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.
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.

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Improving fisheries science with high resolution commercial fishery data

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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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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.
Spatial planning for aquaculture: the Georeferenced Interactions Database (GRID)

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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.

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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 seabed 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....

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A comparative review of fisheries management experiences in the European Union and in other countries worldwide: Iceland, Australia, and New Zealand

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BFI (2015): BFI-level 2
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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 \( \sim 1.6 \text{ km}^2 \text{ h}^{-1} \) of which 0.08 km\(^2\) has an impact at the subsurface level (sediment penetration \( \geq 2 \text{ cm} \)). 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 km\(2\)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.

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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.
Species interactions in the western Baltic Sea: With focus on the ecological role of whiting

The food web of the upper trophic levels in marine ecosystems is often complex, encompassing multiple biological interactions. One species may serve as prey, predator and competitor at the same time, and the interactions are likely to change with the ontogenetic development from juvenile to adult. Disentangling food web dynamics is important for both ecologists and conservationists involved with management. Multispecies assessment models and ecosystem-based trophic models are becoming increasingly used as tools to investigate and assess biological interactions and predation impacts of key species in the food web. Furthermore, the models can be used to evaluate effects of anthropogenic activities such as fishing, eutrophication and pollution from land-based activities and shipping. Despite the growing awareness of the strength of these models to describe food web dynamics and ecosystem functioning, implementation of the models in strategic management advice for commercially important fish stocks and protected marine mammals is not common practice. This is due to the lack of sufficient information about species interactions including knowledge about the diet, food intake and growth dynamics. This thesis investigates the ecological role of whiting in the western Baltic Sea. The ecosystem is more brackish than for example the North Sea and the species diversity of the upper trophic levels is lower and the food web simpler. The main piscivorous fish species are whiting and cod, while herring and sprat are the predominant forage fishes. The growth dynamics and feeding ecology of whiting in the western Baltic Sea has not previously been investigated, despite the fact that it is an important species both in the commercial fishery and in the food web of the North Sea. Due to differences in hydrography, species diversity and fishing pressure, the ecological role of whiting in the Baltic Sea is likely to differ considerably from that of its conspecific in the North Sea. The western Baltic Sea also provides a habitat for protected marine mammals, including the harbour porpoise, the grey seal and the harbour seal, which potentially prey on and compete for food with whiting. Here, the growth dynamics and feeding ecology of whiting in the western Baltic Sea is investigated and discussed in an ecosystem context. Furthermore, the diet of the harbour porpoise is examined and the interactions between whiting, cod and porpoises are discussed. Describing the fish population dynamics and biological interactions of the main species at the higher trophic levels in the western Baltic Sea is an important step towards a broader regional understanding of the ecosystem dynamics. The information can be used to inform single species and multispecies assessment models for fish and ecosystem-based trophic models, and, thus, potentially improve management advice for fish stocks and protected marine mammals in the western Baltic Sea.
The diet of whiting Merlangius merlangus in the western Baltic Sea

The diet of whiting Merlangius merlangus in the western Baltic Sea was investigated and compared to the diet in the southern North Sea. Clupeids were important prey in both areas, but especially in the western Baltic Sea where they constituted up to 90% of the diet of larger individuals. Gobies, brown shrimps and polychaetes were the main prey of juveniles in the western Baltic Sea, while a wider range of species were consumed in the North Sea. The shift to piscivory occurred at smaller sizes in the western Baltic Sea and the fish prey consumed was proportionately larger than in the southern North Sea. Estimates of prey abundance and food intake of M. merlangus are required to evaluate its predatory significance in the western Baltic Sea, but its diet suggests that it could be just as significant a fish predