautionary exploitation of WBSS. This procedure used two kinds of information about the fishery, the fraction of WBSS that is caught in area IIIa, and the fraction of the catches by the area IIIa fleets that consist of WBSS based on recent historic data. This very crude procedure can be refined with more detailed information on how the stocks on one hand and the fisheries on the other hand are distributed geographically and seasonally. Furthermore, the differences in both distribution and fishing pattern both in terms of season and stock components suggest a scope for a fishery management that is more fishery and stock oriented, allowing for more directed stock-wise exploitation. The primary goal of the project is to improve the assessment and advice of the mixed stock in area IIIa by elaborating fleet- and stock-based disaggregation on the existing projection method. The advice would so take into account both stocks and all fleet components in area IIIa. Temporal and spatial distribution of the different stock components and fleet exploitation patterns will form the basis for the elaboration.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources

Institute of Marine Research
Period: 01/01/2005 → 31/12/2007
Number of participants: 6
Research area: Marine Living Resources
Project participant:
Ulrich, Clara (Intern)
Mosegaard, Henrik (Intern)
Dalskov, Jørgen (Intern)
Andersen, Bo Selgaard (Intern)
Tarp, Bjarne Gloerfelt (Ekstern)
Project Manager, academic:
Worsøe Clausen, Lotte (Intern)

Limfjord regime shift (38181)

The aim of the project was to reveal causes and mechanisms related to a regime shift in the Limfjord, including the relationship with nutrient loading and fish production in the Limfjord. Furthermore management scenarios for ensuring good environmental conditions and sustainable use of the living resources would be examined and discussed. DTU Aqua’s share of the project was through models to demonstrate a regime shift and to explore potential causes of this. The project made it possible to combine different types of data across sub-basins with different physical-chemical conditions and trophic groups and to explore various methods. We chose to use an Integrated Trend Assessment approach and a series of statistical tests were applied (sequential t-test analyses of regime shifts (STARS), principle component analyses (PCA), STARS on PCA scores and Chronological Clustering). A Traffic Light Plot was used to visualize changes in the ecosystem. A regime shift was identified starting in 1990 and fully developed by 1996. It impacted the whole food-chain structure in the fjord. Possible causes were identified as climatic causes (temperature, salinity and wind) and eutrophication (nutrient N, P loadings and bottom oxygen conditions). To a lesser extent fishery of demersal fish species could also have been a contributory factor. The regime shift caused a decrease in the fishery of large demersal fish, whereas there was a general increase in the stock size of pelagic and small demersal fish species, crustaceans (crabs, lobster), echinoderms, starfish and jelly fish. After the regime shift primary production in the water column decreased. In the present project it was not possible to determine if the decrease in large demersal fish stocks was caused by failure in recruitment or by over-fishing. At the management level it was pointed out that it was important to study sub-basins of the fjord due to the high variation of parameters between sub-basins. The fundamental changes that had occurred in the system further suggested that it may not be possible for the system to revert back to its original condition even if the nutrient loadings were brought back to their original levels. However, this needs to be further investigated.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
**Marine protected areas as a tool for ecosystem conservation and fisheries management (PROTECT) (38095)**

1) To evaluate the potential of MPAs as a tool to protect sensitive species, habitats and ecosystems from the effect of fishing.

2) To outline and develop monitoring, assessment and management tools for MPAs that can assess: a) the impact of fisheries on marine ecosystems, b) the effect of different levels of protection and c) the impact and socio-economic effects of MPAs on fishing communities.

3) To facilitate linkages between science and management in the areas of: a) MPA design and implementation, b) timing and level of stakeholder involvement and c) management effectiveness and adaptability.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Finnish Game and Fisheries Research Institute
Swedish National Board of Fisheries
Institute for Marine Sciences
University of Hamburg
Sea Fisheries Institute
Centre for Ecology and Hydrology
Cefas
Marine Scotland
National University of Ireland
Institute of Marine Research
University of Portsmouth
University of Tromsø
IFREMER
University of Gothenburg
Wageningen IMARES
University of Copenhagen

**National Institute of Aquatic Resources**

Period: 01/01/2005 → 31/12/2008
Number of participants: 9
Research area: Ecosystem Based Marine Management
Contact person:
Nielsen, J. Rasmus (Intern)
Project participant:
Christensen, Asbjørn (Intern)
Sørensen, Thomas Kirk (Intern)
Project Manager, academic:
Monitoring effective population sizes of North Sea houting using genetic markers (38272)

This project was aimed at providing basic information on the genetic structure of lake whitefish and North Sea houting, species where population genetic data are needed in order to improve conservation and management efforts, including principles for stocking.

The project focused on North Sea houting within the framework of the EU LIFE project Urgent Actions for the endangered houting (Coregonus oxyrhunchus). It was investigated if there are other remaining indigenous populations than that in the Vidaa River, which is currently assumed to be the last remnant of this species/form. Moreover, effective population size was estimated in order to assess if it was below the threshold where inbreeding and loss of genetic variation is an immediate concern. A paper was published on genetic monitoring of effective population size in North Sea houting, showing that the described methods are useful for monitoring purposes. All analyses were based on microsatellite DNA analysis of contemporary and historical samples. In addition, the results were used in the context of a US-based working group, aimed at defining and developing the emerging field of genetic monitoring, i.e. the use of genetic markers for monitoring populations.

The project was coordinated by the Nature Agency, Danish Ministry of the Environment, Denmark.

The project was funded by EU LIFE.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Ministry of the Environment
Period: 01/01/2005 → 31/12/2011
Number of participants: 1
Research areas: Population Genetics & Freshwater Fisheries and Ecology
Project Manager, academic:
Bekkevold, Dorte (Intern)

Predator fish populations: The impact of behavioural and physical-biological parameters (38267)

Some of the mechanisms guiding the interactions of fish species in clear water lakes seems to act differently in turbid water, thus more knowledge of these relationships are essential. Both in order to understand how the fish population in a lake will develop when the lake is about to change to a clear water state, but also in order to understand the stability of predator fish populations under various environmental conditions. One of the important related issues can be the capability of predator fish, to hunt in turbid water and the interactions of more predator fish species. The capacity of pike and large perch to hunt in turbid water was tested in extensive pond experiments with different clay turbidity, including also the importance of prey fish density. The experimental approach was supplemented by parallel radio telemetry field studies of both predator species, in order to explain the role of behaviour and the importance for the natural composition of fish populations in turbid and clear water lakes. Pond experiments showed that pike were perfectly able to hunt in turbid water, backed up by the field findings of higher activity levels for some pike in the turbid lake, however in general with a larger variation in behavioural strategy in turbid water. Surprisingly, perch were also capable of hunting in very low turbidity at least in high prey fish densities. The telemetry study showed two alternative behavioural patterns of perch in clear water and turbid water, perch being more active in the turbid water on a diel basis including at night and not showing any sunrise and sunset peaks in activity as was seen in the clear water lake. The alternative strategy in the turbid lake might be interpreted as a means of allocating more time for hunting due to visual constraints. Contemporary studies on prey fish behaviour in the study lakes also revealed different behaviours on a diel basis dependent on turbidity, which can be linked to predator fish behaviour.

Two peer-reviewed papers and a master thesis were published on pike-behaviour as well as two peer-reviewed papers on perch behaviour. Results were presented on international and national conferences.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Rod and Net Fishing License Funds.
RESTOCK (38566) (38400 pre-project)
The aim of the pre-project was to explore the potential for restocking the cod stock in the eastern Baltic. A theoretical study was conducted to explore the potential for restocking bringing together scientists from the aquaculture sector, fisheries managers, ecological scientists and scientists with a background in stock enhancement. The ecology, biology and fisheries biology of the eastern Baltic was reviewed and provided the basis for the study. The results indicated a good potential for restocking with first-feeding cod larvae (Støttrup et al. 2008). This was the first example of a study to examine the potential for large-scale restocking prior to the release of fish. A 2-3 month delay in the spawning period compared to 20-30 years ago has altered feeding conditions and predation susceptibility in a way that may have exacerbated the decline in recruitment. Producing and releasing cod larvae during spring would mimic the spawning period recorded in previous times and would coincide with the spring peak in copepod production. An evaluation of 3 different release scenarios showed that a release of 474 million first-feeding larvae over 5 months (covering the historic and present day spawning period) would enhance the average population of 2 year old by 10% and be biologically and economically the most feasible scenario.

Three years of a six year follow up project (RESTOCK) to verify the theoretical findings was funded, but due to political changes, funding for the final three years was not possible and the project was unable to empirically ascertain the potential for restocking. During the three years, 3 cod broodstocks were established with different photoperiods and subsequent spawning periods, together with the development of a technique to determine fish gender non-invasively (McEvoy et al., 2009). Egg and larval incubation techniques were developed and several investigations on temperature, salinity and food impacts on first feeding cod larvae to define the “window of opportunity” for release (i.e. time when the larvae were ready to start feeding to when they began to be too poor in condition to feed) (Støttrup et al., 2008; Overton et al. 2010; Meyer et al 2011a). A release strategy was developed and the first successful release of first-feeding fish larvae at 23 m depth was conducted, but needed further adjustments (Støttrup et al., 2008). An extensive disease monitoring program was established (Støttrup et al., 2008) and the presence of a protistan endoparasite generated a further study (Skovgård et al., 2010). Studies were also conducted to determine explore marking techniques for identification of released fish (Meyer et al., 2011b) and explore growth characteristics in cod larvae (Meyer et al., 2011a).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
National Veterinary Institute
Danish Fishermen’s Association
University of Copenhagen
University of Hamburg
University of Caen
Period: 01/01/2005 → 31/12/2007
Number of participants: 9
Research area: Coastal Ecology
Project participant:
Sørensen, Sune Riis (Intern)
Røjbek, Maria (Intern)
Pedersen, Per Bovbjerg (Intern)
Creation of multi-annual management plans for commitment (COMMIT) (2212)
The objective of COMMIT was to provide a sound scientific basis for the long-term planning of fisheries management consistent with sustainable development, while also identifying any short-term biological and socio-economic consequences. This was done through the evaluation of multi-annual management plans that reduce annual fluctuations in exploitation strategy and ensure commitment of the stakeholders to the plan. Strategies were based upon harvest rules and developed explicitly recognizing uncertainty due to process, measurement, estimation, model and implementation error. In particular a socio-economic analysis identified mechanisms affecting the commitment of key stakeholders and hence the level of implementation error. Robust strategies were designed that explicitly took this into account. Stocks chosen are those of interest to the community (Baltic salmon, North Sea flatfish and Northern hake) and in particular those exploited in mixed fisheries, although the methods developed are generic and applicable to other stocks.

The project was coordinated by Centre for Environment, Fisheries & Aquaculture Science (CEFAS), UK.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Cefas
Wageningen IMARES
Marine and Food Technological Centre
Marine Scotland Science
Imperial College of Science, Technology and Medicine
University of Tartu
Finnish Game and Fisheries Research Institute
University of Portsmouth
National Research Institute for Agriculture and Fisheries
Wageningen University & Research
Period: 01/01/2004 → 31/12/2007
Number of participants: 3
Research area: Fisheries Management
Project participant:
Nielsen, J. Rasmus (Intern)
Sparre, Per J. (Ekstern)
Project Manager, academic:
Ulrich, Clara (Intern)

Critical interactions between species and their implications for a precautionary fisheries management in a variable environment – a modeling approach (BECAUSE) (38613)
Across Europe, the population of predatory fish has fallen dramatically in recent years. This has reduced the predation rate and the prey species has remained fairly stable. Therefore the balance between predators and prey species has been radically changed. No accurate scientific picture of the exact interactions between these species and their effects on non-commercial top predators is available. To maintain biodiversity and make recovery plans more effective, such an understanding is vital.

The sustainable management of European fisheries requires an adaptive approach that takes into account the long term dynamics of the entire marine ecosystem so as to protect the biodiversity of our seas. BECAUSE investigated the interaction between predator and prey, and the shifts in their relative populations and looked into how fishing affects the balance of the marine food chain. The interactions targeted for investigation included sandeel/predator fish, predators and
prey of cod, and hake/prey fish.

Contributions to the policy development aimed at integrating a sustainable ecosystem approach into the EU’s Common Fisheries Policy (CFP) thereby helping the EU to meet its global fishing commitments and underwrite the sustainability of ecosystem services. Multi-species fisheries assessment were improved and enhanced policy and management measures to replenish fish stocks and ensure high yields were proposed.

The was coordinated by Universität Hamburg, Germany.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Universität Hamburg
Marine and Food Technological Centre
Cefas
Finnish Game and Fisheries Research Institute
Marine Scotland
Marine Research Institute
Leibniz Institute of Marine Sciences
IFREMER
Consejo Superior de Investigaciones Científicas
Institute of Marine Research
National Centre for Marine Research
Sea Fisheries Institute
Sapienza University of Rome
University of St Andrews
Latvian Fish Resources Agency
Instituto Español de Oceanografía
Period: 01/01/2004 → 31/12/2007
Number of participants: 6
Research area: Marine Living Resources
Contact person:
Köster, Fritz (Intern)
Project participant:
Tomkiewicz, Jonna (Intern)
Neuenfeldt, Stefan (Intern)
Rindorf, Anna (Intern)
Christensen, Asbjørn (Intern)
Project Manager, organisational:
Vinther, Morten (Intern)

**Fatty acids in the marine food chain (38160)**

Primary production by autotrophic phytoplankton fuels the marine ecosystem and this energy is passed through the food web by trophic interactions. Understanding how energy flows through these interactions is vital for understanding how marine ecosystems function. The efficiency of energy transfer from primary producers to higher trophic levels depends on the efficiency of secondary producers utilizing the new carbon. This crucial link is still poorly understood and most often we observe that secondary production is not simply correlated with phytoplankton biomass. However, reproduction and growth of secondary producers, such as copepods, depend also on food quality. The goal of this project is to investigate the effect of essential fatty acids on copepod reproduction, growth and survival. Essential fatty acid are the ones the copepod need but has to attain from the food, as it cannot synthesize those de-novo. The project is based on series of laboratory, field and mesocosm studies with the focus on understanding on how food composition, both chemical composition and type affect growth and mortality all contribution to population dynamics of the copepod species. In addition the project has a strong teaching factor for masters and PhD students in form of advanced summer schools.
The project is coordinated by DTU Aqua.
National Institute of Aquatic Resources
Centre for Ocean Life
Aarhus University
Uni Research AS
Period: 01/01/2004 → 31/12/2013
Number of participants: 3
Research area: Oceanography
Project participant:
Koski, Marja (Intern)
Dutz, Jörg (Intern)
Project Manager, academic:
Jonasdottir, Sigrun (Intern)
Project

**Nephrops and cetacean species selection information and technology (NECESSITY) (38623)**

The project objectives were to develop effective and acceptable:
- gear modifications (by-catch reduction devices) and alternative fishing tactics in cooperation with the fishing industry to reduce the by-catch and mortality of non-target fish species in European Nephrops fisheries, and determine the biological effects and socio-economic repercussions of using these.
- gear modifications (by-catch reduction devices and acoustical deterrents) and alternative fishing tactics in cooperation with the fishing industry to reduce the by-catch and mortality of cetaceans in European pelagic fisheries, and determine the biological effects and socio-economic repercussions of using these.

With specific objectives:
- To develop novel species-selective gear prototypes and alternative fishing tactics in cooperation with the fishing industry for use in the European Nephrops fisheries.
- To review the current status of knowledge of cetacean by-catches in pelagic fisheries, using existing data sources and oncoming data collection programmes, and to collect additional biological data (age, year of maturity, causes of death) of landed cetaceans.
- To develop novel species-selective gear prototypes and alternative fishing tactics in cooperation with the fishing industry for pelagic trawl fisheries where cetaceans by-catch may occur (pair trawling on bass, pair trawling on albacore, single boat and pair pelagic trawling on herring, mackerel and horse mackerel, fishery with high opening bottom trawls and midwater pair trawls on hake).
- To compare the effectiveness of commercial available acoustic deterrents (pingers) on cetaceans.
- To develop an interactive pinger in cooperation with a manufacturer.
- To evaluate the potential biological and economic impacts of the technologies and tactics developed above.
- To disseminate the results to relevant sectors in the fishing industry, and contribute to implementation of the technologies and tactics developed above.

In total there are 22 partners in the project. The project is coordinated by Wageningen University, The Netherlands.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2004 → 31/12/2007
Number of participants: 1
Research area: Fisheries Technology
Project Manager, academic:
Madsen, Niels (Intern)
Project

**Operational evaluation tools for fisheries management options (EFIMAS) (38094)**

Existing models in fisheries management advice (FMA) only consider effects of overall fishing on single fish stocks, while not taking broader ecosystem, social and economic impacts of management decisions into account. Mixed fisheries aspects where several fishing fleets fish on several stocks in the same fishery, spatial planning, and long-term management strategy evaluation are also not considered adequately.

In response to this situation, managers launched EFIMAS aiming to develop alternative management evaluation tools and management strategies that have broader, multi-disciplinary and long-term perspectives. These include social and economic impacts and ecosystem impacts (e.g. by-catch and discards), besides biological consequences on single stocks.
This is a new way of thinking international fisheries research and FMA, by developing conceptual and comprehensive multi-fleet and multi-stock bio-economic simulation tools and management evaluation frameworks (MEF), being spatial and seasonal explicit. A successful implementation of ecosystem, social and economic dynamics and factors on a spatial scale in the advisory process is a major leap towards more holistic and sustainable management within EU waters and fisheries. MEFs enable higher degree of participatory management evaluation by involving various stakeholders in FMA.

EFIMAS, and sister projects, develop and integrates a set of new and existing software tools and simulation models (especially FLR – Fisheries Library in R), generating a more robust Management Strategy Evaluation (MSE) framework, that allows testing plausible hypotheses about dynamics of fish stocks, fisheries and fleets.

The MEF contributes to a conceptual change and paradigm shift in generating advice and management with entire fleets and fisheries as the central units. Here the basic management instrument is the input, i.e. the capacity of fishing fleets, the vessel efficiency, and the effort (activity). This differs from the traditional output based ICES approach, providing advice on single fish stock catch limit from rather uncertain terminal year stock assessments and under strong assumptions on future total stock fishing mortality (F) without much consideration on factors, creating and controlling F and partial Fs by fleet.

The developed frameworks allow simulating and evaluating, respectively, the biological, social and economical consequences of a range of proposed management options and objectives within different management regimes. They can evaluate fleet and mixed fisheries interactions and fisheries behavior, uncertainties in stock and fisheries dynamics, data collection, assessment, modelling, as well as the advisory management and implementation processes. Being capable of evaluating the relative performance of multiple alternative options the MEFs possess strong capacity in performing sensitivity and risk analyses of consequences.

Managing fisheries in a virtual environment provides more reliable scientific advice to stakeholders: In the same way that a pilot might fly in a simulator before flying for real, the simulation tools evaluates the robustness of alternative strategies and virtual regimes to give more holistic FMA in broader context before implementation. This provides managers and stakeholders a better idea of the consequence of a given strategy or intervention before opting for a particular management approach.

The overall evaluation comprises process evaluation (PE) and technical evaluation (TE). PE focuses on participatory management. Here participatory and iterative scenario-based MEF modelling is used to obtain input and cyclic feedback from multiple stakeholders for different options, and to test the general utility of the operational MEF.

Participants: 30 European universities and national fisheries research institutes with biological and economic expertise as listed under www.efimas.org.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2004 → 31/12/2009
Number of participants: 11
Research area: Fisheries Management
Project participant:
Bastardie, Francois (Intern)
Munch-Petersen, Sten (Intern)
Eigaard, Ole Ritzau (Intern)
Andersen, Bo Selgaard (Intern)
Nielsen, Jacob (Ekstern)
Blæsbjerg, Mette (Intern)
Vestergaard, Ole (Intern)
Project Manager, academic:
Ulrich, Clara (Intern)
Degnbol, Poul (Ekstern)
Sparre, Per Johan (Intern)
Project Coordinator:
Nielsen, J. Rasmus (Intern)
Project

Test and demonstration of a selective Nephrops trawl (4307)
This aim of this project was testing a newly developed and more selective fishing gear onboard a smaller vessel in the Danish Nephrops directed fishery in Kattegat and Skagerrak. The selective effect of different selective devices can vary with the type and size of the vessels using the gear. The Danish fleet operating in Kattegat and Skagerrak covers very
different vessels, both with regards to size and type. The aim of this project was to test the applicability of a selective sorting panel, developed and tested on larger vessels using larger trawls, on a small vessel and compare selective effect across different vessel sizes.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
Period: 01/01/2004 → 31/12/2005
Number of participants: 3
Research area: Fisheries Technology
Project participant:
Madsen, Niels (Intern)
Frandsen, Rikke (Intern)
Project Manager, academic:
Krag, Ludvig Ahm (Intern)

Analysis of biological key parameters, population structure and population dynamics of the lesser sandeel (Ammodytes marinus) in the North Sea, based on detailed information about the sandeel fishery (AHADOT) (2167)
The overall goal is to establish the scientific basis for a management system for the North Sea sandeel fishery that will prevent local depletion of sandeels due to fishing and improve the yield of the fishery.

Stock assessment of sandeels in the North Sea is based on the assumption that there is one stock of sandeels in the North Sea and one stock in the Shetland area. However, recent investigations suggest that sandeels in the North Sea can be divided into several stock components or sub-stocks. Further, growth and fecundity seem to vary significantly between the different stock components. This project will analyse spatial trends in key biological parameters (emergence behaviour, growth and fecundity) and the distribution of the lesser sandeel Ammodytes marinus in the North Sea. Additionally the drift pattern of sandeels larvae between the spawning areas will be analysed by use of a hydrographical model. Information about distribution, biological parameters and the drift of larvae will be used to define the stock components of sandeels to be assessed as separate population units.

Besides the lack of information about the spatial heterogeneity on the biology of sandeels, the possibility to carry out regional assessments is hindered by a lack of information about the sandeel fishery and the catches of sandeels, where the main problem being the level of aggregation of the data. To carry out assessments for each of the stock components separately, more detailed information about the fishery and the catches of sandeels is needed. The data available about the fishery can only be allocated to ICES rectangles. However, data will have to be allocated to fishing grounds. Effort and catch data as well as biological samples has since 1999 been collected on a by haul basis for 15-20 Danish vessels representing the existing vessel categories and fishing pattern in the Danish North Sea sandeel fishery. During this project satellite data for all Danish vessels fishing sandeels in the North Sea will together with the detailed data from the 15-20 vessels, be used to disaggregate data on effort and catches of sandeels, from being on a trip and ICES rectangle level to being on a haul and fishing ground level.

The information about the biology and population structure of sandeels and the detailed data about catches and effort will be used to carry out separate assessments of each of the stock components of sandeels. Furthermore, a model that was developed at DTU Aqua (THEMAS) will be used to simulate the effect of different management scenarios on the fishing fleet and the sandeel populations.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Living Resources
Danish Fishermen's Association
Krog Consult ApS
University of Hamburg
Marine Scotland Science
Period: 01/01/2003 → 31/12/2007
Number of participants: 4
Research area: Marine Living Resources
Project Manager, academic:
Mosegaard, Henrik (Intern)
Rindorf, Anna (Intern)
Christensen, Asbjørn (Intern)
Management of the fish population in lakes under heavy human influence (38268)

The objectives of this project are to improve our understanding of how the physical conditions of lakes can affect spawning and fry mortality and growth for the most important piscivorous fish species. We will especially focus on the conditions of the littoral zone. This knowledge can be used to ensure that the demands of these species in relation to spawning and YOY development are met. The results will be used as part of the web-based "Handbook on the Management of Lake Fish", which is under development.

The majority of Danish lakes are strongly influenced by human activity, partly in the form of increased nutrient load, but also direct physical alterations are common, e.g. by regulation of the water level, consolidation of the banks or the consequences of heavy boat traffic. These types of physical alterations are often most common in lakes situated in or close to urban areas. In these kinds of lakes, lake restoration by biomanipulation might prove to be insufficient to achieve the improved environmental conditions expected, including a good population of piscivorous fish. Thus, the lakes environmental quality, as well as the possibility to use the lake for recreational activities including recreational fisheries, might be negatively influenced.

During the project, several activities related to this subject have been conducted:
1) An experiment demonstrating the importance of water depth for the mortality of 0+ pike.
2) Another experiment, which showed that it is possible to build an artificial spawning habitat for pike in an urban, artificial lake without a natural littoral zone and that the pike did use it for spawning and that the pike fry used it as nursery habitat.
3) A stocking experiment with 0+ pike to find out if stocking is a possible way to enhance a very low population density of pike in a lake with heavy boat traffic and extensive angling. During this experiment we demonstrated that it is possible to tag 0+ pike of 6-8 cm with PIT tags without mortality, but also that the tagging has a negative effect on growth of the tagged pike.
4) An investigation on the spawning habitat choice and spawning behavior of pike in a small natural lake (in cooperation with project no 39270).

The use of specially designed "egg traps" has been used successful in two of these experiments.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
City Council of Copenhagen
Period: 01/01/2003 → 31/03/2013
Number of participants: 3
Research area: Freshwater Fisheries and Ecology
Project participant:
Baktoft, Henrik (Intern)
Project Manager, academic:
Berg, Søren (Intern)
Skov, Christian (Intern)

Monitoring and Documentation of the Performance of ModelTroutFarms (ModelTroutFarm)

De-coupling fish production and environmental impact is a sustainable way of increasing aquaculture. In order to achieve increased production and—simultaneously— reduced environmental impact a new farming concept was developed, tested and demonstrated.

Applying cost-efficient technologies from recirculation on large, traditional flow-through farms provided the basic concept for ModelTroutFarms. Through intensified production in concrete tanks, the former earthen ponds could be used as constructed wetlands for end-of-pipe treatment of the discharged water.

Due to recirculation, water consumption was reduced by a factor 25, so damming of natural water courses was no longer needed for supplying water to the farm. As a consequence, dammings could be removed leaving the water course to its natural flow.

A reduction of some 80 % in organic matter and phosphorous discharge was achieved, and 50 % of the nitrogen was removed.

Through the concept, technical an practical means of decoupling fish production and environmental impact was demonstrated in large scale commercial operations. Concomitantly, legislation was changed and now approximately 50 %
of the Danish fresh water production is in ModelTroutFarms.

This project was coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Aquaculture
Aarhus University

Eight trout farms
Period: 01/01/2003 → 31/12/2008
Number of participants: 4
Research area: Aquaculture
Project participant:
Rasmussen, Richard Skøtt (Intern)
Dalsgaard, Anne Johanne Tang (Intern)
Suhr, Karin Isabel (Intern)
Project Coordinator:
Pedersen, Per Bovbjerg (Intern)

Monitoring and documentation of the performance of ModelTroutFarms (ModelTroutFarm) (38192)
De-coupling fish production and environmental impact is a sustainable way of increasing aquaculture. In order to achieve increased production and, simultaneously, reduced environmental impact a new farming concept was developed, tested and demonstrated.

Applying cost-efficient technologies from recirculation on large, traditional flow-through farms provided the basic concept for ModelTroutFarms. Through intensified production in concrete tanks, the former earthen ponds could be used as constructed wetlands for end-of-pipe treatment of the discharged water.

Due to recirculation, water consumption was reduced by a factor 25, so damming of natural water courses was no longer needed for supplying water to the farm. As a consequence, dammings could be removed leaving the water course to its natural flow.

A reduction of some 80 % in organic matter and phosphorous discharge was achieved, and 50 % of the nitrogen was removed.

Through the concept, technical an practical means of decoupling fish production and environmental impact was demonstrated in large scale commercial operations. Concomitantly, legislation was changed and now approximately 50 % of the Danish fresh water production is in ModelTroutFarms.

This project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).
National Institute of Aquatic Resources
Section for Aquaculture
Aarhus University

Eight trout farms
Period: 01/01/2003 → 31/07/2011
Number of participants: 4
Research area: Aquaculture
Project participant:
Rasmussen, Richard Skøtt (Intern)
Dalsgaard, Anne Johanne Tang (Intern)
Suhr, Karin Isabel (Intern)
Project Coordinator:
Pedersen, Per Bovbjerg (Intern)
Research on effective cod stock recovery measures (RECOVERY) (4304)
The cod stock in some European waters is at critical levels. The project aimed at developing more selective gears for the three most relevant fisheries that take cod with the highest number of discards and total catches. The otter trawl (and seine) fishery has the highest catches of cod and greatest level of discard of all fisheries, followed by the beam trawl fishery. The Nephrops fishery has a high discard rate and this is a fishery which the fleet often will switch to when fisheries for fish species are restricted. The main objective was to develop novel species-selective gear prototypes for the three prominent mixed-species demersal trawl fisheries in the North and Irish Sea, where cod is an important catch component. The development of novel species selective fishing gears is intended to reduce the fishing mortality rate on cod of all ages/sizes, to enhance the recovery of cod stock, and at the same time permit the continued exploitation of other species taken in the same fisheries as cod.

The project was coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Sea Fish Industry Authority
Institute of Marine Research
Marine Scotland
Institute for Agricultural and Fisheries Research
ConStat, The North Sea Centre
Queen's University Belfast
Period: 01/01/2003 → 31/12/2007
Number of participants: 2
Research area: Fisheries Technology
Project participant:
Madsen, Niels (Intern)
Project Manager, academic:
Krag, Ludvig Ahm (Intern)
Project

An assessment of mortality in fish escaping from trawl cod ends and its use in fisheries management (SURVIVAL) (4305)
The survival of fish escaping from towed fishing gears is essential if selective devices are to be used as a practical conservation tool. Several studies have attempted to test this principle and assess the mortality of escaping fish. Unfortunately, these early endeavours have been shown to be fundamentally flawed in methodology so there are currently no reliable estimates of escape mortality. This project developed methods for accurate assessment of escape mortality. The work covered development of techniques to sample fish escaping from a trawl cod end, without introducing biases into the mortality estimates. These techniques were then applied in the field to estimate mortality in cod and haddock under various circumstances including escape at depth and surface, in high intensity fisheries and at different times of the year.

The objectives of the project were:
- to develop sampling techniques that overcome current biases in escape mortality estimation
- to test these techniques directly against previous protocols in order to establish the validity of the new methods
- to develop a methodology to compare the cod end selectivity, and survival, of gadoid fish escaping at the surface in a side-trawler fishery with that of fish escaping at depth
- to estimate the number of repeated encounters with trawls on intensively fished grounds
- to study the effect of repeated gear encounters on escape mortality
- to determine if gadoid escape mortality varies throughout the year and identify its cause
- to report the project work and results to the fishing industry, the public and the European Commission.

The contribution of DTU Aqua centered around:
- testing the validation of the new cover design against previous designs
- investigating the seasonal variation in escape mortality of gadoids trough surface selectivity
- investigating the seasonal variation in total escape mortality.

The project was coordinated by Institute of Marine Research, Norway.
National Institute of Aquatic Resources
Conservation of diversity in an exploited species: Spatio-temporal variation in the genetics of herring (Clupea harengus) in the North Sea and adjacent areas (HERGEN) (5512)

National Institute of Aquatic Resources
Section for Marine Living Resources
Wageningen IMARES
Stockholm University
University of Gothenburg
University of Hull
Institute of Marine Research

Marine Laboratory
Period: 01/01/2002 → 31/12/2005
Number of participants: 4
Research area: Population Genetics
Project participant:
Mosegaard, Henrik (Intern)
Worsøe Clausen, Lotte (Intern)

Bekkevold, Dorte (Intern)
Ruzzante, Daniel (Ekstern)

European advisory system evaluation (EASE) (2194)

The overall objective was to set up the basis for more appropriate data collection and analysis programs in order to support existing and emerging fishery management issues. The present data and advisory structures have developed by a process of evolution and involve considerable commitment of human and financial resources. In general these resources are in short supply and may be declining. It is no longer clear whether present systems can be maintained or whether they are appropriate for emerging issues, notably those relating to a more holistic approach to fishery management.

The first objective of the concerted action was to understand the current balance between resources devoted to data collection and value of these data in the provision of advice. This required the evaluation of the range of advice requested on fishery management and the data needs to perform the science to support it. Of particular importance is the basic fisheries data on catch composition according to species, size or age and commercial catch per unit of effort (CPUE) according to fleet since these are used in almost all analyses. However other types of necessary data have also been included, e.g. research vessel CPUE, stock structure according to size or age, weight and maturity at age.

The second objective was to quantify the quality of the scientific outputs derived from the data inputs. Since much advice is qualitative and relies on expert judgement, this objective was focussed to quantifying the reliability of routine annual stock assessments upon which advice is formulated.

The third objective was to identify alternative uses of data and alternative analytical methods which could support present fishery management needs as well as those which could address new and emerging issues, such as multi-annual decision rules and mixed fisheries issues.

The fourth and final objective was to analyse ways of re-deploying existing resources in order to support a modern fishery management system. With focus on where data collection should be improved and rationalisation of the deployment of
current resources to improve efficiency scope for re-deployment of resources to address emerging management advisory needs, such requirements of effort management systems and the implementation of the ecosystem approach to fisheries management.

The project was coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Swedish National Board of Fisheries
Institute of Marine Research
Netherlands Institute for Fisheries Research
Cefas
Marine Scotland Science
Marine Institute
IFREMER
Ecole Nationale Supérieure Agronomique
Instituto Español de Oceanografía
Instituto Português de Investigação das Pescas e do Mar
Bundesforschungsanstalt für Fischerei
Finnish Game and Fisheries Research Institute
Marine Research Institute
Fisheries Research Station
Period: 01/01/2002 → 31/12/2006
Number of participants: 2
Research area: Fisheries Management
Contact person:
Köster, Fritz (Intern)
Nielsen, J. Rasmus (Intern)
Project

Fish larvae and recruitment to fish stocks (38150)
Processes related to fish reproduction and the recruitment to fish stocks are key elements in stock dynamics. Both annual variability and long term changes in recruitment have great influence on the fishery. Hence, further insight into these processes is important for ecosystem understanding and management of fish stocks. A wide range of projects related to the early life of fish are carried out at DTU Aqua. These investigate eggs and larvae through laboratory experiments and studies in the field, focusing on the ecological and oceanographic context of the early life. The present project is set up to accumulate and cross-analyze information from these projects and prepare new research initiatives, ensuring a consistent effort towards improved understanding of larval ecology and recruitment processes. The project follows a hypothesis-oriented, comparative approach identifying key processes in larval biology and analyzing linkages between fish reproductive strategies and major oceanographic patterns, specifically frontal zones. Comparisons cover both coastal and oceanic areas and include all latitude zones: temperate, tropical and arctic. Major traits of apparent universal importance have been identified and these findings guide further research into bio-physical linkages and structuring of fish larval communities in relation to oceanographic features. Subsequently the findings are used in model-based evaluations of recruitment variability and the potential influence of climatic changes. A range of internal and external partners are part of the project.

The project is coordinated by DTU Aqua.
National Institute of Aquatic Resources
Section for Oceans and Arctic
Period: 01/01/2002 → 01/01/9999
Number of participants: 1
Research area: Oceanography
Project Manager, academic:
Munk, Peter (Intern)
Cooperative agreement between Greenland Institute of Natural Resources and DTU Aqua (38085)

DTU Aqua supports the Greenland Institute of Natural Resources (GINR) within general fisheries biology, assessment, survey planning and evaluation and education and support of young scientists.

The scientists are also engaged in formulation of advice to the Greenland Government in several ICES Expert Groups such as North Western Working Group (NWWG) and Working Group for Widely Distributed Stocks (WGWISE), North East Atlantic Fisheries Commission (NEAFC) and North West Atlantic Fisheries Organization (NAFO). ICES and NAFO are further the platforms where important assessment issues such as stock ID, assessment methods and survey techniques are discussed and applied in the advisory service.

Further scientists acts as appointed experts at the Self-Governments bilateral fisheries meetings and costal state meetings.

During the years DTU has recruited eight scientists from GINR while one scientist has been recruited from DTU Aqua to GINR.

The project is coordinated by DTU Aqua.

The project is funded by the Greenland Institute of Natural Resources.

National Institute of Aquatic Resources
Section for Oceans and Arctic
Greenland Institute of Natural Resources
Period: 01/01/2001 → …
Number of participants: 3
Research areas: Fisheries Management & Marine Living Resources
Project participant:
Boje, Jesper (Intern)
Wieland, Kai (Intern)
Project Manager, academic:
Jørgensen, Ole A. (Intern)

Gene flow from stocked salmonids to wild populations (38273)

The aim of the project was to develop and implement genetic marker based methods to assess population characteristics, such as genetically effective population sizes and exchange of dispersers among salmonid populations, focusing on brown trout, Salmo trutta. Strong focus was on an assessment of the genetic effects of stocking wild populations based on releases of juveniles of native wild brood-stock or from domesticated hatchery strains. Analyses of temporal samples, both archived and continuously sampled, have contributed to an understanding of effects of stocking on wild populations on short to long term.

National Institute of Aquatic Resources
Section for Marine Living Resources
Period: 01/01/2001 → 31/12/2015
Number of participants: 1
Research area: Population Genetics
Project Manager, academic:
Bekkevold, Dorte (Intern)

Danish Network for Aquaculture and Fisheries Research (FISHNET) (38082)

FISHNET is a network of Danish Fisheries and Aquaculture scientists. It was established to foster cooperation in aquaculture and fisheries research and research education in Denmark.

From the start it functioned as an umbrella over four independent thematic research schools and networks in fisheries biology (SLIP), Fisheries and Aquaculture Management and Economics (FAME), Fish Food, Biochemistry and Physiology (FIBP) and Sustainable Control of Fish Diseases in Aquaculture (SCOFDA). In 2001 a research school in Maritime History and Marine Environmental Research (MARINERS) was added to the network.

FISHNET aims to enhance the visibility and quality of Danish fisheries and aquaculture research through improved
collaboration and communication, improving the recruitment and training of PhD students through networks and research schools, thus providing high quality courses, seminars and workshops.

FISHNET has organised a large number of joint courses, seminars, workshops and conferences connecting more than 100 fisheries and aquaculture scientists from Danish universities and sectoral research institutions.

In 2004 Fishnet received funds to embed the network through a number of postdoc grants and co-funded professorships in Fisheries Oceanography, Fisheries Management and Fish Physiology.

The merger of the Danish Universities and Sectoral Research Institutions and various changes in Danish marine research made it necessary to extend the second phase of the project from 2008 to the end of 2012.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
University of Copenhagen

Aarhus University
University of Southern Denmark
Period: 01/01/2000 → 31/12/2012
Number of participants: 4
Research area: Marine Populations and Ecosystem Dynamics
Project participant:
Rindorf, Anna (Intern)
van Deurs, Mikael (Intern)
Gislason, Henrik (Intern)
MacKenzie, Brian (Intern)

Scaling from individuals to populations (SLIP) (38726)
The research school SLIP (Scaling from Individuals to Populations) focuses on how individual behavior and mutual interactions generate the dynamics observed at the population level. This topic forms the link between the basic and applied marine ecological research environments in Denmark and requires input from biology, mathematics and statistics. SLIP is one of the five research networks and research schools under the Danish Network for Aquaculture and Fisheries Research (Fishnet). SLIP has arranged a number of national and international PhD courses and workshops and has served to focus the interest on size and trait-based modeling, as well as on improved understanding of the physiology, genetics and behavior of marine organisms, in particular fish.

The project is coordinated by DTU Aqua.

DTU Data Analysis
National Institute of Aquatic Resources
Section for Marine Living Resources
Roskilde University
Royal Veterinary and Agricultural University
Aarhus University
University of Copenhagen
Period: 01/01/2000 → 31/12/2008
Number of participants: 9
Research area: Marine Populations and Ecosystem Dynamics
Project participant:
Höffle, Hannes (Intern)
Gürkan, Zeren (Intern)
Therkildsen, Nina Overgaard (Intern)
Sichlau, Mie Hylstofte (Intern)
Mosgaard, Thomas (Intern)
Frisk, Christina (Intern)
FAO Fish Oil
The purpose of the project is to obtain preliminary data on the storage stability of a fish oil-enriched, vegetable-based product intended as a supplement to the staple diet in sub-Saharan populations. FAO Fisheries Utilization Division is in the process of setting up a project which involves supplying families in certain African regions with fish oil, rich in docosahexaenoic acid. The role of this pre-project is to follow the development of possible oxidation products during the storage at ambient temperature of the fish oil-enriched tomato-and-onion sauce. The storage stability is assessed through sensory evaluation and chemical measurements of oxidation indices.

National Institute of Aquatic Resources
Period: 01/07/1999 → 01/07/2000
Number of participants: 3
Project participant:
Jacobsen, Charlotte (Intern)
Vu, Thi Thu Trang (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner

Proteome analysis of muscle tissues: Two dimensional protein mapping of pig and cod muscle.
Certain aspects of muscle biology such as metabolism, growth and development of muscle cells influence the quality of muscle based foods. In addition, the proteolytic processes that start immediately after slaughter or catch (post mortem metabolism) have major impact on taste and texture of meat from fish and mammals. In order to secure optimal quality, it is important to understand the basic mechanisms of muscle biology as well as to understand the post mortem processes that turn muscle into meat. Hence it is important to characterize the involved proteins and genes, and how they interact with each other and with environmental factors to influence meat quality. Proteome analysis is a new and powerful tool for characterization of cellular protein expression. This method is based on 2 dimensional (2D) electrophoretic separation of the cellular proteins so that each protein can be identified by its specific coordinates in a 2D protein map from which it can be extracted and identified by micro sequencing and mass spectrometry. Our aim is to establish and optimize such 2D protein maps of muscle tissues from cod and pork. Existing methods of tissue preparation, 2D gel separation and computer assisted image analysis of the 2D maps will be optimized. The established 2D maps will be used to study proteins that are involved in post mortem changes of muscle tissue, in order to find and identify marker proteins that can be used as assays for quality labeling.

National Institute of Aquatic Resources
Danish Institute of Agricultural Sciences
Period: 01/07/1999 → 31/05/2003
Number of participants: 3
Project participant:
Kjærgård, Inger Vibeke Holst (Intern)
Stampe-Villadsen, Hanne Lilian (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 5,135,000.00 Danish Kroner

Antioxidative defence
Oxidative defense, mandatory for protection of human health and for maintaining safety and freshness of foods, will be investigated in dietary invention studies in humans. Early stages of oxidation involving protein damage and formation of
long-lived protein radicals will be characterized in fish and pig muscle systems which will allow detection of radical damage in tissues in more details than in humans.

Department of Biotechnology
National Institute of Aquatic Resources
Department of Systems Biology
Royal Veterinary and Agricultural University

VFD
Aarhus University
Period: 01/05/1999 → 30/04/2001
Number of participants: 6
Project participant:
Jensen, Benny (Intern)
Leif Skibsted (Ekstern)
Bittmarie Sandstrom (Ekstern)
Dragsted, Lars O (Ekstern)
Andersen, Henrik (Ekstern)
Project Manager, organisational:
Refsgaard, Hanne (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 6,000,000.00 Danish Kroner

Dietary fats: Technology - Quality- Nutrition
The production of interesterified fats is optimized in laboratory scale as well as in pilot plant. The intestinal absorption of the fats is examined in animal models and the fats are incorporated into food.

Department of Biochemistry and Nutrition
National Institute of Aquatic Resources
Department of Systems Biology
Period: 01/01/1999 → 31/12/2003
Number of participants: 9
Project participant:
Porsgaard, Trine (Intern)
Jensen, Karen (Intern)
Nielsen, Nina Skall (Intern)
Mu, Huiling (Intern)
Børresen, Torger (Ekstern)
Jacobsen, Charlotte (Ekstern)
Adler-Nissen, Jens (Ekstern)
Xu, Xuebing (Ekstern)
Project Manager, organisational:
Høy, Carl-Erik (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 14,300,000.00 Danish Kroner

Efficient data collection and storage
Development of a database for raw data of various kinds (single values, vectors, matrices) so that they are easily accessible for e.g. multivariate analysis.
Environmental and Fisheries Influences on Fish Stock Recruitment in the Baltic Sea (STORE)
The objectives of the research project are to:

1. Determine stock-recruitment relationships for Baltic cod and sprat in relation to key environmental factors influencing the production of viable spawn and the survival of early life history stages.

2. Improve short-term predictions of stock development by integrating recruitment estimates based on the present status of the stock and its biotic and abiotic environment.

3. Develop predictive recruitment models for medium- to long-term forecasts of stock development under different environmental and fishery scenarios.

4. Estimate biological management reference points, critical stock limits and target spawning stock sizes based on stock-recruitment relationships and stock development simulation models, and considering the precautionary approach for fisheries management.

National Institute of Aquatic Resources
Institute of Marine Sciences, Kiel
Finnish Game and Fisheries Research Institute
Gotland University College
Baltic Sea Research Institute
Federal Research Centre for Fisheries, Institute for Baltic Sea Fishery

Fish Meal Quality assessed by analysis of volatiles
Current methods for analysis of oxidation status of the lipid component (fish oil) in fish meal do not give satisfactory results, possibly due to extraction problems. As oxidation processes result in, i.a., formation of volatile breakdown products, it is hypothesized that the determination of such volatiles may give a better indication of the oxidative deterioration of fish meal. Fish meals from various sources, processes, and antioxidant treatments were stored for 12 weeks, exposed to light and air. Amounts (arbitrary units) were determined by headspace - gas chromatography (GC), and volatiles were identified by mass spectrometry - GC. The development of volatiles displayed clear differences between meal types. The correlation of these results with the quality estimates of the trade (fish meal manufacturers) remains to be carried out.

National Institute of Aquatic Resources
Period: 01/01/1999 → 31/12/1999
Number of participants: 2
Project participant:
Vu, Thi Thu Trang (Intern)
Project Manager, organisational:
Jensen, Benny (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
The development of the fish community in lakes after biomanipulation: key factors in the development of a good population of piscivorous fish species (38264)

The objectives of the project are to strengthen the ability of DTU Aqua to consult authorities and stakeholders in the management of the fish community in lakes through (i) building time series on the development of the fish population in lakes, which has been subject to biomanipulation, (ii) make a cross analysis on a large data set containing information on standardized investigations of the fish community in more than 100 Danish lakes. Target species in lake fisheries in Denmark are the piscivorous species, which will be the focus of this project as well.

1) Biomanipulation has been applied to more than 50 Danish lakes with the objective to restore eutrophicated lakes to a state with clear water, extensive distribution of submerged macrophytes, a higher degree of biodiversity compared to turbid lakes, and a fish community dominated by piscivorous fish species. It is possible to apply biomanipulation to almost any eutrophic lake, but this restoration tool will only have a long lasting effect in lakes with an intermediate or low content and load of nutrients. In lakes where the improved environmental conditions last for several years, changes in the fish community can still be observed many years after the biomanipulation. Thus we want to describe the long term (10-25 years) development of the fish community, to be able to correctly answer what the end product of a biomanipulation is, regarding fish, on both community structure and population dynamics of the piscivorous species.

Beginning in 1990 we have built time series of the development on the fish population in 10 Danish lakes, where biomanipulation has been applied as a restoration tool. We use a standardized investigation method, which allows both within and between lakes analysis. Under the project 38826 (Handbook for management of lake fish and fisheries) a status report will be prepared in fall 2011.

2) The cross analysis of the more than 100 lake data set aims at developing models to describe the relation between population density and size distribution for important piscivorous species and factors like food availability, distribution and types of vegetation, nutrient levels and water clarity. This analysis is also done within the frame of the project 38826 (Handbook for management of lake fish and fisheries).

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/1999 → 31/12/2011
Number of participants: 2
Project Manager, academic:
Berg, Søren (Intern)
Skov, Christian (Intern)

Development of multisensor techniques for monitoring the quality of fish.
Physical signals from various instruments like near infrared vision systems, texture meters and electronic noses are correlated to organoleptic and physical/chemical quality parameters by multivariate dataanalysis (projection methods and neural networks). Based on these results, a multisensor device is designed for at line (or even in line) use in the fish production chain.

National Institute of Aquatic Resources
Period: 15/12/1998 → 15/12/2001
Number of participants: 1
Project Manager, organisational:
Jørgensen, Bo Munk (Intern)

Fresh Fish with Traceable Quality
National Institute of Aquatic Resources
Period: 01/12/1998 → 31/07/2001
Number of participants: 1
Project Manager, organisational:
Frederiksen, Marco Thorup (Intern)
The coupling between the dynamics and the biology in the North Sea

In stratified waters there may be a close connection between the dynamics and the biology of the water masses. Recent research suggests that this circumstance is responsible for the fact that the North Sea is among the world's most important with respect to the production of fish. The project aims at studying this possible close connection by considering the course of the thermal stratification in the North Sea and the abundance of cod larvae for the past 40 years.

Department of Hydrodynamics and Water Resources

National Institute of Aquatic Resources

Department of Environmental Engineering

Period: 01/10/1998 → 14/12/1999
Number of participants: 2
Project participant:
St. John, Michael (Intern)
Project Manager, organisational:
Nielsen, Morten Holtegaard (Intern)

Studies of low volatility oxidation products of sensory significance

The aim is to establish the identity and sensory significance of low volatility oxidation products in lipid-rich foods. Methods for isolation of compounds of low volatility are under development. High-vacuum distillation and supercritical extraction (SFE) have been tested for the ability to isolate lipid-derived oxidation products. Method development using SFE will be continued. Fractionation of fish muscle has been carried out by centrifugation and by HPLC of extracts. Method development along these lines is also continuing. Studies of protein oxidation in the presence of lipids are the focus in a collaboration project with Dr. Earl Stadtman at NIH (Bethesda, MD, USA).

Department of Aquatic Resources

Department of Biotechnology

Period: 01/10/1998 → 31/12/2000
Number of participants: 3
Project participant:
Refsgaard, Hanne (Intern)
Holmberg, Inge (Intern)
Project Manager, organisational:
Jensen, Benny (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,900,000.00 Danish Kroner

TMAO aldolase in fish products. A key to reduction of the quality problems connected with formaldehyde and dimethylamine.

The formation of formaldehyde and dimethylamine are main factors in the reduction in quality of lean fish like cod during frozen storage. They are formed from trimethylamine-oxide, catalysed by the enzyme trimethylamine-oxide aldolase (TMAOase; EC 4.1.2.32) which is situated mainly in the inner organs like gall bladder, spleen and kidney. The presence of the enzyme in other marine species is not thoroughly described, and it is to be expected that TMAOase activity may be the cause of formaldehyde formation and quality deterioration in other products than those formed from lean fish. Products of commercial importance to the Nordic fish industry were screened for TMAOase activity. TMAOase was almost only found in gadoide fishes. The TMAOase activity concentrations varied much between individuals. Results from the frozen storage experiment showed that the formation of formaldehyde at -10°C was both proportional to the TMAOase activity and the storage time. Therefore TMAOase activity concentration can be used as a selection criteria to sort out individuals less suitable to frozen storage.

National Institute of Aquatic Resources

Number of participants: 6
Project participant:
Nielsen, Michael Krogsgaard (Intern)
Berner, Lis (Intern)
Degradation of myofibrillar proteins from herring muscle by herring Cathepsin D

The aim of the project is to investigate the role of the lysosomal protease Cathepsin D in the ripening process of salted herring. The project is part of a larger project "Production of Cathepsin D from Herring" carried out at Biotechnological Institute, Denmark. The aim of the experimental work is to see whether Cathepsin D is active and able to degrade myofibrillar proteins under conditions corresponding to storage conditions of marinated and salted herring. Myofibrillar proteins extracted from herring muscle have been incubated with purified cathepsin D from herring muscle at pH (4.5 and 6), temperature (5°C) and salt concentration (10 and 20% NaCl) corresponding to what is found in marinated and salted herring during storage. Changes in the profile of myofibrillar proteins has been study by SDS-PAGE.

National Institute of Aquatic Resources

Bioteknologisk Institut
Period: 01/04/1997 → 30/04/1998
Number of participants: 3
Project participant:
Reimers, Karin (Intern)
Nielsen, Lars Bjarne (Ekstern)
Project Manager, organisational:
Nielsen, Henrik Hauch (Intern)

Applied multivariate dataanalysis and measurement techniques.

National Institute of Aquatic Resources

Department of Biotechnology
Department of Systems Biology
Royal Veterinary and Agricultural University
Period: 01/01/1997 → 01/01/19999
Number of participants: 4
Project participant:
Berner, Lis (Intern)
Martens, Haraid (Intern)
Munck, Lars (Ekstern)
Project Manager, organisational:
Jørgensen, Bo Munk (Intern)

European Quality Fish Net (EQF-Net)
Coordinating project in EU Leonardo Program dealing with training and information dissemination in quality issues. Forty industry and University participants in EU countries

National Institute of Aquatic Resources
Period: 01/01/1997 → 31/12/1998
Number of participants: 1
Project Manager, organisational:
Bremner, Allan (Intern)

Financing sources
Fast instrumental methods.
Development and implementation of near-infrared spectrometry and other fast instrumental methods for prediction of quality parameters for raw material and seafood products. Optimization of multivariate data-analytical applications directed towards these goals.

National Institute of Aquatic Resources
Period: 01/01/1997 → …
Number of participants: 2
Project participant:
Berner, Lis (Intern)
Project Manager, organisational:
Jørgensen, Bo Munk (Intern)

Peptides and free amino acids on the quality of salted fish products
Enzymatic degradation of proteins in salted fish products can influence the sensory quality of the products both in a positive and negative way. However, it is today only possible to detect the presence of active proteolytic enzymes but not how active the enzymes actually are under the conditions the products are stored. In order to estimate which proteolytic enzymes that are active in the products during storage, it is necessary to identify the breakdown products, such as peptides and free amino acids, from the protein degradation and correlate this to the presence of active enzymes. Heavy salted and spice salted herring is characterised by a long ripening process where a degradation of proteins in the fillet is considered to be important in order to obtain the correct sensory profile of the product. The enzymatic degradation of the muscle proteins in the herring results in a more soft texture and in the formation of taste-active peptides and free amino acids. The aim of the present project is therefore to establish a well defined profile of peptides and free amino acids in brine and fillets of spice salted herring during storage. Changes in the profiles will be investigated when the different proteases present in fillet are influenced by inhibitors. Capillary zone electrophoresis (CZE) will be used to analyse changes in the peptide fraction of spice salted herring during storage. Dominating peptides will be collected and sequenced. Changes in the peptide and amino acid concentrations will be followed during storage.

National Institute of Aquatic Resources
Period: 01/01/1997 → 31/01/1999
Number of participants: 3
Project participant:
Engvang, Karen (Intern)
Reimers, Karin (Intern)
Project Manager, organisational:
Nielsen, Henrik Hauch (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,500,000.00 Danish Kroner

Quality indicators for frozen fish
An important factor for efficient utilisation of the resources of fish is quality assurance in the chain from catch to consumer. Freezing is an effective method for preserving fat and lean fish. In order to reduce the quality loss during processing, storing and distribution it is necessary to obtain better knowledge of the biochemical shelf life indicators of the different species. It is important to create a system of traceability of the fish through the chain for the benefit of the consumer. On the background of the obtained knowledge in the project the objective is to construct a model for labelling of quality, prediction of shelf life and utilisation and to obtain a better freezing stability. The aim is to give guidelines for the optimum handling of fish prior to freezing, the optimum freezing-, storage- and thawing conditions and to collect data necessary for prediction of a production of thawed fish packed in MAP based on raw material frozen-at-sea. The effect of season, catch handling, cold/chilled storage period and temperature is examined.

National Institute of Aquatic Resources
Hoejmarklaboratory
**Project:** Collection and Analysis of Research Results and Industrial Experience on the salting and ripening of herring

Salted and marinated herring products are of great importance for the fish industry in the Nordic countries. The background for this production is herring caught in the right season and ripened by salting in barrels for several months according to old experience. Little scientific knowledge is however yet available for understanding the process. The aim of the project is to retrieve and process existing data from three Nordic laboratories by means of multivariate statistical analysis in order to obtain a better understanding of the main factors (quality criteria) that govern the salting and ripening of herring, with the purpose of improving the economy in the industry and making the industry able to market products with consistently high quality. In the project an overview will first be obtained of the results that the three laboratories have already obtained in numerous salting experiments on different herring stocks. Secondly, the scientific results will be pooled together. Thirdly, information will be collectively gathered by interviewing experienced people from the industry on the factors that are important for the salting and ripening of herring. The results obtained by the scientific studies and the experience from industry will be combined using sophisticated statistical methods (multivariate analysis). The final step will be to present the results in a workshop to the industry.

**National Institute of Aquatic Resources**

**The Icelandic Fisheries Laboratories**

**Norconserv**

**University of Copenhagen**

**Period:** 01/01/1997 → 01/03/2002  
**Number of participants:** 6  
**Project participant:**  
Jensen, Helle Skov (Intern)  
Jørgensen, Bo Munk (Intern)  
Jessen, Flemming (Intern)  
Jensen, Kristina Nedenskov (Intern)  
Godiksen, Helene (Intern)  
**Project Manager, organisational:**  
Nielsen, Jette (Intern)

**Financing sources**  
**Source:** Unknown  
**Name of research programme:** Ukendt  
**Amount:** 9,994,630.00 Danish Kroner

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**Project:** Advanced methods for identification and quality monitoring of (heat) processed fish

Objectives: -Development of methods for fish species identification, which are tailored for the various types of heated products. -Evaluation of these methods by collaborative studies. -Testing the suitability of image analysis for interpretation and comparison of electrophoresis gels. -Development of a data base containing physical parameters (isoelectric point and/or molecular weight) of proteins for fish species identification. This reference data base will contain data for raw and heated fish and products. -Evaluation of electrophoretic methods to monitor processing parameters (the heating temperature) of fishery products.

**National Institute of Aquatic Resources**

**Netherlands Institute for Fisheries Research**

**Federal Research Centre for Fisheries**

**IFREMER**

**Instituto Portugues de Investigacao Maritima**
Spoilage and safety of cold-smoked fish (EU-FAIR CT95-1207)

In DK the annual export value of cold-smoked salmon is in the order of 150 mill. US $. It is a major problem for the industry that large amounts of products are rejected on the basis of microbiological counts that do not show any relation to the organoleptic quality of the product. The primary objective of the project is to identify indices of quality of cold-smoked salmon. Secondly methods to measure the indices of quality will be developed and validated on a European basis. Identification of indices of quality will be based on an approach where specific spoilage organisms (SSO) and individual chemical compounds that can be related to product shelf life are studied. At the same time a non-specific approach based on measurements of profiles of volatile compounds and other metabolites will be used in combination with multivariate statistical methods for identification of indices of quality.

National Institute of Aquatic Resources

Escola Superior de Biotechnologia

IFREMER

DLO.RIVO, Ijmuiden

Leatherhead Food Research

Period: 01/11/1996 → 28/02/2000

Number of participants: 3

Project participant:

Jørgensen, Lasse Vigel (Intern)

Huss, Hans Henrik (Intern)

Project Manager, organisational:

Dalgaard, Paw (Intern)

Financial sources

Source: Unknown

Name of research programme: Ukendt

Amount: 2,200,000.00 Danish Kroner

Project
Time-temperature integration and shelf life prediction (EU-FAIR-PL95-1090)
The project is a continuation of "Predictive modelling of shelf life of fish and meat products" (EU-AIR CT93-1251). The aim is to evaluate and further develop kinetic and empirical models for prediction of shelf-life of seafoods. Shelf life models will particularly be evaluated with fluctuating temperature conditions. Fresh fish and lightly preserved products, including cold-smoked salmon and brined shrimps, will be studied by empirical or relative rate of spoilage models. An important objective has been to develop the "Seafood Spoilage Predictor" software now available at http://www.dfu.min.dk/micro/ssp. This software allows shelf life of different seafood to be predicted at constant and fluctuating temperatures. The project is financed by EU and carried out in collaboration with Greece and France.

National Institute of Aquatic Resources
National Technical University of Athens
Danish Institute for Fisheries Research
ADRIA Developpement
Agricultural University of Athens
Period: 01/11/1996 → 30/04/2000
Number of participants: 1
Project Manager, organisational: Dalgaard, Paw (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,100,000.00 Danish Kroner

Ice quality and pumpable ice.
The aim is to investigate those parameters which possibly can influence the manual handling characteristics of tube ice, the most common type of ice used on danish fishing vessels. Also investigation of parameters, which can lead to production of pumpable ice/water-mixtures based on tube ice will be done.

National Institute of Aquatic Resources
Period: 01/10/1996 → 01/05/1998
Number of participants: 4
Project participant: Frederiksen, Marco Thorup (Intern)
Johannesen, Erlendur (Intern)
Popescu, Valeriu (Intern)
Project Manager, organisational: Olsen, Karsten Bæk (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 567,000.00 Danish Kroner

Quality Assurance & Information Technology
Development of QA and IT systems suitable for use in the fishing industry. Provide leadership to Process Technology group, develop strategies in QA and chain management.

National Institute of Aquatic Resources
Period: 01/06/1996 → …
Number of participants: 1
Project Manager, organisational: Bremner, Allan (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Oxidation mechanisms in fish oil enriched emulsions

The purpose of the project is to study the oxidation mechanisms in fish oil enriched emulsions in order to develop combined emulsifier and antioxidant systems which are more efficient in protecting fish oil enriched foods against oxidation than existing antioxidant systems. Results obtained in 1999 have shown that the low pH in mayonnaise is a very important factor for the initiation of the oxidation processes in mayonnaise. This is due to the fact that iron ions are released/loosened from the egg yolk components at the oil/water interface when pH is decreased to 4, which is the normal pH in mayonnaise. The released iron promotes decomposition of peroxides to volatiles, which are responsible for the off-flavour formation in mayonnaise. The metal chelator EDTA was observed to be a very efficient antioxidant in mayonnaise due to its ability to chelate iron. A HPLC method for determination of lipid peroxides has been further optimised and is now fully operational. By the aid of GC-MS a large number of volatiles that correlate to the fishy and rancid off-flavours in oxidised mayonnaise have been identified.

National Institute of Aquatic Resources
Department of Biochemistry and Nutrition
Department of Biotechnology
Danisco Ingredients
Association of Danish Fish Meal and Fish Oil Manufacturers

Royal Veterinary and Agricultural University
Period: 01/05/1996 → 31/12/1999
Number of participants: 11
Project participant:
Vu, Thi Thu Trang (Intern)
Jacobson, Charlotte (Intern)
Hartvigsen, Karsten (Intern)
Lund, Pia (Intern)
Datta, Suvra (Intern)
Helmer, Gunhild Kofod (Intern)
Meyer, Anne S. (Intern)
Green, Else (Intern)
Reitz, Suzie (Intern)
Adler-Nissen, Jens (Intern)
Project Manager, organisational:
Børresen, Torger (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,050,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 6,178,065.00 Danish Kroner

Assess the yield from eel stocking in a marine fjord (38262)

The overall objective of the project was to estimate the outcome of stocking eel in a marine area, to estimate the yield to the fishery and the proportions of eels escaping the fishery. To reach this goal it was necessary to estimate the total catch in the fjord, the fishing mortality and whether eels stay in the fjord area or migrate to adjacent waters.

Stocking is a widely used measure to enhance local eel populations throughout Europe. About 1.5 million elvers are stocked annually in Danish marine waters. There are only vague indications that these stockings actually improve the number of fish that are available to the fisheries and the spawning population.

In 1998 and 1999 a total of 100.000 coded wire tagged eel were stocked in the inner parts of Roskilde Fjord. During 1999-2015 the eel catches made by professional and recreational fishermen were analyzed for recapture of tagged fish in order to establish the ratio of tagged to untagged fish in the eel catches. Based on the knowledge of numbers of fish caught in the yellow eel fishery as well as the silver eel fishery, the yield to the fishery was calculated. Migration patterns of the stocked eel were studied by collecting data from different strata of the fjord and adjacent fisheries, Isefjord and Arresø. Migrating silver eels were Carlin tagged and released to the fishery in September and October. Based on reported
recaptures from fishermen an estimate of fishing mortality was established as well as of the number of silver eels leaving
the Fjord and migrating toward the Sargasso spawning grounds. The total catches made by recreational fishermen were
established through questionnaires to recreational fishermen.

The overall result suggests that about 13% of the stocking were captured by the fishery in Roskilde Fjord and 5% left the
fjord as silver eels on spawning migration.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Rod and Net License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/1996 → 31/12/2015
Number of participants: 5
Research areas: Freshwater Fisheries and Ecology & Coastal Ecology
Project participant:
Christensen, Hans-Jørn Aggerholm (Intern)
Carøe, Morten (Intern)
Mikkelsen, Jørgen Skole (Intern)
Project Manager, academic:
Rasmussen, Gorm (Intern)
Project Coordinator:
Pedersen, Michael Ingemann (Intern)

Leaching of heavy metals from soils
Quality criteria for soils with respect to heavy metals have traditionally focused on the environmental issues related to the
land use (ingestion of soil, skin contact, etc.) and very little attention has been given to protection of the groundwater. The
complex form of heavy metals in polluted soils makes prediction of leachability difficult and leaching experiments or
leaching test are usually the only way to assess the amount of metal to leach from the soil. Model scenarios are being
developed to evaluate heavy metal leaching in the context of groundwater protection and allow for simplified methods to
account for groundwater quality criteria, depth and location of polluted soil, reduction in infiltration and leachable amounts
determined in leaching test. Experimental studies have been performed at actual sites and leaching experiments are
conducted in the laboratory.

Department of Environmental Science and Engineering
National Institute of Aquatic Resources
VKI Water Quality Institute
Period: 01/01/1996 → 31/12/1998
Number of participants: 9
Project participant:
Kjeldsen, Peter (Intern)
Astrup, Thomas Fruegaard (Intern)
Boddum, Jens Kjærgaard (Intern)
Astrup, Thomas Fruegaard (Intern)
Jensen, Dorthe Lærke (Intern)
Foverskov, Anja (Intern)
Holm, P. (Ekstern)
Hjelmar, O. (Ekstern)
Project Manager, organisational:
Christensen, Thomas Højlund (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 200,000.00 Danish Kroner
Source: Unknown
Name of research programme: Ukendt
Amount: 100,000.00 Danish Kroner
Project
NUTRIFISH - Nutritional Studies on Dried Functional Ingredients Containing n-3 Polyunsaturated Fatty Acids

1998: The project objectives are to define the lowest intake of n-3 PUFA which will exert a positive nutritional effect against biomarkers of chronic diseases in humans; to design high quality bioavailable fish oil-enriched ingredients; to incorporate these novel dried ingredients in a range of consumer food products. The tasks at FF are to provide fish oil for powder-production, to set up quality specifications for fish oil, to prepare antioxidant formulations and to test their efficiencies, and to study formation and identity of volatile oxidation products formed in spray-dried fish oil powders during storage. Fish oil was refined and deodorized for production of microencapsulated fish oil and for a storage experiment. The fish oil was protected against oxidation by adding a antioxidant system prepared at FF. The shelf-life of commercial powders have been compared with the shelf-life of powders produced in this project. The dynamic headspace method develop at FF, applying analysis of the volatiles by gas chromatography-mass spectrometry (GC-MS), was used to evaluate sensorially significant volatiles formed by lipid oxidation. Compounds with a characteristic and easily detectable odour were selected by GC sniffing analyses. The amount of the volatiles were calculated using calibration curves, that were determined by quantitative GC-MS analysis of standards. The amounts of volatiles were found in levels of microgram volatiles / g powder (ppm).

National Institute of Aquatic Resources

Golden Vale plc

TEAGASC

Deutsches Institut für Lebensmitteltechnik

Ytkemiska Institutet

Instituto de la Grasa

Trinity College Dublin

University College Cork

University of Ulster

Period: 01/12/1995 → 01/03/1999

Number of participants: 4

Project participant:

Haahr, Anne-Mette (Intern)

Jensen, Benny (Intern)

Vu, Thi Thu Trang (Intern)

Project Manager, organisational:

Schmidtsdorff, Walther (Intern)

Financing sources

Source: Unknown

Name of research programme: Ukendt

Amount: 1,834,000.00 Danish Kroner

Prevalence and growth of Listeria monocytogenes

National Institute of Aquatic Resources

Period: 01/09/1995 → 31/08/1997

Number of participants: 1

Project Manager, organisational:

Jørgensen, Lasse Vigel (Intern)

Quality of water for the production of bivalve molluscs

National Institute of Aquatic Resources

Period: 01/09/1995 → 31/08/1997

Number of participants: 1

Project Manager, organisational:

Jørgensen, Lasse Vigel (Intern)

Financing sources
Improving Quality Control in the Seafood Industry using an integrated process approach and advanced on-line methods

By use of multivariate process data analysis and viewing the process as an integrated whole, the aim is to study possibilities for improving the controllability of quality and the quality management in seafood industries.

National Institute of Aquatic Resources
Period: 15/08/1995 → 31/12/1997
Number of participants: 1
Project Manager, organisational: Moe, Tina (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 72,000.00 Danish Kroner

Shelf-life prediction for improved safety and quality of foods (EU-COPERNICUS)

The aim of the Concerted Action is to stimulate interest in the complex issue of shelf-life prediction. The work focuses primarily on (i) development of computer modelling techniques, (ii) predictive microbiology, (iii) product specific shelf-life determination.

National Institute of Aquatic Resources
Period: 01/05/1995 → 31/12/1997
Number of participants: 1
Project Manager, organisational: Dalgaard, Paw (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 2,500,000.00 Danish Kroner

Purification and characterization of TMAOase of saithe and hake.

The intracellular distribution of the enzyme TMAO aldolase (EC 4.1.2.32) is determined from detergent-treated tissue extracts. The enzyme is isolated and purified by chromatography and its properties are studied. Thereby, greater knowledge is gained of the factor that determines the formation of dimethylamine and formaldehyde in frozen fish. This knowledge forms a basis for the possibility of influencing the process that is considered important for quality deterioration during frozen storage.

National Institute of Aquatic Resources
Bundesforschungsanstalt für Fischerei
Universidad de Vigo
Period: 01/04/1995 → 31/03/1998
Number of participants: 6
Project participant: Nielsen, Michael Krogsgaard (Intern)
Jessen, Flemming (Intern)
Berner, Lis (Intern)
Rehbein, Hartmut (Ekstern)
Gonzalez-Sotelo, Carmen (Ekstern)
Project Manager, organisational: Jørgensen, Bo Munk (Intern)
Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,300,000.00 Danish Kroner

Predictive models of microbial growth in foods (EU-COST 914)
The Concerted Action focused on (i) validation of models (ii) evaluation of instrumental methods for data capture (iii) modelling of mixed microbial populations and (iv) modelling of microbial survival. DIFRES has particularly participated in validation of models in seafoods and in the development of absorbance methods for generation of growth data. DIFRES represents Denmark in the management committee.

National Institute of Aquatic Resources
Period: 01/03/1995 → 31/12/1999
Number of participants: 1
Project Manager, organisational:
Dalgaard, Paw (Intern)

Thaw-rigor
The metabolic processes related to rigor mortis in fish during freezing, frozen storage and thawing can be related to quality deterioration. In this project these processes are studied in dependence of time and temperature. A special interest is on the relation between thaw-rigor and quality deterioration during processing of fish. The project shall determine the extent and importance of gaping as a result of thaw-rigor and investigate the potential for thaw-rigor in frozen industrial cod blocks. Based on these results an optimized thawing procedure will be developed in order to increase quality and yield of thawed raw material.

National Institute of Aquatic Resources
Thorfish A/S
Period: 01/01/1995 → 31/03/1999
Number of participants: 2
Project participant:
Cappeln, Gertrud (Intern)
Project Manager, organisational:
Jessen, Flemming (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,700,000.00 Danish Kroner

Traceability of packed and weighed fresh fish onboard vessels

National Institute of Aquatic Resources
Period: 01/01/1995 → 01/08/1997
Number of participants: 3
Project participant:
Frederiksen, Marco Thorup (Intern)
Popescu, Valeriu (Intern)
Project Manager, organisational:
Olsen, Karsten Bæk (Intern)

Lightly salted lumpfish roe. Composition, spoilage, safety and preservation
Traditional caviar products are often heavily salted and further preserved by addition of chemical preservatives. This industrial Ph.D. project has studied the problems associated with reducing the salt content and eliminating the chemical preservatives from the product. It was shown that Lactic Acid Bacteria (LAB) dominated the microbial flora after three
months of storage at plus 5°C of this lightly salted product (approx. 4% water phase salt (WPS)), but also Enterobacteriaceae was found in high numbers, particularly when WPS was lower than 4%. A number of chemical indicators of spoilage were analysed, but only volatile sulphur compounds were related to sensory spoilage. The presence and growth of Listeria monocytogenes was identified as a possible health hazard. Experiments with biopreservation were unsuccessful, but the use of 2.8% (w/w) sodium lactate was found to be a possible alternative.

**National Institute of Aquatic Resources**

**Abba Seafood A/S**
- **Period:** 01/10/1994 → 31/07/1997
- **Number of participants:** 2
- **Project participant:**
  - Basby, Merethe (Intern)
  - Huss, Hans Henrik (Intern)

**Project:**

**In vitro protein digestion in fish**

A project has been carried out with the aim of developing a rapid and reliable method for predicting the protein digestibility in fish feed. The method should replace present methods using experimental animals like rats, minks and fish. These methods take up to several weeks until the result is known. The results in the present project show that an in vitro method can give a result after a one day assay only. The project has been successfully ended by submission of a thesis for an industrial ph.d., which has been approved.

**National Institute of Aquatic Resources**

**Fiskernes Fiskeindustri**

**Aalborg University**
- **Period:** 01/02/1994 → 31/03/1997
- **Number of participants:** 2
- **Project participant:**
  - Bassompierre, Marc (Intern)
  - Børresen, Torger (Intern)

**Project:**

**Improved utilization of low-value fish**

The specific objectives of this project were in three areas: 1. To examine and adapt traditional Asian preservation technologies for fish products. 2. To investigate and optimise the fermentation process used in traditional Asian fish products. 3. To study the composition and stability of lipids from low-value fish species. The results have identified potential new use of a large number of low-value fish species. The properties of Lactic Acid Bacteria (LAB) isolated from low salt fermented products have been studied and the capacity to ferment inulin from garlic was found to be an important criteria for selection of starter cultures, since garlic is added to most low-salt fermented products. The fatty acid profile from a great number of tropical fish has been determined. The stability of fish oil and the potential of spices as antioxydants has also been investigated.

**National Institute of Aquatic Resources**

**Indian Council of Agricultural Research**

**Slipi Research Station for Marine Fisheries**

**University Putra Malaysia**

**NOFIMA**

**University of the Philippines Visayas**

**National Aquatic Resources Agency**

**Fishery Technological Development Institute**

**Natural Resources Institute**

**Prince of Songkla University**
- **Period:** 01/01/1994 → 31/10/1997
- **Number of participants:** 4
- **Project participant:**
Biological and technological significance of the fish parasite Ichthyophonus hoferi

In 1991 an epizootic of ichthyophoniasis in herring was recorded for the first time in waters around Denmark and Norway causing mass mortality. This Ph.D. study demonstrates how continuously successful subculturing of Ichthyophonus hoferi is possible only at alternating pH (between pH 3.4 and pH 7). The morphology of I. hoferi at pH 3.5 and 7.0 was studied using light and scanning electron microscopy. At pH 3.5 only hyphal growth was seen while only growth of uni-to multinucleate spherical bodies was seen at pH 7. These findings were used to explain the lifecycle of this parasite. The phylogenetic position of the genus Ichthyophonus was investigated using a combination of molecular analysis of the genomic DNA encoding the small subunit ribosomal RNA, ultra-structural features and biochemical data. These studies indicated that I. hoferi is not a member of the Fungi, but belongs to the protist Kingdom. Feeding experiments with mice showed that I. hoferi is not a pathogen in mammals. However, the technological significance of I. hoferi infected fish fillets entering processing is severe due to soft texture, unfavourable flavour changes and discolorations of the fish products.

National Institute of Aquatic Resources
Royal Veterinary and Agricultural University
Period: 01/11/1993 → 01/01/1997
Number of participants: 2
Project participant:
Spanggaard, Bettina (Intern)
Project Manager, organisational:
Huss, Hans Henrik (Intern)

Analytical Chemistry

Analytical Chemistry at FF is a basic activity, aimed at maintaining the chemical-analytical know-how, which is necessary for carrying out general analytical tasks, e.g. analyses for salt, crude protein, and TVB-N. In addition, newer instrumental methods may be part of this general project area, though usually such analyses are developed within specific projects (analysis of peptides, proteins, microbial metabolites, autolytic breakdown-products). The available instrumentation include i.a. 4 HPLC-instruments (UV, DAD, ELSD, RI, fluorescence detection), 3 GC instruments (MS, PFD, FID, olfactory detection), 2 scanners for 2-D-gel electropherograms, NIR, low-resolution NMR, differential scanning calorimeter. The Analytical Quality Group follows up on developments and trends in analytical principles and in analytical quality control that may be relevant for analytical chemistry at FF. This group carries out updating of standard procedures and method descriptions for the purpose of improving quality assurance and minimizing environmental effects, and occasionally manages participation in national and international inter-laboratory tests. Safety activities have been strengthened by the employment of a safety officer. Also, within this project area are placed advisory activities towards internal and external questions on analytical problems. - A central theme of present and planned activities is quality assurance and quality control of standard analytical methods. - External cooperation in the field of chemical analysis of fish with WEFTA Working Group on Analytical Methods (WEFTA = [West] European Fish Technologists’ Association. - The basal chemistry activities, comprising approx. 1 person/year, are financed by the running costs of the department.

National Institute of Aquatic Resources
Period: 01/06/1989 → 31/12/2013
Number of participants: 7
Project participant:
Berner, Lis (Intern)
Stampe-Villadsen, Hanne Lilian (Intern)
Jørgensen, Bo Munk (Intern)
Olsen, Lone Rosenkær (Intern)
Reimers, Karin (Intern)
Haahr, Anne-Mette (Intern)
Project Manager, organisational:
Jensen, Benny (Intern)
**Lipid Chemistry**
Lipid chemistry activities at FF are related partly to projects that are based in the fish oil and fish meal area, and partly to projects studying the formation of lipid-derived aroma and flavours. Lipid oxidation is a central topic. Lipid analytical methods maintained at FF comprise analysis of lipid content by extraction or occasionally by NIR or microwave methods. Lipid class analysis is carried out using the principle of solid phase extraction. Fatty acid composition is an important parameter in studies both of fish and of fish oil. Capillary gas chromatography, with detection by flame ionization or, occasionally, with mass spectrometric analysis is used. Oxidation parameters are analyzed traditionally (e.g. peroxide value). Polymer formation is analyzed using high performance size exclusion chromatography. Oxidative stability of edible oils, and thereby the effect of various antioxidants, is assessed using accelerated methods (Rancimat, Oxidograph). Formation of volatile products of lipid oxidation is analyzed using headspace chromatography with adsorbent trapping, thermal desorption, and gas chromatography with detection by flame ionization, mass spectrometry or olfactometry (sniffing analysis). - The basal lipid activities are financed by the related projects and by the basic running costs of the department.

**National Institute of Aquatic Resources**
Period: 01/06/1989 → …
Number of participants: 2
Project participant:
Jørgensen, Bo Munk (Intern)
Project Manager, organisational:
Jensen, Benny (Intern)

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**Population dynamics of eel (38260)**
The project has 3 main goals:

1) **Evaluation of the feasibility of eel stocking**
In compliance with the National eel MP, 1.3 million pre-fed eel are stocked annually in lakes and rivers. In coastal areas 0.2 million are stocked. Very little is known about the feasibility of these stockings. Due to the long life cycle of eels, both short and long term experiments are carried out.

**Short-term:** Wild and cultured (pre-fed) eels of similar size (2-5 gram) are stocked in a number of large open ponds (old trout farm) and their growth and survival is recorded during their first year. Similar experiments are performed with wild glass eels stocked in different densities in the ponds.

**Long-term:** Small CW-tagged eel were stocked in the river Gudenåen in 2001, 2002 and 2011. The return from these stockings in the form of migrating silver eels are monitored by scanning eel caught in a trap (at a hydropower station), operating every autumn from 2006-2013. Furthermore, the silver eels caught in the trap are PIT tagged and recorded when reaching the lowermost obstacle in the river (Tange HPS). In Ribe Å, in Vester Vandetlake and in Karrebæk estuary CW-tagged eel were stocked in 2011 and 2012. The monitoring of catches for tagged eel started in 2015 and will continue for several years to get an estimate of how much the stocked eel contribute to the fisheries and how the ratio wild/stocked is, giving an indication of the natural recruitment.

2) **Monitoring of recruitment/elvers**
The recruitment of eel has been continually declining since early 80’s and is now at a historical low. Monitoring of the number of elvers/glass eels arriving every year is therefore very important for the whole of EU. In DK we have two stations, where upstream migrating elvers are caught and recorded on a daily basis. Both stations are on the Danish East Coast. On the West coast the immigration is monitored by electric fishing/sampling in small streams in early summer.

3) **Monitoring of the prevalence of the swim bladder parasite Anguillicola in Danish eels**
The swim bladder worm Anguillicola crassus was introduced to Europe from the far east in the beginning of the 1980’s. The parasites are thought to be one of the causes of the decline of the European eel population. Therefore the colonisation of Anguillicola in Denmark has been monitored in fresh and marine water bodies to assess the abundance of parasites and the general health of parasitized eels. The geographical distribution and the stability of the parasite abundance are of international interest due to the decline of the eel stock, but also because large effort is done to secure that the 1.5 million annually stocked eel are free of parasites.
This project is coordinated by DTU Aqua.
This project is funded by the Danish Rod and Net Fishing Licence Funds.

**National Institute of Aquatic Resources**
Section for Freshwater Fisheries Ecology
Period: 01/01/1988 → …
Number of participants: 3
Research area: Freshwater Fisheries and Ecology
Project participant:
Carøe, Morten (Intern)
Project Manager, academic:
Jepsen, Niels (Intern)
Monitoring of glass eel recruitment to Danish inland waters (38263)
The objectives are to collect data on the glass eel recruitment from the ocean to Danish inland waters, to be used in national and international advice on fisheries and stocks.

A decline in recruitment of glass eel to the Danish coast and elsewhere in Europe has been persistent through several decades. The yield in fisheries has also declined and the stock is considered by ICES to be outside safe biological limits. Several hypotheses have been proposed for the decline, but no unambiguous cause has been identified. Monitoring of the stock is traditionally a national task, though coordinated international monitoring is needed, especially to evaluate if any change in management have the intended effect on the size of recruitment.

In Denmark the monitoring is currently taking place at two hydropower stations where ascending eels are monitored in bypass traps, where personnel at the hydropower stations are doing the daily monitoring. The distance from the ocean to the hydropower dams are 5 and 35 km and the ascending eels do not directly reflect the annual size of the glass eel recruitment, but consist of several age groups (0-5 years).

Glass eels recruitment directly from the ocean is also quantified by electro fishing in four small brooks on the west coast of Denmark. Sections of each brook are electro fished three times a year allowing for calculation of numbers and fluctuations in the recruitment to the brooks. The monitoring data are used in the ICES stock assessment group on eel WGEEL.

Sensory analysis at Dept. of Seafood Research
The aim is to strenghten the sensory research area and consumer test at Dept. of Seafood Research in a way that will enable the function to give qualified advice on sensory problems and for participation in planning and doing sensory analysis for various research projects. The sensory research area will be expanded by building up knowledge about consumer test. For this purpose new methodologies will be introduced at Dept. of Seafood Research. Consumer test can be used for confirming consumer preferences which can be correlated with laboratory tests. The knowledge obtained gives a picture of which specific sensory attributes the consumer prefer. These attributes can be used by selection and training of new assessors. The electronic FIZZ-system will be used as a tool for planning and performing sensory analysis. The results will be analysed by classic and/or multivariate methods. Futher research will develop the Quality Index Method (QIM) to a standard analysis by incorporation of more species and fish products. QIM will be introduced to Danish fish companies. The project will also include finding correlations between rheological and sensory properties and characterisation of microstructure of fish and fish products.

Activities:
The distribution of coastal gobies from the Inner Danish Waters.
Period: Feb 2018 → Jul 2018
Elliot John Brown (Supervisor)
Forvaltning af Tobis i Nordsøen
Period: 12 Nov 2017
Ole Henriksen (Guest lecturer)
National Institute of Aquatic Resources
Section for Marine Living Resources

Related event

DanFish International
11/10/2017 → 13/10/2017
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

Differences in juvenile plaice and flounder otolith microchemistry from the Inner Danish Waters
Period: 11 Nov 2017 → 16 Nov 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event

10th International Flatfish Symposium
11/11/2017 → 16/11/2017
Saint-Malo, France
Activity: Talks and presentations › Conference presentations

Ozonation of recirculating aquaculture system based on system's demand
Aikaterini Spiliotopoulou (Speaker)
Richard Martin (Other)
Lars-Flemming Pedersen (Other)
Henrik Rasmus Andersen (Other)
Department of Environmental Engineering
National Institute of Aquatic Resources
Section for Aquaculture
Water Technologies

Related event

Aquaculture Europe 2017
17/10/2017 → 20/10/2017
Dubrovnik, Croatia
Activity: Talks and presentations › Conference presentations

Complex Motion in Fluids Summer School
Period: 24 Sep 2017 → 29 Sep 2017
Seyed Saeed Asadzadeh (Participant)
Jens Honore Walther (Participant)
Lasse Tor Nielsen (Participant)
Julia Dölger (Participant)
Thomas Kierboe (Participant)
Anders Peter Andersen (Participant)
Department of Mechanical Engineering
Fluid Mechanics, Coastal and Maritime Engineering
National Institute of Aquatic Resources
Centre for Ocean Life
Department of Physics
Biophysics and Fluids

Description
The school will consist of 16 lectures in total, given by 8 speakers (90'+60' each), contributed talks, poster sessions and other activities.
Degree of recognition: International
Documents:
Asadzadeh

Related event
Complex Motion in Fluids Summer School
24/09/2017 → 30/09/2017
Cambridge, United Kingdom
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

The effect of dietary fatty acid content on rainbow trout fry robustness towards Flavobacterium psychrophilum
Period: 4 Sep 2017
Nikolaj Reducha Andersen (Guest lecturer)
Ivar Lund (Guest lecturer)
Alfred Jokumsen (Guest lecturer)
Lone Madsen (Guest lecturer)
National Veterinary Institute
Fish Diseases
National Institute of Aquatic Resources
Section for Aquaculture
Degree of recognition: International

Related event
18th International Conference on Diseases of Fish and Shellfish: 18th International Conference on Diseases of Fish and Shellfish
04/09/2017 → 08/09/2017
Belfast, United Kingdom
Activity: Talks and presentations › Conference presentations

Coastal Fish Monitoring Through Citizen Science
Period: 16 Jul 2017 → 20 Jul 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event
World Recreational Fishing Conference 2017
16/07/2017 → 20/07/2017
Victoria, Canada
Activity: Talks and presentations › Conference presentations
Sampling juvenile fish habitats with engaged community members – Smáfisk2017
Period: 16 Jul 2017 → 20 Jul 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event
World Recreational Fishing Conference 2017
16/07/2017 → 20/07/2017
Victoria, Canada
Activity: Talks and presentations › Conference presentations

Species-specific vulnerability of Arctic copepods to oil contamination and global warming
Period: 9 May 2017
Khuong Van Dinh (Speaker)
Torkel Gissel Nielsen (Other)
National Institute of Aquatic Resources
Section for Oceans and Arctic

Description
Special session: Combined effects of chemical and environmental stressors: from local stressors towards climate change,
SETAC Europe 27th Annual Meeting in Brussels, Belgium

Related external organisation
Society of Environmental Toxicology and Chemistry
United States
Activity: Talks and presentations › Conference presentations

EGU 2017
Period: 27 Apr 2017
Urban Wünsch (Speaker)
Colin Stedmon (Speaker)
National Institute of Aquatic Resources
Section for Oceans and Arctic

Description
General assembly of the European Geosciences Union 2017
Degree of recognition: International
Links:

Related event
EGU General Assembly 2017: European GEosciences Union 2017
24/04/2017 → 28/04/2017
Vienna, Austria
Activity: Talks and presentations › Conference presentations

LEARN-TEACH: a pilot to boost Ocean Literacy in High Schools
Period: 27 Apr 2017
Ivo Grigorov (Speaker)
Diana Payne (Speaker)
Bynna Vogt (Other)
Raising the Ocean Literacy of all levels of society is now a policy priority for the European Commission. The long-term objective is better appreciation of the socio-economic benefits and ecosystem services that the marine environment provides, and encourage better stewardship of the seas.

One long-term, and potentially self-sustainable, concept is to put sufficient mutual incentives in place so that researchers, teachers and students in high-schools science and mathematics classes accessorize school curricula with the latest marine research results and knowledge.

Summary of preliminary teachers consultations at Copenhagen International School suggest that teachers are prepared and willing to include recent marine research, research data and knowledge in high school science classes and carry over the research data to mathematics/statistics classes and exercises. However the active participation of researchers is sought to provide guidance and translation of latest research findings, and point to real data sources.

LEARN-TEACH Pilot’s main objective is to test a long-term scalable and locally applicable solution for engaging young people in marine environment issues and challenges.

LEARN-TEACH sustainability of concept relies on mutual training and clear mutual incentives. For the teachers, it allows an opportunity to understand and inject recent research in the school curriculum in order to “increase the level of knowledge among the population of the marine environment”.

For the researchers, LEARN-TEACH is tailored as a tool for outreach and dissemination, as well as exposing young marine researchers to the challenges of translating and communicating research to non-academic audiences, and potentially an alternative career.

The presentation will demonstrate how LEARN-TEACH can be embedded in every research grant in any EU region, and how it can add a competitive edge at research grant proposal evaluation.

The content is based on the “Blue Schools” initiative of Horizon 2020 SeaChange Consortium, an EC Ocean Literacy project (www.seachangeproject.eu)

Degree of recognition: International

Documents:
EGU2017-18398-2

Links:

Related event

EGU General Assembly 2017: European GEosciences Union 2017
24/04/2017 → 28/04/2017
Vienna, Austria
Activity: Talks and presentations › Conference presentations

EGU2017-18355 Passive vs Active Knowledge Transfer: boosting grant proposal impact
Period: 24 Apr 2017
Ivo Grigorov (Speaker)
Georgia Bayliss-Brown (Other)
David Murphy (Other)
Thomas Lindberg Thøgersen (Other)
Patrizio Mariani (Other)
National Institute of Aquatic Resources
Research Secretariat
Centre for Ocean Life
Section for Marine Ecology and Oceanography
Research funders are increasingly concerned with measurable socio-economic impact of investment in research, and on increasingly shorter timescales. Innovation, and “open innovation” are the policy priorities of the moment and optimising the flow of ideas along the lab-2-market spectrum is essential for re-use of results, fuelling open innovation, and boosting socio-economic impact or public funded research.

The presentation showcases two complimentary strategies that Project Managers can employ pre- and/or post-award in order to optimise the exploitation and impact of research project: passive and active knowledge transfer. Passive Knowledge Transfer relies on maximum disclosure of research output (other than commercially exploitable research via patents and other IPR) in the interest of optimal reproducibility, independent validation and re-use by both academic and non-academic users, without necessarily targeting specific users. Tools of the trade include standard public & academic dissemination means (research articles, online media publications, newsletters, generic policy briefs). Additional transparency of the research workflow can be achieved by integrating “open science” (open notebooks, open data, open research software and open access to research publications) as well as Virtual Research Environments (VREs) in the methodology of the proposed work. Ensuring that the proposal partners are suitably trained in best practices of open science, makes proposal grant more competitive at evaluation and the resulting maximum access to research outputs does contribute to better return on investment for funders (Beagrie 2016) and economic growth objectives of public sector. Blue Growth (Houghton & Swan 2011, Marine Knowledge 2020 Roadmap). Active Knowledge Transfer, or the pro-active translation of research into policy or commercial context, is the more classical and better known approach (also referred to as extension services, or researchers providing advice e.g. to fisheries and aquaculture governance bodies and private sector). Horizon2020 COLUMBUS Consortium proposes and tests a methodology for categorizing the diverse output of research into verifiable “knowledge outputs”, and documenting the execution of an transfer plan to very specific and identified potential users, in order to transfer knowledge along the lab-2-market spectrum. The presentation will demonstrate how Open Science and detailed knowledge transfer plans complement each other, enhance grant proposal evaluation pre- and post-award, and can address Blue Growth policy objectives. Concepts presented are developed by FP7/H2020 FOSTER (www.fosteropenscience.eu), H2020 COLUMBUS (www.columbusproject.eu).

Degree of recognition: International
Documents:
EGU2017-18355-2
Links:
https://www.fosteropenscience.eu/event/ipr-open-science-and-technology-transfer

Related event
EGU General Assembly 2017: European GEosciences Union 2017
24/04/2017 → 28/04/2017
Vienna, Austria
Activity: Talks and presentations › Conference presentations

ASLO Aquatic Sciences Meeting 2017
Period: 26 Feb 2017 → 3 Mar 2017
Urban Wünsch (Speaker)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Degree of recognition: International
Links:

Related event
ASLO Aquatic Sciences Meeting 2017: Mountains to the Sea
26/02/2017 → 03/03/2017
Honolulu, United States
Activity: Talks and presentations › Conference presentations

STECF Expert Working Group EWG-16-14 on Technical Measures
Period: 6 Feb 2017 → 10 Feb 2017
Lars O. Mortensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
STECF Expert Working Group EWG-16-14 on Technical Measures

Related event
STECF Expert Working Group EWG-16-14 on Technical Measures
06/02/2017 → 10/02/2017
Brussels
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Period: 2016 → …
Ole Henriksen (Consultant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International
Links:
http://www.ices.dk/community/groups/Pages/HAWG.aspx

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Public and private sector consultancy › Public sector consultancy

ICES - Herring Assessment Working Group - HAWG (External organisation)
Period: 2016
Lars O. Mortensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Related external organisation
ICES - Herring Assessment Working Group - HAWG
Activity: Membership › Membership of commitees, commissions, boards, councils, associations, organisations, or similar

Immediate and delayed interactions of global warming and contaminants on aquatic invertebrates
Period: 10 Dec 2016 → 14 Dec 2016
Khuong Van Dinh (Speaker)
National Institute of Aquatic Resources
Section for Oceans and Arctic

Description
Annual Meeting of the British Ecological Society - Liverpool, United Kingdom

Related external organisation
British Ecological Society
London, United Kingdom
Activity: Talks and presentations › Conference presentations

The PhD Association of the Technical University of Denmark (External organisation)
Period: Nov 2016 → 2018
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: National

Related external organisation

The PhD Association of the Technical University of Denmark
c/o The Administration, The Technical University of Denmark, Building 101, Anker Engelunds Vej, 2800, Kongens Lyngby, Denmark
Activity: Membership › Board duties in companies, associations, or public organisations

ICES - Workshop on Fish Distribution Shifts - WKFISHDISH (External organisation)
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Workshop on Fish Distribution Shifts - WKFISHDISH
H. C. Andersens Boulevard 44-46, 1553, Copenhagen, Denmark
Activity: Membership › Membership of research networks or expert groups

Havet, Klima og Kulstof: hvordan hænger det sammen?.
Period: 5 Nov 2016
Colin Stedmon (Lecturer)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Related event

Dansk Laborant Forening årsmøde
05/11/2016 → ...
København, Denmark
Activity: Talks and presentations › Conference presentations

Effects of climate change on the pelagic food web with emphasis on the potential changes in the succession and composition of the marine pelagic food web
Period: 26 Sep 2016
Torkel Gissel Nielsen (Invited speaker)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Related event

European Marine Biology Symposium
26/09/2016 → 30/09/2016
Rhodes, Greece
Activity: Talks and presentations › Conference presentations

How to Incorporate Open Science in a Grant Proposal?: Open science: the tools for your research success
Period: 29 Jul 2016
Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat
Microplastic occurrence in marine coastal gobies and sticklebacks in the Inner Danish Coastal Waters

Period: Jun 2016 → Jun 2017

Elliot John Brown (Supervisor)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
Identifying the spatial abundance of microplastics and the difference between benthic feeding and pelagic feeding non-commercial fish species in the Inner Danish Coastal Waters.

Activity: Examinations and supervision › Supervisor activities

Winning Horizon2020 with Open Science: How to incorporate Open Science in competitive grant proposals

Period: 22 Jun 2016

Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat

Related event


20/06/2016 → 22/06/2016
Lulea, Sweden
Activity: Talks and presentations › Conference presentations

'Havet, Klima og Kulstof: hvordan hænger det sammen?.

Period: 28 Apr 2016

Colin Stedmon (Lecturer)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Related event

EGU2016 European Geosciences Union General Assembly 2016

Period: 17 Apr 2016 → 22 Apr 2016
Ivo Grigorov (Organizer)
National Institute of Aquatic Resources
Research Secretariat

Description
Session Co-Organiser of EOS21 Geoscience for Society: Knowledge transfer and collaborative research management, and ESSI3.6 Open Science goes Geo

Session Co-Organiser of
EOS21 Geoscience for Society: Knowledge transfer and collaborative research management, and ESSI3.6 Open Science goes Geo
Related event

EGU2016 European Geosciences Union General Assembly 2016: EOS21 Geoscience for Society: Knowledge transfer and collaborative research management
17/04/2016 → 22/04/2016
Vienna, Austria
Activity: Attending an event › Participating in or organising a conference

SciDataCon2016
Period: 18 Mar 2016 → 13 Sep 2016
Ivo Grigorov (Organizer)
National Institute of Aquatic Resources
Research Secretariat

Description
Program Committee Member

As part of International Data Week to be held on September 11-17, 2016 in Denver, Colorado, USA, SciDataCon 2016 will seek to advance the frontiers of data in research.

This means addressing a range of fundamental and urgent issues around the ‘Data Revolution’ and the recent data-driven transformation of research and the responses to these issues in the conduct of research.

Related event

SciDataCon2016: SciDataCon 2016 will seek to advance the frontiers of data in research.
Denver, United States
Activity: Attending an event › Participating in or organising a conference

Ocean Sciences Meeting 2016
Period: 26 Feb 2016
Urban Wünsch (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Description
Oral presentation

Ocean Sciences Meeting 2016
Links:
https://agu.confex.com/agu/os16/preliminaryview.cgi/Paper90933.html (Abstract)

Related event

Ocean Sciences Meeting 2016
21/02/2016 → 26/02/2016
New Orleans, United States
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Helsinki Commission - Baltic Marine Environment Protection Commission (External organisation)
Period: 2015 → 2018
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
HELCOM FISH-PRO II: Project for Baltic-wide assessment of coastal fish communities in support of an ecosystem-based management
Degree of recognition: International
Links:
http://www.helcom.fi/helcom-at-work/projects/fish-pro

Related external organisation
Helsinki Commission - Baltic Marine Environment Protection Commission
Finland
Activity: Membership › Membership of research networks or expert groups

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2015
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2015
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2015
Jørgen Dalskov (Participant)
National Institute of Aquatic Resources
Public Sector Consultancy

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2015
Marie Storr-Paulsen (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2015
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2015
Jesper Boje (Participant)
National Institute of Aquatic Resources
Arctic Section
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2015
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2015
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST (External organisation)
Period: 2015
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop for North Sea Stocks - WKNSEA (External organisation)
Period: 2015
Jakob Hemmer Hansen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources

Related external organisation
ICES - Benchmark Workshop for North Sea Stocks - WKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop for North Sea Stocks - WKNSEA (External organisation)
Period: 2015
Casper Willestofte Berg (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop for North Sea Stocks - WKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop for North Sea Stocks - WKNSEA (External organisation)
Period: 2015
Anders Nielsen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop for North Sea Stocks - WKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop for North Sea Stocks - WKNSEA (External organisation)
Period: 2015
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop for North Sea Stocks - WKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD (External organisation)
Period: 2015
Marie Storr-Paulsen (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD (External organisation)
Period: 2015
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD (External organisation)
Period: 2015
Karin Hüssy (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD (External organisation)
Period: 2015
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD (External organisation)
Period: 2015
Martin Wæver Pedersen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Cod Stocks - WKBALTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Plaice - WKPLE (External organisation)
Period: 2015
Jesper Boje (Chairman)
National Institute of Aquatic Resources
Arctic Section
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Plaice - WKPLE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Plaice - WKPLE (External organisation)
Period: 2015
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Plaice - WKPLE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Plaice - WKPLE (External organisation)
Period: 2015
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Plaice - WKPLE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benthos Ecology Working Group - BEWG (External organisation)
Period: 2015
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benthos Ecology Working Group - BEWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)

Period: 2015
Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2015
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2015
Karin Hüssy (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2015
Artur Palacz (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2015
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015
Artur Palacz (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015
Bastian Huwer (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation
ICES - International Bottom Trawl Survey Working Group - IBTSWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Joint GFCM/EIFAAC/ICES Working Group on Eels - WGEEL (External organisation)
Period: 2015
Michael Ingemann Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - Joint GFCM/EIFAAC/ICES Working Group on Eels - WGEEL
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Joint NAFO/ICES Pandalus Assessment Working Group - NIPAQ (External organisation)
Period: 2015
Ole Ritzau Eigaard (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Joint NAFO/ICES Pandalus Assessment Working Group - NIPAQ
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Data Needs for Assessments and Advice - PGDATA (External organisation)
Period: 2015
Marie Storr-Paulsen (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Planning Group on Data Needs for Assessments and Advice - PGDATA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Data Needs for Assessments and Advice - PGDATA (External organisation)
Period: 2015
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Planning Group on Data Needs for Assessments and Advice - PGDATA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group for International Pelagic Surveys / post cruise meeting - WGIPS-IESSNS (External organisation)
Period: 2015
Karl-Johan Stæhr (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group for International Pelagic Surveys / post cruise meeting - WGIPS-IESSNS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group for International Pelagic Surveys - WGIPS (External organisation)
Period: 2015
Karl-Johan Stæhr (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group for International Pelagic Surveys - WGIPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biodiversity Science - WGBIODIV (External organisation)
Period: 2015
Henrik Gislason (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on Biodiversity Science - WGBIODIV
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biological Parameters - WGBIOP (External organisation)
Period: 2015
Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Working Group on Biological Parameters - WGBIOP
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)
Period: 2015
Finn Larsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Bycatch of Protected Species - WGBYC
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Commercial Catches Sampling - WGCATCH (External organisation)
Period: 2015
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Commercial Catches Sampling - WGCATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Commercial Catches Sampling - WGCATCH (External organisation)
Period: 2015
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Working Group on Commercial Catches Sampling - WGCATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Elasmobranch Fishes - WGEF (External organisation)
Period: 2015
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Elasmobranch Fishes - WGEF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Fisheries Acoustics and Technology - WGFAST (External organisation)
Period: 2015
Karl-Johan Stæhr (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Fisheries Acoustics and Technology - WGFAST
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on Fishing Technology and Fish - WGFTFB (External organisation)
Period: 2015
Ludvig Ahm Krag (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group on Fishing Technology and Fish - WGFTFB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Fishing Technology and Fish - WGFTFB (External organisation)
Period: 2015
Rikke Frandsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group on Fishing Technology and Fish - WGFTFB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2015
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation
ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2015
Casper Willestofte Berg (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Related external organisation
ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Integrating Ecological and Economic Models - WGIMM (External organisation)
Period: 2015
J. Rasmus Nielsen (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group on Integrating Ecological and Economic Models - WGIMM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Integrating Surveys for the Ecosystem Approach - WGISUR (External organisation)
Period: 2015
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation

ICES - Working Group on Mackerel and Horse Mackerel Egg Surveys - WGMEGS (External organisation)
Period: 2015
Sigrun Jonasdottir (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International
Related external organisation

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2015
Kerstin Geitner (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation

ICES - Working Group on Marine Habitat Mapping - WGMHM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2015
Thomas Kirk Sørensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation

ICES - Working Group on Marine Habitat Mapping - WGMHM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2015
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Marine Habitat Mapping - WGMHM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on marine planning and coastal zone management - WGMPCZM (External organisation)
Period: 2015
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on marine planning and coastal zone management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH (External organisation)
Period: 2015
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH (External organisation)
Period: 2015
Lars O. Mortensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on North Atlantic Salmon - WGNAS (External organisation)
Period: 2015
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - Working Group on North Atlantic Salmon - WGNAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2015
Hans Jakob Olesen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2015
Christian Skov (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Spatial Fisheries Data - WGSFD (External organisation)
Period: 2015
Josefine Egekvist (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group on Spatial Fisheries Data - WGSFD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Spatial Fisheries Data - WGSFD (External organisation)
Period: 2015
Francois Bastardie (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Spatial Fisheries Data - WGSFD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2015
J. Rasmus Nielsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2015
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2015
Jordan P. Feekings (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2015
Anna Rindorf (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2015
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2015
Thomas Kirk Sørensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2015
Jordan P. Feekings (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2015
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)
Period: 2015
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)
Period: 2015 → 2018
Elliot John Brown (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Related external organisation

**ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Degree of recognition: International

Links:
http://ices.dk/community/groups/Pages/WGVHES.aspx

**ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)**

Period: 2015

Morten Vinther (Participant)

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Degree of recognition: International

Related external organisation

**ICES - Working Group on Widely Distributed Stocks - WGWIDE**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015

Mark Payne (Participant)

National Institute of Aquatic Resources

Centre for Ocean Life

Degree of recognition: International

Related external organisation

**ICES - Working Group on Widely Distributed Stocks - WGWIDE**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015

Karl-Johan Stæhr (Participant)

National Institute of Aquatic Resources

Section for Monitoring and Data

Degree of recognition: International

Related external organisation

**ICES - Workshop on evaluating current national acoustic abundance estimation methods for HERAS surveys - WKEVAL (External organisation)**

Period: 2015

Karl-Johan Stæhr (Participant)

National Institute of Aquatic Resources

Section for Monitoring and Data

Degree of recognition: International

Related external organisation

**ICES - Workshop on evaluating current national acoustic abundance estimation methods for HERAS surveys - WKEVAL**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Period: 2015

Karl-Johan Stæhr (Participant)

National Institute of Aquatic Resources

Section for Monitoring and Data

Degree of recognition: International

Related external organisation

**ICES - Workshop on guidance for the review of MSFD Decision Descriptor 4 - foodwebs II - WKGMSFDD4-II (External organisation)**

Period: 2015

Anna Rindorf (Chairman)

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Degree of recognition: International

Related external organisation

**ICES - Workshop on guidance for the review of MSFD Decision Descriptor 4 - foodwebs II - WKGMSFDD4-II**

Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Recent changes in stock conditions and spatial mixing on sustainability and economic viability of the fishery - The Danish Baltic cod fisheries
Period: 2015
Francois Bastardie (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Links:

Related event
ICES MYFISH Symposium: Targets and Limits for Long Term Fisheries Management
27/10/2015 → 30/11/2015
Athens, Greece
Activity: Talks and presentations › Conference presentations

RIO Research Idea & Outcomes (Journal)
Period: 1 Nov 2015 → …
Ivo Grigorov (Editor)
National Institute of Aquatic Resources
Research Secretariat

Description
The Research Ideas and Outcomes (RIO) journal publishes all outputs of the research cycle, including: project proposals, data, methods, workflows, software, project reports and research articles together on a single collaborative platform, with the most transparent, open and public peer-review process. Our scope encompasses all areas of academic research, including science, technology, humanities and the social sciences.

Subject Editor: Open Science in Marine Biota & Ecosystems; Oceanography; Marine & Freshwater ecology

Related journal
RIO Research Idea & Outcomes
Local database
Activity: Communication › Journal editor

International Workshop on Organic Matter Spectroscopy 2015
Period: 25 Sep 2015
Urban Wünsch (Speaker)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Description
aquaDOM – An open-source toolbox for determining apparent fluorescence quantum yields of dissolved organic matter

Related event
22/09/2015 → 25/09/2015
Sopot, Poland
Activity: Talks and presentations › Conference presentations

Populationsgenetiske undersøgelser af torsk fra Vestgrønland
Period: 24 Sep 2015
Ole Henriksen (Guest lecturer)
National Institute of Aquatic Resources
Section for Marine Living Resources
Related external organisation

Dansk Selskab for Marinbiologi (DSFMB)
København, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

TOL2015: Transatlantic Ocean Literacy in support of Galway Declaration
Period: 24 Sep 2015
Ivo Grigorov (Organizer)
National Institute of Aquatic Resources

Description
TOL2015 builds on previous TOL efforts, but with a more specific aim: draft recommendations on how Ocean Literacy can serve marine research projects for greater societal impact, and contribute to Blue Growth objectives (What is Blue Growth? A short, and a long version) through more effective knowledge exchange and engagement with non-academic stakeholders and the public.

The recommendations should assist transatlantic marine research consortia supporting the Galway Statement on Atlantic Ocean Cooperation to capitalize on citizen science, promote a science-literate citizenry, and increase public awareness on Societal Challenges issues (e.g., ocean health, responsible ocean stewardship, food security, climate mitigation).

Links:
http://www.conferencemanager.dk/TOL2015

Related event

TOL2015: Transatlantic Ocean Literacy in support of Galway Declaration: EU-US-Canada Workshop
24/09/2015 → 25/09/2015
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Environmental determinates of blue whiting (Micromesistius poutassou) spawning distributions
Period: 23 Sep 2015
Anna Katharina Miesner (Invited speaker)
National Institute of Aquatic Resources

Description
Presented at: ICES Annual Science Conference.
Theme Session: Basin-scale dynamics at lower trophic levels in the North Atlantic.

Documents:
AK Miesner 2015 ICES Presentation Abstract

Related event

ICES Annual Science Conference 2015
21/09/2015 → 25/09/2015
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

NOM 6 2015
Period: 9 Sep 2015
Urban Wünsch (Speaker)
National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography

Description
Oral presentation
Relationships between fluorescence spectra in the OpenFluor database, and similarities with the spectra of pure organic compounds

Related event

NOM 6 2015: 6th International Water Association (IWA) Specialist Conference on Natural Organic Matter in Water
07/09/2015 → 11/09/2015
Malmö, Sweden

EGU2015-12590 Open Science as a Knowledge Transfer strategy
Period: 17 Apr 2015
Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat

Description
Beyond providing basic understanding of how our Blue Planet functions, flows and breathes, the collection of Earth & Marine Research disciplines are of major service to most of today's Societal Challenges: from Food Security and Sustainable Resource Management, to Renewable Energies, Climate Mitigation & Ecosystem Services and Hazards. Natural Resources are a key commodity in the long-term strategy of the EU Innovation Union(1), and better understanding of the natural process governing them, as well as science-based management are seen as a key area for stimulating future economic growth. Such potential places responsibility on research project managers to devise innovative methods to ensure effective transfer of new research to public and private sector users, and society at large. Open Science is about removing all barriers to full sphere basic research knowledge and outputs, not just the publishable part of research but also the data, the software code, and failed experiments. The concept is central to EU's Responsible Research and Innovation philosophy(2), and removing barriers to basic research measurably contributes to the EU's Blue Growth Agenda(3). Despite the potential of the internet age to deliver on that promise, only 50% of today’s basic research is freely available(4). The talk will demonstrate how and why Open Science can be a first, passive but effective strategy for any research project to transfer knowledge to society by allowing access and discoverability to the full sphere of new knowledge, not just the published outputs. Apart from contributing to economic growth, Open Science can also optimize collaboration, within academia, assist with better engagement of citizen scientists into the research process and co-creation of solutions to societal challenges, as well as providing a solid ground for more sophisticated communication strategies and Ocean/Earth Literacy initiatives targeting policy makers and the public at large.

Degree of recognition: International

Related event

European Geosciences Union General Assembly 2015
12/04/2015 → 17/04/2015
Vienna, Austria

EGU2015-13698 Soft Skills for Hard Impact
Period: 16 Apr 2015
Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat

Description
Marine and Earth Science graduates will be under increasing pressure in future to delve into research questions of relevance to societal challenges. Even fundamental research focused on basic processes of the environment and universe will in the coming decade need to justify their societal impact. As the Research Excellence Frameworks (REF) for research evaluation shift more and more away from the classical Impact Factor and number of peer-reviewed publications to “societal impact”, the question remains whether the current graduates, and future researchers, are sufficiently prepared...
to deal with this reality. The essential compliment of skills beyond research excellence, rigor and method are traditionally described as “soft skills”. This includes how to formulate an argument, how to construct a scientific publication, how to communicate such publications to non-experts, place them in context of societal challenges and relevant policies, how to write a competitive proposal and “market” one’s research idea to build a research group around an interesting research topic. Such “soft skills” can produce very measurable and concrete impact for career development, but are rarely provided systematically and coherently by graduate schools in general. The presentation will focus on Open Science as a set of “soft skills”, and demonstrate why graduate schools should train Open Science competencies alongside research excellence by default. Open Science is about removing all barriers to research process and outputs, both published and unpublished, and directly supports transparency and reproducibility of the research process. Open Science as a set of news competencies can also foster unexpected collaborations, engage citizen scientists into co-creation of solutions to societal challenges, as well as use concepts of Open Science to transfer new knowledge to the knowledge-based private sector, and help them with formulating more competitive research proposals in future.

Documents:
EGU2015-13698-4 Soft Skills for Hard Impact
Links:

Related event
European Geosciences Union General Assembly 2015
12/04/2015 → 17/04/2015
Vienna, Austria
Activity: Talks and presentations › Conference presentations

EGU2015-13805 Open Science: a first step towards Science Communication
Period: 16 Apr 2015
Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat

Description
As Earth Science communicators gear up to adopt the new tools and captivating approaches to engage citizen scientists, budding entrepreneurs, policy makers and the public in general, researchers have the responsibility, and opportunity, to fully adopt Open Science principles and capitalize on its full societal impact and engagement. Open Science is about removing all barriers to basic research, whatever its formats, so that it can be freely used, re-used and re-hashed, thus fueling discourse and accelerating generation of innovative ideas. The concept is central to EU’s Responsible Research and Innovation philosophy, and removing barriers to basic research measurably contributes to engaging citizen scientists into the research process, it sets the scene for co-creation of solutions to societal challenges, and raises the general science literacy level of the public. Despite this potential, only 50% of today’s basic research is freely available. Open Science can be the first passive step of communicating marine research outside academia. Full and unrestricted access to our knowledge including data, software code and scientific publications is not just an eth- ical obligation, but also gives solid credibility to a more sophisticated communication strategy on engaging society. The presentation will demonstrate how Open Science perfectly compliments a coherent communication strategy for placing Marine Research in societal context, and how it underpin an effective integration of Ocean & Earth Literacy principles in standard educational, as well mobilizing citizen marine scientists, thus making marine science Open Science.

Documents:
EGU2015-13805 Open Science A First Step Towards Science Communication
Links:
National Institute of Aquatic Resources

Research Secretariat

Description
Session Co-Convenor for: SC26 Open Science goes Geo - Part IV: Winning Horizon 2020 with Open Science, and EOS9 Public Interest & Research Management - Earth Sciences for Society

Links:

Related event
European Geosciences Union General Assembly 2015
12/04/2015 → 17/04/2015
Vienna, Austria
Activity: Attending an event › Participating in or organising a conference

The PhD Association of the Technical University of Denmark (External organisation)
Period: Mar 2015 → Nov 2016
Elliot John Brown (Chairman)
Section for Ecosystem based Marine Management
National Institute of Aquatic Resources
Degree of recognition: National

Related external organisation
The PhD Association of the Technical University of Denmark
c/o The Administration, The Technical University of Denmark, Building 101, Anker Engelunds Vej, 2800, Kongens Lyngby, Denmark
Activity: Membership › Board duties in companies, associations, or public organisations

18. Danske Havforskermøde
Period: 30 Jan 2015
Mads Christoffersen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
Kystnære stenrev - en oversigt over deres historiske skæbne, nuværende status og biologiske betydning

Claus Stenberg, Karsten Dahl, Zyad Al Hamdani, Flemming Mahlenberg, Cordula B. Göke, Josianne Støttrup

Related event
18. Danske Havforskermøde
28/01/2015 → 30/01/2015
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

Hvad kan man lære af et mesocosm eksperiment i et baglokale på Den Blå Planet
Period: 29 Jan 2015
Mads Christoffersen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Hvad kan man lære af et mesocosm eksperiment i et baglokale på Den Blå Planet

Mikael Van Deurs, Claus Stenberg, Patrizio Mariani, Christian Mohn, Mads Christoffersen, Josianne Støttrup, Peter Gravlund, Pia Haackly, Flemming T. Hansen, Henrik Baktoft, Xerxes Mandiviwalla

Related event

Hvad kan man lære af et mesocosm eksperiment i et baglokale på Den Blå Planet
29/01/2015 → …
Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Relativ forekomst af fiskesamfund i en dansk fjord – speciel fokus på sortmundet kutling (Neogobius melanostomus)

Period: 28 Jan 2015

Mads Christoffersen (Lecturer)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description

Related event

18. Dansk Havforskermøde
28/01/2015 → 30/01/2015
København, Denmark
Activity: Talks and presentations › Conference presentations

Åleekspeditonen 2014

Period: 2014

Torkel Gissel Nielsen (Lecturer)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Related event

Dansk Selskab for Marinbiologi, Fyraftensmøde
19/06/2014 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT (External organisation)

Period: 2014

Margit Eero (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT (External organisation)
Period: 2014
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT (External organisation)
Period: 2014
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - A Benchmark Workshop on Baltic Flatfish Stocks - WKBALFLAT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2014
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2014
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Lotte Worsøe Clausen (Participant)  
National Institute of Aquatic Resources  
Section for Marine Living Resources  
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Marie Storr-Paulsen (Chairman)  
National Institute of Aquatic Resources  
Section for Monitoring and Data  
Degree of recognition: International

Related external organisation
ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Margit Eero (Participant)  
National Institute of Aquatic Resources  
Section for Ecosystem based Marine Management  
Degree of recognition: International

Related external organisation
ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Henrik Degel (Participant)  
National Institute of Aquatic Resources  
Section for Monitoring and Data  
Degree of recognition: International

Related external organisation
ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Jesper Boje (Participant)  
National Institute of Aquatic Resources  
Arctic Section
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2014
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST (External organisation)
Period: 2014
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation

ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2014
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2014
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Data Compilation for Benchmark Workshop on North Sea stocks - DCWKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Jakob Hemmer Hansen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Data Compilation for Benchmark Workshop on North Sea stocks - DCWKNSEA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Casper Willestofte Berg (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62°N - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62°N - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2014
Mikael van Deurs (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2014
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2014
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB (External organisation)
Period: 2014
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB (External organisation)
Period: 2014
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - International Bottom Trawl Survey Working Group - IBTSWG (External organisation)
Period: 2014
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - International Bottom Trawl Survey Working Group - IBTSWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - International Bottom Trawl Survey Working Group - IBTSWG (External organisation)
Period: 2014
Bastian Huwer (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - International Bottom Trawl Survey Working Group - IBTSWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Joint ICES-MYFISH Workshop to consider the basis for Fmsy ranges for all stocks - WKMSYREF3 (External organisation)
Period: 2014
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Joint ICES-MYFISH Workshop to consider the basis for Fmsy ranges for all stocks - WKMSYREF3
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Joint ICES-MYFISH Workshop to consider the basis for Fmsy ranges for all stocks - WKMSYREF3 (External organisation)
Period: 2014
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Joint ICES-MYFISH Workshop to consider the basis for Fmsy ranges for all stocks - WKMSYREF3
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - North Western Working Group - NWWG (External organisation)
Period: 2014
Jesper Boje (Participant)
National Institute of Aquatic Resources
Arctic Section
Degree of recognition: International

Related external organisation

ICES - North Western Working Group - NWWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2014
Jørgen Dalskov (Participant)
National Institute of Aquatic Resources
Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2014
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2014
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The ACOM Workshop to develop recommendations for potentially useful Food Web Indicators - WKFOOWI (External organisation)
Period: 2014
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - The ACOM Workshop to develop recommendations for potentially useful Food Web Indicators - WKFOOWI
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The ACOM Workshop to develop recommendations for potentially useful Food Web Indicators - WKFOOWI (External organisation)
Period: 2014
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - The ACOM Workshop to develop recommendations for potentially useful Food Web Indicators - WKFOOWI
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Data and Information Group - DIG (External organisation)
Period: 2014
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - The Data and Information Group - DIG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Joint NAFO/ICES Pandalus Assessment Working Group - NIPAQ (External organisation)
Period: 2014
Ole Ritzau Eigaard (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - The Joint NAFO/ICES Pandalus Assessment Working Group - NIPAQ
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Steering Committee for the Regional Database FishFrame - SC-RDB (External organisation)
Period: 2014
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - The Steering Committee for the Regional Database FishFrame - SC-RDB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Steering Committee for the Regional Database FishFrame - SC-RDB (External organisation)
Period: 2014
Jørgen Dalskov (Participant)
National Institute of Aquatic Resources
Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - The Steering Committee for the Regional Database FishFrame - SC-RDB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - The Working Group on Commercial Catches - WGCATCH (External organisation)
Period: 2014
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation
ICES - The Working Group on Commercial Catches - WGCATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Working Group on Commercial Catches - WGCATCH (External organisation)
Period: 2014
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation
ICES - The Working Group on Commercial Catches - WGCATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Working Group on Commercial Catches - WGCATCH (External organisation)
Period: 2014 → …
Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation
ICES - The Working Group on Commercial Catches - WGCATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2014
Hans Jakob Olesen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation
ICES - The Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2014
Christian Skov (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation

ICES - The Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA (External organisation)
Period: 2014
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA (External organisation)
Period: 2014
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA (External organisation)
Period: 2014
Karin Hüssy (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA (External organisation)
Period: 2014
Jane Behrens (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - The Workshop on Scoping for Integrated Baltic Cod Assessment - WKSIBCA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - The Workshop to draft recommendations for the assessment of Descriptor D3 - WKD3R (External organisation)
Period: 2014
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - The Workshop to draft recommendations for the assessment of Descriptor D3 - WKD3R
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2014
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Application of Genetics in Fisheries and Mariculture - WGAGFM (External organisation)
Period: 2014
Dorte Bekkevold (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International
Related external organisation
ICES - Working Group on Application of Genetics in Fisheries and Mariculture - WGAGFM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biodiversity Science - WGBIODIV (External organisation)
Period: 2014
Henrik Gislason (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group on Biodiversity Science - WGBIODIV
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)
Period: 2014
Finn Larsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation
ICES - Working Group on Bycatch of Protected Species - WGBYC
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Elasmobranch Fishes - WGEF (External organisation)
Period: 2014
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Related external organisation

ICES - Working Group on Elasmobranch Fishes - WGEF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2014
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2014
Casper Willestofte Berg (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International
Related external organisation

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Integrating Surveys for the Ecosystem Approach - WGISUR (External organisation)
Period: 2014
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International
Related external organisation

ICES - Working Group on Integrating Surveys for the Ecosystem Approach - WGISUR
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2014
Kerstin Geitner (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data

Related external organisation

ICES - Working Group on Marine Habitat Mapping - WGMHM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Pelagic Surveys - WGIPS (External organisation)
Period: 2014
Karl-Johan Stæhr (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Pelagic Surveys - WGIPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recruitment Forecasting in a Variable Environment - WGRFE (External organisation)
Period: 2014
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Working Group on Recruitment Forecasting in a Variable Environment - WGRFE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recruitment Forecasting in a Variable Environment - WGRFE (External organisation)
Period: 2014
Karin Hüssy (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Working Group on Recruitment Forecasting in a Variable Environment - WGRFE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Spatial Fisheries Data - WGSFD (External organisation)
Period: 2014
Josefine Egekvist (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Spatial Fisheries Data - WGSFD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2014
J. Rasmus Nielsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2014 → …
Anna Rindorf (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Henrik Gislason (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2014
Thomas Kirk Sørensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2014
Nis Sand Jacobsen (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
Period: 2014
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Widely Distributed Stocks - WGWIDE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
Period: 2014
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation

ICES - Working Group on Widely Distributed Stocks - WGWIDE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
ICES - Workshop on Integrated DATRAS Products - WKIDP (External organisation)
Period: 2014
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Workshop on Integrated DATRAS Products - WKIDP
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Integrated DATRAS Products - WKIDP (External organisation)
Period: 2014
Casper Willestofte Berg (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Workshop on Integrated DATRAS Products - WKIDP
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Integrated DATRAS Products - WKIDP (External organisation)
Period: 2014
Kasper Kristensen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Workshop on Statistical Analysis of Biological Calibration Studies - WKSABCAL (External organisation)
Period: 2014
Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Workshop on Statistical Analysis of Biological Calibration Studies - WKSABCAL
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Statistical Analysis of Biological Calibration Studies - WKSABCAL (External organisation)
Period: 2014
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Workshop on Statistical Analysis of Biological Calibration Studies - WKSABCAL
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on the identification of clupeoid larvae - WKIDCLUP (External organisation)
Period: 2014
Bastian Huwer (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation

ICES - Workshop on the identification of clupeoid larvae - WKIDCLUP
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop to consider reference points for all stocks - WKMSYREF (External organisation)
Period: 2014
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Workshop to consider reference points for all stocks - WKMSYREF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop to consider reference points for all stocks - WKMSYREF (External organisation)
Period: 2014
Mikael van Deurs (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Workshop to consider reference points for all stocks - WKMSYREF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop to consider reference points for all stocks - WKMSYREF (External organisation)
Period: 2014
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Workshop to consider reference points for all stocks - WKMSYREF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop to consider reference points for all stocks - WKMSYREF (External organisation)
Period: 2014
Jesper Boje (Participant)
National Institute of Aquatic Resources
Arctic Section
Degree of recognition: International

Related external organisation
ICES - Workshop to consider reference points for all stocks - WKMSYREF
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Muslingeudvalget (External organisation)
Period: 2014
Jens Kjerulf Petersen (Participant)
National Institute of Aquatic Resources
Danish Shellfish Centre

Related external organisation
Muslingeudvalget
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Når livet går i fisk
Period: 18 Nov 2014
Mads Christoffersen (Lecturer)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Description
Fordrag for foreningen "Fiskehjælpen" i Lyngby/Taarbæk

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Introduction to DTU, Polar DTU and climate impact on the arctic marine food web
Period: 10 Nov 2014
Torkel Gissel Nielsen (Speaker)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Related event
Joint Seminar on Polar Research : Ministry of Earth Sciences, The Royal Danish Embassy in India
10/11/2014 → …
New Delhi, India
Activity: Talks and presentations › Conference presentations

Examining the interactions of growth, climate and recruitment of boarfish (Capros aper) for a better understanding of the recent population expansion
Period: 21 Oct 2014
Julie Olivia Davies (Speaker)
National Institute of Aquatic Resources
Section for Monitoring and Data
Description
Symposium abstract
Oral presentation
Examining the interactions of growth, climate and recruitment of boarfish (Capros aper) for a better understanding of the recent population expansion

**Related event**

5th International Otolith Symposium
20/10/2014 → 24/10/2014
Mallorca, Spain
Activity: Talks and presentations › Conference presentations

2nd International Workshop on the Swimming Physiology of Fish
Period: 9 Oct 2014
Kim Aarestrup (Invited speaker)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology

Description
Track'n field…the challenge of following migrating fishes

Invited Keynote in FITFISH Workshop
Links:
http://2ndfitfishworkshop2014.wordpress.com/program/

**Related event**

2nd International Workshop on the Swimming Physiology of Fish
09/10/2014 → 10/10/2014
Barcelona, Spain
Activity: Talks and presentations › Conference presentations

Nøglefiskermøde
Period: 27 Sep 2014
Mads Christoffersen (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
Præsentation af Marin Fiskepleje, hvem og hvad er Marin Fiskepleje og hvilke projekter beskæftiger vi os med.

**Related event**

Nøglefiskermøde
27/09/2014 → …
Fjeldsted, Denmark
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

Foreløbige resultater fra Dansk Åleekspedition 2014: "Plankton fødekæden i ålens vugge": Dansk Naturhistorisk Forening
Period: 11 Sep 2014
Torkel Gissel Nielsen (Lecturer)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Description
Sargassohavet, der ligger 6.000 km fra Danmark mellem Bermuda og De Vestindiske Øer, er gydeområde for vores hjemlige ål. Ålen er gået voldsomt tilbage i Europa og Dansk Åleekspedition 2014 har på en to måneders ekspedition med Danmarks største havforskningsskib, Dana, blandt andet søgt svar på, hvilken rolle klimabetingede ændringer i ålens
gydeområder kan spille for ålens nedgang. Der har deltaget 33 danske og internationale eksperter på togtet, som var ledet af DTU Aqua og blev finansieret af Dansk Center for Havforskning og Carlsbergfondet.

Ålen er på mange måder lidt af et mysterium: Hvorfor vælger ålen at svømme helt til det sydlige Sargassohav for at gyde? Hvad er det for særlige forhold, der giver larver en god start på livet her - og hvilke havstrømme bringer larverne til Europa og sikrer en fornyelse af ålebestanden? Tilgangen af åle-yngel er gået voldsomt tilbage de seneste 30 år, og spørger målet er, om der er sket ændringer i larvernes overlevelsesmuligheder i Sargassohavet eller på deres vej mod Europa, som kan have bidraget til nedgangen? Via undersøgelser på 72 forskellige lokaliteter i et område på over 2000 kilometers bredde har ekspeditionen kortlagt de små ålelarvers forkomst i Sargassohavet og beskrevet sammenhængen til vandets temperatur, saltholdighed og sammensætningen af plankton.

Blandt de mange prøver, som ekspeditionen har haft med hjem, er ålelarver og geleplankton, som gopler og halesapunge, som man ud fra tidligere undersøgelser i området har en teori om kan være ålelarvernes diet. Geleplankton er vanskelige at indsamle, fordi de nemt går i stykker i nettene og desuden er svære at konservere. Men vi har haft held med at indsamle geleplankton i netop det område, hvor vi også fandt de yngste ålelarver. Ved at matche DNA-undersøgelser af gele-planktonet med DNA-analyser af indholdet i ålelarvernes maver håber vi endelig at få svar på, hvad de tidlige ålelarver lever af. Det er viden med store perspektiver, fordi manglende viden om nyklækkede ålelarvers kost bremser forsøg på at opdrætte ål i akvakultur. Foredraget vil beskrive Sargassohavets økologi som baggrund for en diskussion af vækstforholdene for de yngste ålelarver.

**Related external organisation**

**Unknown external organisation**
*Activity: Talks and presentations › Conference presentations*

**Den Sortmundede kutling**
*Period: 8 Sep 2014*
*Mads Christoffersen (Speaker)*

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

**Related external organisation**

**Bornholms Gymnasium**
*Rønne, Denmark*
*Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities*

Relative abundance of Round Goby in a brackish Danish Fjord
*Period: 4 Sep 2014*
*Mads Christoffersen (Lecturer)*

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Documents:
*Mads Christoffersen Relative abundance of Round Goby in a brackish Fjord*

**Related event**

**Round goby – need for collaborative science and management in Nordic and Baltic countries**
*04/09/2014 → 05/09/2014*  
Charlottenlund, Denmark
*Activity: Talks and presentations › Conference presentations*

Effekter af klima og olie på havet i arktis
*Period: 2 Sep 2014*
*Torkel Gissel Nielsen (Invited speaker)*

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

**Description**
Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

10th International Conference on Recirculating Aquaculture
Paulo Fernandes (Speaker)
National Institute of Aquatic Resources
Section for Aquaculture
Documents:
Biofilter mode of operation effects on water quality in Recirculating Aquaculture Systems

Related event

10th International Conference on Recirculating Aquaculture
22/08/2014 → 24/08/2014
Roanoke, VA, United States
Activity: Talks and presentations › Conference presentations

Single-sludge denitrification in recirculating aquaculture systems: Effects of pre-fermentation and pH
Karin Isabel Suhr (Invited speaker)
National Institute of Aquatic Resources
Section for Aquaculture

Related event

Annual International Meeting of the American Society of Agricultural and Biological Engineers Joint with the Canadian Society of Biological Engineers
13/07/2014 → 16/08/2014
Canada
Activity: Talks and presentations › Conference presentations

Supporting bio-economic evaluation of spatial planning constraining fishing activities: be quantitative, spatially explicit, vessel-oriented, stochastic, and dynamically coupled to fish
Period: 10 Jul 2014
Francois Bastardie (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
Oral presentation at IIFET 2014, Brisbane, Australia

Related event

International Institute of Fisheries Economics and Trade Conference 2014
07/07/2014 → 11/07/2014
Brisbane, Australia
Activity: Talks and presentations › Conference presentations

Euroscience Open Forum 2014
Period: 21 Jun 2014 → 26 Jun 2014
Ivo Grigorov (Organizer)
National Institute of Aquatic Resources
Research Secretariat
Technical Information Center of Denmark
Department of Management Engineering

Description
We are on the verge of a paradigm shift in the way new knowledge is shared. The internet allows for complete openness for research, innovation and personal and government information. Openness to resources from academia, government and industry changes the playing field for citizens, scientists, inventors and industry allowing all to participate in innovation and value creation, regardless of geography and background. This session explores the balance between benefits and concerns in relation to openness to knowledge and data. It showcases the current impact potential of Open Science and Open Innovation, while considering intellectual property, the right for commercial exploitation of innovative concepts, and not least, the need for privacy legislation preventing misuse of personal data. The session is an experiment to eliminate the boundaries between research, innovation and social science, and explore the effects of an Open Attitude, based on the understanding that there is an inevitable paradigm shift across them all. The interactive session provides exposure to a multidisciplinary audience, that is appealing not only across scientific disciplines but also for citizens, industry and policy makers. Some of the questions to instigate the discussion include “Why should I care about openness?”, “Does Open Science create more impact?”, “Does intellectual property enable or hinder progress?”, “Does openness pose risks for privacy and patients?”.

ESOF2014 Session: Open Science, Benefiting Progress, or a Concern for Privacy?

Links:
http://www.esof2014.org

Related event

Euroscience Open Forum 2014
21/06/2014 → 26/06/2014
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising a conference

How spatial planning constrains transnational fisheries: the bio-economic DISPLACE evaluation on the Baltic Sea
Period: 17 Jun 2014 → 18 Jun 2014
Francois Bastardie (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Links:

Related event

Baltic MSP Forum
17/06/2014 → 18/06/2014
Riga, Latvia
Activity: Talks and presentations › Conference presentations

Particulate matter and solids removal in Recirculating Aquaculture Systems
Paulo Fernandes (Lecturer)
National Institute of Aquatic Resources
Section for Aquaculture

Description
Course lecturer

Related organisation

Particulate matter and solids removal in Recirculating Aquaculture Systems
Fernandes, P. (Lecturer)
Apr 2014 → May 2015
Activity: Other

**Nitrogen removal in RAS farms for Baltic Sea coastal farming**
Period: 5 Feb 2014 → 6 Feb 2014
Karin Isabel Suhr (Speaker)
National Institute of Aquatic Resources
Section for Aquaculture
Documents:
aquabest_18_2014_report

**Related event**
Nitrogen removal in RAS farms for Baltic Sea coastal farming: Sustainable aquaculture in the Baltic Sea Region - boosting regional development while limiting environmental effects
05/02/2014 → 06/02/2014
Mariehamn, Åland Islands, Denmark
Activity: Talks and presentations › Conference presentations

**Recirculation Technology for Future Aquaculture (REFA) seminar**
Period: 14 Jan 2014 → 15 Jan 2014
Paulo Fernandes (Participant)
National Institute of Aquatic Resources
Section for Aquaculture

**Related event**
Recirculation Technology for Future Aquaculture (REFA) seminar
14/01/2014 → 15/01/2014
Fredericia, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**ASLO 2013 Aquatic Sciences Meeting**
Period: 2013 → …
Mie Hylstofte Sichlau (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life

**Related event**
ASLO 2013 Aquatic Sciences Meeting: Learning for the future
17/02/2013 → 22/02/2013
New Orleans, United States
Activity: Attending an event › Participating in or organising a conference

**ASLO 2013 Aquatic Sciences Meeting**
Period: 2013 → …
Mie Hylstofte Sichlau (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life

**Related event**
ASLO 2013 Aquatic Sciences Meeting: Learning for the future
17/02/2013 → 22/02/2013
New Orleans, United States
Activity: Attending an event › Participating in or organising a conference

ICES - Advice Drafting Group on Icelandic Capelin - ADGICAP (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Advice Drafting Group on Icelandic Capelin - ADGICAP
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Advice drafting group on Vulnerable Marine Habitats Committee - ADGVME (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Advice drafting group on Vulnerable Marine Habitats Committee - ADGVME
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES – Advisory Committee - ACOM (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES – Advisory Committee - ACOM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2013 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Arctic and North-Western Advice Drafting Group Committee - ADGANW (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Arctic and North-Western Advice Drafting Group Committee - ADGANW
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2013 → …
Marie Storr-Paulsen (Chairman)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST (External organisation)
Period: 2013 → …
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation

ICES - Baltic Salmon and Trout Assessment Working Group - WGBAST
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Baltic Multispecies Assessments - WKBALT (External organisation)
Period: 2013 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Baltic Multispecies Assessments - WKBALT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Benchmark Workshop on Greenland Halibut Stocks - WKBUT (External organisation)
Period: 2013 → …
Jesper Boje (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop on Greenland Halibut Stocks - WKBUT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Nephrops Stocks - WKNEPH (External organisation)
Period: 2013 → …
Jordan P. Feekings (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop on Nephrops Stocks - WKNEPH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2013 → …
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2013 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Benchmark Workshop on Sprat Stocks - WKSPRAT (External organisation)
Period: 2013 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Benchmark Workshop on Sprat Stocks - WKSPRAT
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Data and Information Group - DIG (External organisation)
Period: 2013 → …
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Data and Information Group - DIG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2013 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2013 → …
Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2013 → …
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - International Bottom Trawl Survey Working Group - IBTSWG (External organisation)
Period: 2013 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - International Bottom Trawl Survey Working Group - IBTSWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - North Western Working Group - NWWG (External organisation)
Period: 2013 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - North Western Working Group - NWWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2013
Jørgen Dalskov (Participant)
Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2013 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Board duties in companies, associations, or public organisations

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS (External organisation)
Period: 2013 → …
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2013 → …
Thomas Kirk Sørensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Application of Genetics in Fisheries and Mariculture - WGAGFM (External organisation)
Period: 2013 → …
Dorte Bekkevold (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation

ICES - Working Group on Application of Genetics in Fisheries and Mariculture - WGAGFM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)
Period: 2013 → …
Finn Larsen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on Bycatch of Protected Species - WGBYC
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2013 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2013 → …
Kerstin Geitner (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group on Marine Habitat Mapping - WGMHM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Habitat Mapping - WGMHM (External organisation)
Period: 2013 → …
Thomas Kirk Sørensen (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on Multispecies Assessment Methods - WGSAM (External organisation)

ICES - Working Group on Multispecies Assessment Methods - WGSAM (External organisation)
Period: 2013 → …
Anna Rindorf (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on Nephrops Surveys - WGNEPS (External organisation)

ICES - Working Group on Nephrops Surveys - WGNEPS
Period: 2013 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation
ICES - Working Group on Nephrops Surveys - WGNEPS (External organisation)

ICES - Working Group on Nephrops Surveys - WGNEPS (External organisation)
Period: 2013 → …
Jordan P. Feekings (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on Nephrops Surveys - WGNEPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2013 → …
Hans Jakob Olesen (Participant)
National Institute of Aquatic Resources
Section for Monitoring and Data
Degree of recognition: International

Related external organisation

ICES - Working Group on Spatial Fisheries Data - WGSFD (External organisation)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2013 → …
Jordan P. Feekings (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2013 → …
Clara Ulrich (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2013 → …
Clara Ulrich (Chairman)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2013 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
Period: 2013 → …
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International

Related external organisation
ICES - Working Group on Widely Distributed Stocks - WGWIDE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop of National Age Readings Coordinators - WKNARC2 (External organisation)
Period: 2013 → …
Lotte Worsøe Clausen (Chairman)
National Institute of Aquatic Resources
Section for Marine Living Resources
Degree of recognition: International

Related external organisation
ICES - Workshop of National Age Readings Coordinators - WKNARC2
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on age validation studies of Gadoids - WKAVSG (External organisation)
Period: 2013 → …
Karin Hüssy (Chairman)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Degree of recognition: International

Related external organisation
ICES - Workshop on age validation studies of Gadoids - WKAVSG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Workshop on Global Assessment of the Implications of Climate Change on the Spatial Distribution of Fish and Fisheries - WKSICCME-Spatial (External organisation)
Period: 2013 → …
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International
Related external organisation

ICES - Workshop on Global Assessment of the Implications of Climate Change on the Spatial Distribution of Fish and Fisheries - WKSICCME-Spatial
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Northeast Atlantic mackerel monitoring and methodologies including science and industry involvement - WKNAMMM (External organisation)
Period: 2013 → …
Mark Payne (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Degree of recognition: International
Related external organisation

ICES - Workshop on Northeast Atlantic mackerel monitoring and methodologies including science and industry involvement - WKNAMMM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on sea trout - WKTRUTTA (External organisation)
Period: 2013 → …
Stig Pedersen (Chairman)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Related external organisation

ICES - Workshop on sea trout - WKTRUTTA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and Hake - WKMSGAD (External organisation)
Period: 2013 → …
Maria Krüger-Johnsen (Participant)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Related external organisation

ICES - Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and Hake - WKMSGAD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Et arktis i problemer
Period: 21 Nov 2013
Torkel Gissel Nielsen (Lecturer)
National Institute of Aquatic Resources
Centre for Ocean Life
Links:
http://snm.ku.dk/dnf/foredrag/2013-efteraar/et-arktis-i-problemer/ (Link to abstract)

Related event

Foredrag i Naturhistorisk Forening
21/11/2013 → …
København, Denmark
Activity: Talks and presentations › Conference presentations

Galathea - 3
Period: 19 Nov 2013
Torkel Gissel Nielsen (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life
Description
Dansk Militærmedicinsk Selskab (DMMS)

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Danish Fish Immunology Research Network (DAFINET) workshop
Period: 12 Nov 2013 → 14 Nov 2013
Morten Sichlau Bruun (Participant)
National Veterinary Institute
Section for Virology
National Institute of Aquatic Resources
Description
DAFINET Workshop, Fish Immunology: From Egg to Adult Fish

Related event

Danish Fish Immunology Research Network (DAFINET) workshop: Fish Immunology: From Egg to Adult Fish
12/11/2013 → 14/11/2013
Frederiksberg, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Tang og multitrofisk produktion
Period: 6 Nov 2013
Susan Løvstad Holdt (Invited speaker)
National Institute of Aquatic Resources
Department of Environmental Engineering
National Food Institute
Residual Resource Engineering

Related event

ATV Temamøde Marin akvakultur: Perspektiver og potentiøler
06/11/2013 → 06/11/2013
Kgs. Lyngby, Denmark
40th CIESM Mediterranean Science Commission Congress: Mediterranean Science Commission, Annual Congress
Period: 31 Oct 2013
Ivo Grigorov (Invited speaker)
National Institute of Aquatic Resources

Description
Access to all aspects of research is a key objective to the EU’s Digital Agenda and Horizon 2020 Framework Program. National funders are also increasingly requesting that research provides full access for society to research data, publications, and that scientist engage more the general public, especially within disciplines of relevance to societal challenges like ours.

The digital age is transforming scientific publishing, and also provides a number of means and methods that can serve the Marine Research community to become a leading example in Open Science (OS) practices. OS not only directly feeds into the need for high Research Assessment Exercise (RAE) score for individual authors, but also can help replacing the current "publish or perish" reality with a "share to flourish" attitude. As result authors can continue to produce high impact research, while engage citizen scientists, and ultimately fewer publications that are better understood, more used and highly cited.

Implementation support of OS for Marine Research will be provided by FP7 FOSTER (www.fosteropenscience.eu) in 2014-2015

Links:
http://www.ciesm.org/marine/congresses/podcasts.html (Podcasts of Keynotes at the CIESM 40th Congress)

Related event
40th CIESM Mediterranean Science Commission Congress
28/10/2013 → 01/11/2013
Marseille, France
Activity: Talks and presentations › Conference presentations

2nd NordicRAS workshop
Period: 10 Oct 2013 → 11 Oct 2013
Paulo Fernandes (Speaker)
Section for Aquaculture

Documents:
Mesh size effect on general water quality parameters in replicated recirculating aquaculture systems

Related event
2nd NordicRAS workshop
10/10/2013 → 11/10/2013
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

Facilitating Open Science through e-Infrastructure & Advocacy: the Marine Research Users Experience
Period: 10 Oct 2013
Ivo Grigorov (Invited speaker)
National Institute of Aquatic Resources

Description
Invited speach in Session: User Engagement in Data Infrastructures
Chair: Hilary Hanahoe, Trust-IT Srl, Italy
Related event

*e-Challenges 2013 Conference*
09/10/2013 → 11/10/2013
Dublin, Ireland
Activity: Talks and presentations › Conference presentations

**Microparticles in Recirculating Aquaculture Systems**
Period: 6 Oct 2013
Paulo Fernandes (Invited speaker)
Section for Aquaculture
National Institute of Aquatic Resources

Related external organisation

**Unknown external organisation**
Activity: Talks and presentations › Conference presentations

**Dyreforsøgstilsynets mini-seminar**
Period: 24 Sep 2013
Morten Sichlau Bruun (Participant)
National Veterinary Institute
Section for Virology
National Institute of Aquatic Resources

Related event

**Dyreforsøgstilsynets mini-seminar: Vurdering af belastning af forsøgsdyr**
24/09/2013 → 24/09/2013
Bagsværd, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

**Innovations konference**
Period: 12 Sep 2013
Susan Løvstad Holdt (Invited speaker)
National Institute of Aquatic Resources
Department of Environmental Engineering
National Food Institute
Residual Resource Engineering

Description
Presented: Tang som ressource - mulighed for udvikling og produktion af ingredienser.

Fødevareingredienser - et dansk væksteventyr
Sundhed, Fødevareforsyning, Bæredygtighed, Fødevaresikkerhed

Related event

**Innovations konference: Fødevareingredienser- et dansk væksteventyr**
12/09/2013 → 12/09/2013
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

**16th International Conference on Diseases of Fish and Shellfish**
Period: 2 Sep 2013 → 6 Sep 2013
Morten Sichlau Bruun (Participant)
National Veterinary Institute
Section for Virology
National Institute of Aquatic Resources

Description
16th International Conference on Diseases of Fish and Shellfish.

Related event
16th International Conference on Diseases of Fish and Shellfish
02/09/2013 → 06/09/2013
Tampere, Finland
Activity: Attending an event › Participating in or organising a conference

Nordic-Baltic IHSS Symposium
Period: 10 Jun 2013 → 12 Jun 2013
Colin Stedmon (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

Description
Coupling the UV-visible spectroscopic properties of dissolved organic matter to its chemical characteristics: Evidence across contrasting environments

Related event
Nordic-Baltic IHSS Symposium
10/06/2013 → 12/06/2013
Uppsala, Sweden
Activity: Talks and presentations › Conference presentations

Dyreforsøgstilsynets mini-seminar om fisk som forsøgsdyr
Period: 4 Jun 2013
Morten Sichlau Bruun (Participant)
National Veterinary Institute
Section for Virology
National Institute of Aquatic Resources

Description
Dyreforsøgstilsynets mini-seminar om fisk som forsøgsdyr

Related event
Dyreforsøgstilsynets mini-seminar om fisk som forsøgsdyr
04/06/2013 → 04/06/2013
Kastrup, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

37th Annual Larval Fish Conference
Period: 2 Jun 2013 → 6 Jun 2013
Evandro Malanski (Participant)
National Institute of Aquatic Resources
Centre for Ocean Life
Links:
http://www.rsmas.miami.edu/LFC2013/

Related event
37th Annual Larval Fish Conference
02/06/2013 → 06/06/2013
Miami, United States
Activity: Attending an event › Participating in or organising a conference

17th Annual Workshop of the National Reference Laboratories for Fish Diseases
Period: 29 May 2013 → 30 May 2013
Morten Sichlau Bruun (Participant)
National Veterinary Institute
Section for Virology
National Institute of Aquatic Resources

Description
17th Annual Workshop of the National Reference Laboratories for Fish Diseases.

Related event
17th Annual Workshop of the National Reference Laboratories for Fish Diseases
29/05/2013 → 30/05/2013
Copenhagen, Denmark
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Sizing solids and microparticles in Recirculating Aquaculture Systems
Period: Apr 2013 → May 2015
Paulo Fernandes (Lecturer)
National Institute of Aquatic Resources
Section for Aquaculture

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Effekter af olie på den Arktiske marine fødkæde
Period: 16 Apr 2013
Torkel Gissel Nielsen (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

Description
SAFT - Selskabet for Arktisk Forskning og Teknologi

Related external organisation
Unknown external organisation
Activity: Talks and presentations › Conference presentations

Gordon Research Conference: Polar Marine Science
Period: 11 Mar 2013
Colin Stedmon (Invited speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

Description
Conservative and non conservative behavior of DOM in polar environments: insight into macro and micro scale processes

Related event
Gordon Research Conference: Polar Marine Science: Linking Polar Observations, Processes and Models at Regional and Global Scales
10/03/2013 → 15/03/2013
Ventura, United States
Activity: Talks and presentations › Conference presentations

ASLO 2013 Aquatic Sciences Meeting
Period: 22 Feb 2013
Mette Dalgaard Agersted (Speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

Description
Krill - not a fussy eater

Related event
ASLO 2013 Aquatic Sciences Meeting: Learning for the future
17/02/2013 → 22/02/2013
New Orleans, United States
Activity: Talks and presentations › Conference presentations

17. Danske havforskermøde
Period: 21 Jan 2013 → 23 Jan 2013
Mette Dalgaard Agersted (Speaker)
National Institute of Aquatic Resources
Centre for Ocean Life

Description
Konkurrerer krill om føden?

Related event
17. Danske havforskermøde
21/01/2013 → 23/01/2013
Roskilde, Denmark
Activity: Talks and presentations › Conference presentations

17. Danske havforskermøde
Period: 21 Jan 2013 → 23 Jan 2013
Jane Behrens (Speaker)
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography

Related event
17. Danske havforskermøde
21/01/2013 → 23/01/2013
Roskilde, Denmark
Activity: Talks and presentations › Conference presentations

Fødevaredirektoratet (External organisation)
Period: 2012
Per Dolmer (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Description
ICES Test

WGCRAN
Degree of recognition: International

Related external organisation

Fødevaredirektoratet
Denmark
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

FVM - Fødevareministerens arbejdsgruppe om industrifiskeri (External organisation)
Period: 2012
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics

Related external organisation

FVM - Fødevareministerens arbejdsgruppe om industrifiskeri
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - 2nd ICES/PICES Conference for Early Career Scientists – Oceans of Change (External organisation)
Period: 2012 → …
Martin Hartvig (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - 2nd ICES/PICES Conference for Early Career Scientists – Oceans of Change
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - 6th World Fisheries Congress (WFC 2012) "Sustainable Fisheries in a Changing World" (External organisation)
Period: 2012 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - 6th World Fisheries Congress (WFC 2012) "Sustainable Fisheries in a Changing World"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - 6th World Fisheries Congress (WFC 2012) "Sustainable Fisheries in a Changing World" (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - 6th World Fisheries Congress (WFC 2012) "Sustainable Fisheries in a Changing World"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Ad Hoc Group on the Distribution and Migration of Northeast Atlantic Mackerel - AGDMM2 (External organisation)
Period: 2012 → …
Teunis Jansen (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International
Related external organisation
ICES - Ad Hoc Group on the Distribution and Migration of Northeast Atlantic Mackerel - AGDMM2
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Advisory Committee - ACOM (External organisation)
Period: 2012 → …
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International
Related external organisation
ICES - Advisory Committee - ACOM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Advisory Committee - ACOM (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International
Related external organisation
ICES - Advisory Committee - ACOM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2012 → …
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International
Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2012 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2012 → …
Jørgen Dalskov (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS (External organisation)
Period: 2012 → …
Claus Reedtz Sparrevohn (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation
ICES - Annual Meeting of Advisory Working Group Chairs - WGCHAIRS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation
ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Francois Bastardie (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Anders Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Department of Informatics and Mathematical Modeling
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic Fisheries Assessment Working Group - WGBFAS (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Baltic Fisheries Assessment Working Group - WGBFAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2012 → …
Henrik Degel (Participant)
National Institute of Aquatic Resources

Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources

Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2012 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources

Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Baltic International Fish Survey Working Group - WGBIFS (External organisation)
Period: 2012 → …
Bastian Huwer (Participant)
National Institute of Aquatic Resources

Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Baltic International Fish Survey Working Group - WGBIFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICESS - Baltic Salmon and Trout Assessment Working Group - WGBAST (External organisation)
Period: 2012 → …
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICESS - Baltic Salmon and Trout Assessment Working Group - WGBAST
Activity: Membership › Membership of commitees, commissions, boards, councils, associations, organisations, or similar

ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2012 → …
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of commitees, commissions, boards, councils, associations, organisations, or similar

ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of commitees, commissions, boards, councils, associations, organisations, or similar

ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA (External organisation)
Period: 2012 → …
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICESS - Benchmark Workshop on Pelagic Stocks - WKPELA
Activity: Membership › Membership of commitees, commissions, boards, councils, associations, organisations, or similar

ICESS - Benchmark Workshop on Redfish - WKRED (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: **International**

**Related external organisation**

**ICES - Benchmark Workshop on Redfish - WKRED**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ICES - Benthos Ecology Working Group - BEWG (External organisation)**
Period: 2012 → …
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: **International**

**Related external organisation**

**ICES - Benthos Ecology Working Group - BEWG**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ICES - Bureau meeting - BUREAU (External organisation)**
Period: 2012 → …
Fritz Köster (Participant)
National Institute of Aquatic Resources
Institute Management
Degree of recognition: **International**

**Related external organisation**

**ICES - Bureau meeting - BUREAU**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ICES - Bureau Meeting (External organisation)**
Period: 2012 → …
Fritz Köster (Participant)
National Institute of Aquatic Resources
Institute Management
Degree of recognition: **International**

**Related external organisation**

**ICES - Bureau Meeting**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ICES - Council Meeting (External organisation)**
Period: 2012 → …
Fritz Köster (Participant)
National Institute of Aquatic Resources
Institute Management
Degree of recognition: **International**

**Related external organisation**

**ICES - Council Meeting**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Development of Assessments based on LIFE history traits and exploitation characteristics - WKLIFE (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Development of Assessments based on LIFE history traits and exploitation characteristics - WKLIFE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2012 → …
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2012 → …
Peter Munk (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International

Related external organisation
ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2012 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Herring Assessment Working Group for the Area South of 62ºN - HAWG (External organisation)
Period: 2012 → …
Mikael van Deurs (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB (External organisation)
Period: 2012 → …
Francois Bastardie (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea - WGIAB
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Inter Benchmark Protocol for Baltic salmon - IBPsalmon (External organisation)
Period: 2012 → …
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation

ICES - Inter Benchmark Protocol for Baltic salmon - IBPsalmon
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Inter Benchmark Protocol for Norway pout North Sea stock - IBPNorway Pout (External organisation)
Period: 2012 → …
J. Rasmus Nielsen (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International
Related external organisation
ICES - Inter Benchmark Protocol for Norway pout North Sea stock - IBPNorway Pout
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Inter Benchmark Protocol for Pandalus in Skagerrak and Norwegian Deep - IBPPand (External organisation)
Period: 2012 → …
Ole Ritzau Eigaard (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International
Related external organisation
ICES - Inter Benchmark Protocol for Pandalus in Skagerrak and Norwegian Deep - IBPPand
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Inter Benchmark Protocol for Pandalus in Skagerrak and Norwegian Deep - IBPPand (External organisation)
Period: 2012 → …
Anders Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Department of Informatics and Mathematical Modeling
Degree of recognition: International
Related external organisation
ICES - Inter Benchmark Protocol for Pandalus in Skagerrak and Norwegian Deep - IBPPand
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - International Bottom Trawl Survey Working Group - IBTSWG (External organisation)
Period: 2012 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International
Related external organisation
ICES - International Bottom Trawl Survey Working Group - IBTSWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Joint EIFAC/ICES Working Group on Eels - WGEEL (External organisation)
Period: 2012
Michael Ingemann Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Ole Ritzau Eigaard (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Anders Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Department of Informatics and Mathematical Modeling
Degree of recognition: International

Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Jørgen Dalskov (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Planning Group on Commercial Catches, Discards and Biological Sampling - PGCCDBS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Science Committee meeting - SCICOM (External organisation)
Period: 2012 → …
Brian MacKenzie (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International

Related external organisation
ICES - Science Committee meeting - SCICOM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Science Committee meeting - SCICOM (External organisation)
Period: 2012 → …
Einar Eg Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Science Committee meeting - SCICOM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Second ICES/HELCOM Workshop on Flatfish in the Baltic Sea - WKFLABA2 (External organisation)
Period: 2012 → …
Claus Reedtz Sparrevohn (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International
ICES - Stock Identification Methods Working Group - SIMWG (External organisation)
Period: 2012 → …
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Stock Identification Methods Working Group - SIMWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Stock Identification Methods Working Group - SIMWG (External organisation)
Period: 2012 → …
Karin Hüssy (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Stock Identification Methods Working Group - SIMWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Stock Identification Methods Working Group - SIMWG (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Stock Identification Methods Working Group - SIMWG
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Integration of Economics, Stock Assessment and Fisheries Management - SGIMM (External organisation)
Period: 2012 → …
J. Rasmus Nielsen (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Study Group on Integration of Economics, Stock Assessment and Fisheries Management - SGIMM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Nephrops Surveys - SGNEPS (External organisation)
Period: 2012 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Study Group on Nephrops Surveys - SGNEPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Nephrops Surveys - SGNEPS (External organisation)
Period: 2012 → …
Bo Sølgaard Andersen (Participant)
National Institute of Aquatic Resources

Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Study Group on Nephrops Surveys - SGNEPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources

Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS (External organisation)
Period: 2012 → …
Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources

Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS (External organisation)
Period: 2012 → …
Josefine Egekvist (Participant)
National Institute of Aquatic Resources

Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Study Group on Practical Implementation of Discard Sampling Plans - SGPIDS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Study Group on Spatial Analyses for the Baltic Sea - SGSPATIAL (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Study Group on Spatial Analyses for the Baltic Sea - SGSPATIAL
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Spatial Analyses for the Baltic Sea - SGSPATIAL (External organisation)
Period: 2012 → …
Margit Eero (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Study Group on Spatial Analyses for the Baltic Sea - SGSPATIAL
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Standards in Ichthyoplankton Surveys - SGSIPS (External organisation)
Period: 2012 → …
Bastian Huwer (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Study Group on Standards in Ichthyoplankton Surveys - SGSIPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Study Group on Turned 90° Codend Selectivity, focusing on Baltic Cod Selectivity - SGTCOD (External organisation)
Period: 2012 → …
Bent Herrmann (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Study Group on Turned 90° Codend Selectivity, focusing on Baltic Cod Selectivity - SGTCOD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Anders Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Mikael van Deurs (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Ken Haste Andersen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Henrik Mosegaard (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources" (External organisation)
Period: 2012 → …
Niels Gerner Andersen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Symposium on "Forage fish interactions: Creating the tools for ecosystem based management of marine resources"
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Second Ad Hoc Group on Criteria for Reopening Fisheries Advice - AGCREFA2 (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - The Second Ad Hoc Group on Criteria for Reopening Fisheries Advice - AGCREFA2
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Third Workshop on Implementing the ICES FMSY Framework - WKFRAME3 (External organisation)
Period: 2012
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Third Workshop on Implementing the ICES FMSY Framework - WKFRAME3
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Training Course on Analysing and visualization of VMS and EU logbook data using the VMStools R package (External organisation)
Period: 2012 → …
Francois Bastardie (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Training Course on Analysing and visualization of VMS and EU logbook data using the VMStools R package
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Training Course on Analysing and visualization of VMS and EU logbook data using the VMStools R package (External organisation)
Period: 2012 → …
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Training Course on Analysing and visualization of VMS and EU logbook data using the VMStools R package
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Training Course on Opening the Box: Stock Assessment and Fisheries advice for stakeholders, NGOs and policy makers (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Training Course on Opening the Box: Stock Assessment and Fisheries advice for stakeholders, NGOs and policy makers
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2012 → …
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2012 → …
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group of International Pelagic Surveys - WGIPS (External organisation)
Period: 2012 → …
Karl-Johan Stæhr (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation
ICES - Working Group of International Pelagic Surveys - WGIPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Assessment of New MoU Species - WGNEW (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on Assessment of New MoU Species - WGNEW
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Assessment of New MoU Species - WGNEW (External organisation)
Period: 2012 → …
Cornelia Jaspers (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International

Related external organisation
ICES - Working Group on Assessment of New MoU Species - WGNEW
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biodiversity Science - WGBIODIV (External organisation)
Period: 2012 → …
Henrik Gislason (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on Biodiversity Science - WGBIODIV
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biodiversity Science - WGBIODIV (External organisation)
Period: 2012 → …
Grete E. Dinesen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International
Related external organisation

ICES - Working Group on Biodiversity Science - WGBIODIV
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Biodiversity Science - WGBIODIV (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)
Period: 2012 → …
Finn Larsen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)
Period: 2012 → …
Lotte Kindt-Larsen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on Data and Information Management - WGDIM (External organisation)
Period: 2012 → …
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Working Group on Data and Information Management - WGDIM (External organisation)
Period: 2012 → …
Josefine Egekvist (Participant)
 Related external organisation

**ICES - Working Group on Data and Information Management - WGDIM**
*Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar*

**ICES - Working Group on Elasmobranch Fishes - WGEF (External organisation)**
*Period: 2012 → …*
*Morten Vinther (Participant)*

**ICES - Working Group on Fish Ecology - WGFE (External organisation)**
*Period: 2012 → …*
*Stefan Neuenfeldt (Participant)*

**ICES - Working Group on Fish Ecology - WGFE (External organisation)**
*Period: 2012 → …*
*Anna Rindorf (Participant)*

**ICES - Working Group on Fish Ecology - WGFE (External organisation)**
*Period: 2012 → …*
*Morten Vinther (Participant)*
ICES - Working Group on Fisheries-Induced Evolution - WGEVO (External organisation)
Period: 2012 → …
Asbjørn Christensen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on Fisheries-Induced Evolution - WGEVO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Fisheries-Induced Evolution - WGEVO (External organisation)
Period: 2012 → …
Ken Haste Andersen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on Fisheries-Induced Evolution - WGEVO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Fisheries-Induced Evolution - WGEVO (External organisation)
Period: 2012 → …
Nina Overgaard Therkildsen (Participant)
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on Fisheries-Induced Evolution - WGEVO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA (External organisation)
Period: 2012 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation
ICES - Working Group on Improving use of Survey Data for Assessment and Advice - WGISDAA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Integrating Surveys for the Ecosystem Approach - WGISUR (External organisation)
Period: 2012 → …
Kai Wieland (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International
<table>
<thead>
<tr>
<th>Related external organisation</th>
<th></th>
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<td>ICES - Working Group on Integrating Surveys for the Ecosystem Approach - WGISUR</td>
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<td>ICES - Working Group on Integrative, Physical-biological, and Ecosystem Modelling - WGIPEM (External organisation)</td>
<td>Period: 2012 → …</td>
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<td>Asbjørn Christensen (Participant)</td>
<td>National Institute of Aquatic Resources</td>
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<td>ICES - Working Group on Mackerel and Horse Mackerel Egg Surveys - WGMEGS (External organisation)</td>
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<td>Maria Krüger-Johnsen (Participant)</td>
<td>National Institute of Aquatic Resources</td>
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<td>Kerstin Geitner (Participant)</td>
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<td>ICES - Working Group on Marine Habitat Mapping - WGMHM</td>
<td>Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar</td>
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<tr>
<td>Finn Larsen (Participant)</td>
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National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on Marine Mammal Ecology - WGMME
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Marine Mammal Ecology - WGMME (External organisation)
Period: 2012 → …
Lotte Kindt-Larsen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on Maritime Systems - WGMARS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Maritime Systems - WGMARS (External organisation)
Period: 2012 → …
Ken Haste Andersen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Working Group on Maritime Systems - WGMARS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Maritime Systems - WGMARS (External organisation)
Period: 2012 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Working Group on Maritime Systems - WGMARS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Maritime Systems - WGMARS (External organisation)
Period: 2012 → …
Lotte Worsøe Clausen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Working Group on Maritime Systems - WGMARS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on Maritime Systems - WGMARS (External organisation)
Period: 2012 → …
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Working Group on Maritime Systems - WGMARS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH (External organisation)
Period: 2012 → …
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH (External organisation)
Period: 2012 → …
Josefine Egekvist (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH (External organisation)
Period: 2012 → …
Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Working Group on Mixed Fisheries Advice for the North Sea - WGMIXFISH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Multispecies Assessment Methods - WGSAM (External organisation)
Period: 2012 → …
Stine Dalmann Ross (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Working Group on Multispecies Assessment Methods - WGSAM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on North Atlantic Salmon - WGNAS (External organisation)
Period: 2012 → …
Stig Pedersen (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on North Atlantic Salmon - WGNAS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Oceanic Hydrography - WGOH (External organisation)
Period: 2012 → …
Andre Visser (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International

Related external organisation

ICES - Working Group on Oceanic Hydrography - WGOH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recreational Fisheries Surveys - WGREFS (External organisation)
Period: 2012 → …
Claus Reedtz Sparrevohn (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

ICES - Working Group on Recreational Fisheries Surveys - WGREFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources
Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
ICES - Working Group on the Application of Genetics in Fisheries and Mariculture - WGAGFM (External organisation)
Period: 2012 → …
Dorte Bekkevold (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on the Application of Genetics in Fisheries and Mariculture - WGAGFM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Application of Genetics in Fisheries and Mariculture - WGAGFM (External organisation)
Period: 2012 → …
Einar Eg Nielsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation
ICES - Working Group on the Application of Genetics in Fisheries and Mariculture - WGAGFM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2012 → …
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2012 → …
J. Rasmus Nielsen (Participant)
National Institute of Aquatic Resources
Section for Management Systems  
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK  
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)  
Period: 2012 → …  
Mikael van Deurs (Participant)  
National Institute of Aquatic Resources  
Section for Population Ecology and Genetics  
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK  
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)  
Period: 2012 → …  
Morten Vinther (Participant)  
National Institute of Aquatic Resources  
Section for Public Sector Consultancy  
Degree of recognition: International

Related external organisation

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK  
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ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)  
Period: 2012 → …  
Anna Rindorf (Participant)  
National Institute of Aquatic Resources  
Section for Population Ecology and Genetics  
Degree of recognition: International

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ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK  
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)  
Period: 2012 → …  
Bo Sølgaard Andersen (Participant)  
National Institute of Aquatic Resources  
Section for Management Systems  
Degree of recognition: International

Related external organisation
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO (External organisation)
Period: 2012 → …
Anna Rindorf (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Working Group on the Ecosystem Effects of Fishing Activities - WGECO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
Period: 2012 → …
Morten Vinther (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Working Group on Widely Distributed Stocks - WGWIDE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on Widely Distributed Stocks - WGWIDE (External organisation)
Period: 2012 → …
Teunis Jansen (Participant)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate
Degree of recognition: International

Related external organisation

ICES - Working Group on Widely Distributed Stocks - WGWIDE
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop for maturity staging chairs - WKMATCH (External organisation)
Period: 2012 → …
Jonna Tomkiewicz (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Workshop for maturity staging chairs - WKMATCH
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Benchmarking Integrated Ecosystem Assessment - WKBEMIA (External organisation)
Period: 2012 → …
Stefan Neuenfeldt (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Workshop on Benchmarking Integrated Ecosystem Assessment - WKBEMIA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Implementing a New TS Relationship for Blue Whiting Abundance Estimates - WKTBLUES (External organisation)
Period: 2012 → …
Karl-Johan Stæhr (Participant)
National Institute of Aquatic Resources

Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Workshop on Implementing a New TS Relationship for Blue Whiting Abundance Estimates - WKTBLUES
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Regional Database (External organisation)
Period: 2012
Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources

Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Workshop on Regional Database
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Regional Database (External organisation)
Period: 2012 → …
Margit Eero (Participant)
National Institute of Aquatic Resources

Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Workshop on Regional Database
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Regional Database (External organisation)
Period: 2012 → …
Marie Storr-Paulsen (Participant)
National Institute of Aquatic Resources

Section for Monitoring
Degree of recognition: International

Related external organisation

ICES - Workshop on Regional Database
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Henrik Degel (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICEs - Workshop on Regional Database
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

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Kirsten Birch Håkansson (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

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Henrik Degel (Participant)
National Institute of Aquatic Resources
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Section for Public Sector Consultancy

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Degree of recognition: International

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ICEs - Workshop on Regional Database (External organisation)
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National Institute of Aquatic Resources
Section for Public Sector Consultancy

Related external organisation

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Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
Degree of recognition: International

Related external organisation

ICES - Workshop on Regional Database
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and Hake - WKMSGAD (External organisation)
Period: 2012 → …
Jonna Tomkiewicz (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and Hake - WKMSGAD
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Survey Design and Mackerel and Horse Mackerel Spawning Strategy - WKMSPA (External organisation)
Period: 2012 → …
Maria Krüger-Johnsen (Participant)
National Institute of Aquatic Resources
Section for Population Ecology and Genetics
Degree of recognition: International

Related external organisation

ICES - Workshop on Survey Design and Mackerel and Horse Mackerel Spawning Strategy - WKMSPA
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on the Evaluation of Plaice Stocks - WKPESTO (External organisation)
Period: 2012 → …
Jesper Boje (Participant)
National Institute of Aquatic Resources
Section for Public Sector Consultancy
Degree of recognition: International

Related external organisation

ICES - Workshop on the Evaluation of Plaice Stocks - WKPESTO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on the Evaluation of Plaice Stocks - WKPESTO (External organisation)
Period: 2012 → …
Clara Ulrich (Participant)
National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation

ICES - Workshop on the Evaluation of Plaice Stocks - WKPESTO
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar
**NorMER brings together the expertise of leading research groups from all Nordic countries, and several North American institutions, to implement a collective and multidisciplinary research strategy to explore the biological, economic, and management consequences of global climate change on fisheries resources. It will achieve this through a unique program of primary research, implemented by PhDs and Postdocs in a system of collaborative projects, with a focus on the Atlantic cod (Gadus morhua). Though our Nordic focus is on cod, this research is intended to be a platform to extend this knowledge to other marine systems.**

**Body type:** NorMER  
**Degree of recognition:** International

**Related external organisation**
NorMER Centre for Research on Marine Ecosystems and Resources under Climate Change  
**Activity:** Membership › Membership of research networks or expert groups

**Recirculation Technology for Future Aquaculture (REFA) seminar**  
**Period:** 3 Oct 2012 → 4 Oct 2012  
**Paulo Fernandes (Participant)**  
National Institute of Aquatic Resources  
**Section for Aquaculture**

**Related event**
Recirculation Technology for Future Aquaculture (REFA) seminar  
**03/10/2012 → 04/10/2012**  
**Fredericia, Denmark**  
**Activity:** Attending an event › Participating in or organising workshops, courses, seminars etc.

**New Uses and Possibilities for Seaweed**  
**Period:** 26 Sep 2012 → 27 Sep 2012  
**Susan Løvstad Holdt (Invited speaker)**  
National Institute of Aquatic Resources  
**Department of Environmental Engineering**  
**National Food Institute**  
**Residual Resource Engineering**

**Related event**
Value Added Seafood Conference  
**26/09/2012 → 27/09/2012**  
**London, United Kingdom**  
**Activity:** Talks and presentations › Conference presentations

**Earth System Science Data (Journal)**  
**Period:** 1 Sep 2012 → 31 Dec 2015  
**Ivo Grigorov (Editor)**  
National Institute of Aquatic Resources
Member of the editorial team of the journal, assisting with advocacy and sourcing submissions.

Links:
http://www.earth-system-science-data.net/

**Related journal**

**Earth System Science Data**
1866-3508
Indexed in DOAJ
Central database
Activity: Research › Journal editor

**EC Expert, Open Science/Ocean Literacy (External organisation)**
Period: 2011 → …
Ivo Grigorov (Member)
National Institute of Aquatic Resources
Research Secretariat

Description
Open Science, Ocean Literacy

Body type: Funder
Degree of recognition: International

**Related external organisation**

**EC Expert, Open Science/Ocean Literacy**
Activity: Membership › Membership in review committee

**Danish Polar Research Day**
Period: 8 Nov 2011
Mette Dalgaard Agersted (Invited speaker)
National Institute of Aquatic Resources
Section for Ocean Ecology and Climate

Description
Effects of climate on the Arctic-pelagic foodweb. Invited speaker to the Danish Polar Research Day

**Related event**

**Danish Polar Research Day**
08/11/2011 → 08/11/2011
Lyngby, Denmark
Activity: Talks and presentations › Conference presentations

**Annual index & ranking for institutional Open Access performance**
Period: 22 Jun 2011
Ivo Grigorov (Speaker)
National Institute of Aquatic Resources
Research Secretariat
Description
Chair: William Nixon
Degree of recognition: International
Links:
http://prezi.com/hk_fliqxs7up/?utm_campaign=share&utm_medium=copy (Presentation Slides)
http://indico.cern.ch/sessionDisplay.py?sessionId=5&confId=103325#20110622

Related event
CERN Workshop on Innovations in Scholarly Communication
22/06/2011 → 24/06/2011
Geneva, Switzerland
Activity: Talks and presentations › Conference presentations

Progress in Oceanography (Journal)
Period: 31 Jan 2010
Ivo Grigorov (Editor)
National Institute of Aquatic Resources
Research Secretariat
Description
Progress in Oceanography
Special Issue: Parameterisation of Trophic Interactions in Ecosystem Modelling
Managing Guest Editor for Special Issue
Links:
http://www.sciencedirect.com/science/journal/00796611/84/1-2 (Special Issue Home Page)

Related journal
Progress in Oceanography
0079-6611
Web of Science (2018): Indexed yes
Central database
Activity: Research › Journal editor

NEMO-partners meeting
Period: 9 Sep 2009 → 11 Sep 2009
Dominika Alicja Przybylska (Participant)
National Institute of Aquatic Resources

Related external organisation
Lyngby/ Copenhagen
Activity: Other

Processing techniques for reduced levels of dioxin or PAH in fish – 2 case studies from Denmark
Period: 1 Jan 2007 → …
Maike Timm Heinrich (Speaker)
National Institute of Aquatic Resources
Section for Aquatic Lipids and Oxidation
Description
Place: World Seafood Congress: Innovations in the Seafood Industry, Dublin, Ireland

Related external organisation
**Unknown external organisation**  
*Activity: Talks and presentations › Conference presentations*

**Prizes:**

**Science without Borders - Brazil**  
Evandro Malanski (Recipient)  
National Institute of Aquatic Resources, Centre for Ocean Life

*Description*  
PhD scholarship

*Details*  
Awarded date: 1 Dec 2012  
Granting Organisations: Technical University of Denmark  
Prize: Prizes, scholarships, distinctions

**Press clippings:**

**EKKO med fokus på at torsk spiser sortmundet kutling**  
Mads Christoffersen  
23/10/2017

*Description*  
Deltagelse i Naturprogrammet EKKO sendt på TV2/Bornholm d. 23/10 - 2017

*Subject*  
Gavner den sortmundede kutling de rovfisk der lever i havet omkring Bornholm, med speciel fokus på torsk.  
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

**EKKO**  
23/10/2017  
TV2/Bornholm (National), Denmark, Television  
Marie Møhl  
45 min  
http://play.tv2bornholm.dk/?area=specificTV&serienavn=ekko  
Naturprogram  
Mads Christoffersen  
Press / Media

**Hummere i Lillebælt**  
Mads Christoffersen  
16/10/2017

*Description*  
Der er observeret flere hummere i Lillebælt, hvad skyldes det?  
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

**Hummere i Lillebælt**  
16/10/2017  
TV2/Fyn (Regional), Denmark, Television  
Sofie Myhre  
3:02  
Mads Christoffersen  
Press / Media
Sample labelling in the North Sea helping link up Europe's research ships
Urban Wünsch
20/02/2017

Description
Online Article
National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography

Media coverage (1)

Sample labelling in the North Sea helping link up Europe's research ships
20/02/2017
Horizon Magazine (International), Denmark, Web
Catherine Collins
Urban Wünsch
Press / Media

Sample labelling in the North Sea helping link up Europe's research ships
20/02/2017
Urban Wünsch

Description
Online article featuring a EUROFLEETS2 teaching course that involved Associate Professor Colin Stedmon and Professor Andre Visser as well as DTU AQUA's research vessel Dana.
National Institute of Aquatic Resources, Section for Oceans and Arctic

Media coverage (1)

Sample labelling in the North Sea helping link up Europe's research ships
20/02/2017
Horizon (International), Denmark, Web
Catherine Collins
Urban Wünsch
Press / Media

Invasiv fisk overtager Karrebæk fjord
Mads Christoffersen
23/12/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

Invasiv fisk overtager Karrebæk fjord
23/12/2016
TV Øst, Television
Alexander Brun
2:30
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Press / Media

Ål og Sortmundet kutling
Mads Christoffersen
28/11/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

Ål og Sortmundet kutling
28/11/2016
Indslag om sortmundet kutling og projektet SORTMUND
Mads Christoffersen
10/10/2016

Description
Sendt kl 15.35
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

Indslag om sortmundet kutling og projektet SORTMUND
10/10/2016
DR P4, Radio
Per Gade
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Bønnerup og Grenaa: Små fisk – skal gerne blive større
Ole Henriksen, Elliot John Brown, Dennis Ulrik Andersen & Aurelia Pereira Gabellini
15/09/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data

Media contribution (1)

Bønnerup og Grenaa: Små fisk – skal gerne blive større
15/09/2016
NYT OM Østjylland (Local), Denmark, Web
Ole Henriksen, Elliot John Brown, Dennis Ulrik Andersen & Aurelia Pereira Gabellini
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)

An Expedition covering the Danish Coast's from the 18th July - 22nd August, 2016
Elliot John Brown, Ole Henriksen, Aurelia Pereira Gabellini, Asbjørn Emil Wilken Andreasen & Alexandros Kokkalis
31/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data

Media contribution (1)

An Expedition covering the Danish Coast's from the 18th July - 22nd August, 2016
31/08/2016
YouTube (International), Denmark, Web
Kasper Due Bække
05:35
https://www.youtube.com/watch?v=NaFccdjFuNs
Elliot John Brown, Ole Henriksen, Aurelia Pereira Gabellini, Asbjørn Emil Wilken Andreasen & Alexandros Kokkalis
Condition report from the seabed
Ole Henriksen, Aurelia Pereira Gabellini & Elliot John Brown
07/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Media coverage (1)

Tilstandsrapport fra havbunden
07/08/2016
Nordjyske Stiftstidende (Regional), Denmark, Print
Bent Stenbakken og Jesper Thomasen
Ole Henriksen, Aurelia Pereira Gabellini & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Researchers:
Kortlægning af fiskenes levesteder i den danske del af Øresund
Multidisciplinary mapping of fish habitats in the Sound, Denmark for maritime spatial planning
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
Activities:
ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)

Media contribution (1)

Indslag i 24NORDJYSKE
Ole Henriksen & Elliot John Brown
07/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Indslag i 24Nordjyske omkring Yngeltogt 2016
07/08/2016
24Nordjyske (Regional), Denmark, Television
Bent Stenbakken
02:20
Ole Henriksen & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Researchers:
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
Flatfish nursery grounds (38176)
Forskere undersøger fisk langs kysten
Ole Henriksen & Elliot John Brown
26/07/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Media contribution (1)

Forskere undersøger fisk langs kysten
26/07/2016
TV ØST (Regional), Denmark, Television
Signe Alvang
02:57
https://www.tveast.dk/artikel/forskere-undersoeger-fisk-langs-kysten
Ole Henriksen & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Relations
Projects:
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
Flatfish nursery grounds (38176)
FishHab-II (39345)
Press / Media

Fintælling af bugtens fisk
Elliot John Brown & Ole Henriksen
22/07/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography

Media coverage (1)

Fintælling af bugtens fisk
22/07/2016
DAGBLADET Køge (Local), Denmark, Print
Torben Thorsø
Elliot John Brown & Ole Henriksen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography

Relations
Projects:
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
Flatfish nursery grounds (38176)
FishHab-II (39345)
Press / Media

The marine biologist from the car warehouse
Ole Henriksen
13/07/2016
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Marine Ecology and Oceanography

Media coverage (1)

Havbiologen fra autolageret
13/07/2016
JyskeVestkysten (National), Denmark, Print
Yvonn Tittel
http://www.jv.dk/varde/Havbiologen-fra-autolageret/artikel/2343390
Ole Henriksen
Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources, Section for Marine Living Resources
Forskere på jagt efter plast i fiskene vi spiser
Ole Henriksen
12/07/2016
National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography

Media coverage (1)

Forskere på jagt efter plast i fiskene vi spiser
12/07/2016
TV2 Lorry (Regional), Denmark, Web
Peter Boye
https://www.tv2lorry.dk/artikel/forskere-paa-jagt-efter-plast-i-fiskene-vi-spiser
Ole Henriksen
Section for Marine Ecology and Oceanography, National Institute of Aquatic Resources

Relations
Research outputs:
- Analyse af marint affald i sild og hvilling fra det nordlige Storebælt
- Et hav fuld af mikroplastik
- A critical assessment of visual identification of marine microplastic using Raman spectroscopy for analysis improvement
- Marine microplastics - Method development for detection of plastic particles from sea water down to 10 μm
- Abundance, size and polymer composition of marine microplastics ≥10μm in the Atlantic Ocean and their modelled vertical distribution
- Microplastics
- Microplastic exposure studies should be environmentally realistic

Press / Media

Koralrev i Grønland
31/05/2016
National Food Institute, National Institute of Aquatic Resources, Arctic Section

Media contribution (1)

Koralrev i Grønland
31/05/2016
Videnskab.dk, Web
Sedsel Brøndum
National Institute of Aquatic Resources, Arctic Section, National Food Institute

Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.
Ivo Grigorov
06/01/2016

Subject
Research data, Research Data Management
National Institute of Aquatic Resources, Research Secretariat

Media contribution (1)

Data sharing: An open mind on open data: The move to make scientific findings transparent can be a major boon to research, but it can be tricky to embrace the change.
06/01/2016
NATURE Jobs Online, Print
Virginia Gewin
http://dx.doi.org/10.1038/nj7584-117a
Ivo Grigorov
National Institute of Aquatic Resources, Research Secretariat
The journal of proposals, ideas, data and more: New journal aims to publish from 'all stages of the research cycle'.
Ivo Grigorov
03/09/2015

Description
With so many science journals already in existence, it is rare for a new title to draw attention. But researchers and publishing experts are taking notice of Research Ideas and Outcomes, or RIO, an open-access journal that launched on 1 September. As well as standard articles, the journal will publish proposals, experimental designs, data and software, and aims to cover "research from all stages of the research cycle".

Subject
Open Science, Research publishing, Open Scholarship
National Institute of Aquatic Resources, Research Secretariat

TV2 Bornholm EKKO: Sortmundet kutling og udbredelsen omkring Bornholm
Mads Christoffersen
17/11/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

TV2 Bornholm EKKO: Sortmundet kutling og udbredelsen omkring Bornholm
17/11/2014
TV2 Bornholm, Television
Marie Møhl
40 min
http://www.tv2bornholm.dk/net-tv?area=programmer&program=ekko&filter=ekko&videoID=198937
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Lystfiskere fungerer som jordemødre: Lystfiskere hopper i åerne for at hjælpe havørrederne med at yngle
Mads Christoffersen
17/11/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Lystfiskere fungerer som jordemødre: Lystfiskere hopper i åerne for at hjælpe havørrederne med at yngle
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

**TVAvisen**
Mads Christoffersen
06/10/2014

Subject
Interview omkring invasion af sortmundet kutling
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**TV2 Lorry nyhederne: Udsætning af pighvar i Roskilde fjord**
Mads Christoffersen
06/10/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

**Pighvarrer kan måske bremse den sortmundede kutlings fremfærd: Tirsdag d. 26. august var den store udsættedag af pighvar i den østlige del af Danmark.**
Mads Christoffersen
01/10/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

**Danske Fritidsfiskere, Print**
Henning Nielsen
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**P4 Sjælland nyheder**
Mads Christoffersen
Media contribution (1)

P4 Sjælland nyheder
30/09/2014
P4 Sjælland, Radio
Per Gade
http://www.dr.dk/radio/ondemand/p4sjaelland/nyheder-9464/#t/02:00
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

P4 København nyheder
Mads Christoffersen
30/09/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

P4 København nyheder
30/09/2014
P4 København, Radio
Per Gade
http://www.dr.dk/radio/ondemand/p4kbh/regionale-nyheder-31299/#t/02:55
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

TV2 Bornholm EKKO: Ål og Dansk åleekspedition 2014
Mads Christoffersen
22/09/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

TV2 Bornholm EKKO: Ål og Dansk åleekspedition 2014
22/09/2014
TV2 Bornholm, Television
Marie Møhl
45 min
http://www.tv2bornholm.dk/net-tv?area=programmer&program=ekko&filter=ekko&videoID=196434
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Fisk for 150.000 kroner sluppet løs i Øresund
Mads Christoffersen
28/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

Fisk for 150.000 kroner sluppet løs i Øresund
28/08/2014
Rudersdal Avis, Print
Thomas Schiermacher
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Press / Media
6500 pighvarrer sat ud i fjorden fra Gershøj: Fiskere fra Gershøj Fritidsfiskerforening satte i går 6500 yngel af pighvarrer ud i Roskilde fjord
Mads Christoffersen
28/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

6500 pighvarrer sat ud i fjorden fra Gershøj: Fiskere fra Gershøj Fritidsfiskerforening satte i går 6500 yngel af pighvarrer ud i Roskilde fjord
28/08/2014
Roskilde Dagblad, Print
Rita Vestergård
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Biologisk krig på Karrebæk fjord
Mads Christoffersen
27/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

Biologisk krig på Karrebæk fjord
27/08/2014
Næstved Dagblad, Print
Anna Møhl
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

TV2 Lorry nyhederne: Udsætning af pighvar ved Vedbæk
Mads Christoffersen
26/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

TV2 Lorry nyhederne: Udsætning af pighvar ved Vedbæk
26/08/2014
TV2 Lorry, Television
2 min
http://www.tv2lorry.dk/arkiv/2014/8/26
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

TV2 Øst Nyhederne: Udsætning af pighvar i Karrebæk fjord
Mads Christoffersen
26/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Media contribution (1)

TV2 Øst Nyhederne: Udsætning af pighvar i Karrebæk fjord
26/08/2014
TV2 Øst, Television
4
http://www.tveast.dk/artikler/pighvaren-indsaettes-som-vaaben-mod-kutlingen
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Press / Media
Pighvar indsættes som hemmeligt våben mod kutlingen: Den sortmundede kutling har invaderet Karrebæk Fjord. Men nu sættes pighvaren ind i kampen for at få begrænset bestanden af kutlingen.
Mads Christoffersen
26/08/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

Pighvar indsættes som hemmeligt våben mod kutlingen: Den sortmundede kutling har invaderet Karrebæk Fjord. Men nu sættes pighvaren ind i kampen for at få begrænset bestanden af kutlingen.
26/08/2014
DR.dk, Web
Maria Larsen
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Invasiv art ikke til at komme af med
Mads Christoffersen
30/06/2014

**Subject**
Interviewet om åleudsætningerne og sortmundet kutling i Karrebæksminde fjord
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

Invasiv art ikke til at komme af med
30/06/2014
DR P4, Radio
Asger Ellekrog
5 min
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Mads Christoffersen
22/06/2014
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

**Media contribution (1)**

22/06/2014
Politiken Spis & Bo, Print
Lars Dahlager
Mads Christoffersen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Den dag Europa kom til Kalundborg
Susan Løvstad Holdt
01/12/2013

**Description**
Grand opening of the Bioreactor Greenhouse facility in the Kalundborg wastewater treatment plant.
Department of Environmental Engineering, Residual Resource Engineering, National Food Institute, National Institute of Aquatic Resources
Media contribution (1)

Den dag Europa kom til Kalundborg
01/12/2013
Det ny' EnergiMagasin, Print
Kalundborgs godsers Erhvervsråd
Susan Levstad Holdt
National Institute of Aquatic Resources, Department of Environmental Engineering, National Food Institute, Residual Resource Engineering
Press / Media

Vragtorsk
Junita Diana Karlsen
03/07/2011
National Institute of Aquatic Resources, Section for Management Systems

Media contribution (1)

Vragtorsk
03/07/2011
Natursyn, Radio
Jens Olesen
http://www.dr.dk/P1/Natursyn/Udsendelser/2011/06/28132018.htm
Junita Diana Karlsen
National Institute of Aquatic Resources, Section for Management Systems
Press / Media

Jorden rundt med Galathea 3
Peter Vilhelm Skov
08/01/2007
National Institute of Aquatic Resources, Section for Aquaculture

Media contribution (1)

Jorden rundt med Galathea 3
08/01/2007
Antarctic, Television
Peter Vilhelm Skov
National Institute of Aquatic Resources, Section for Aquaculture
Press / Media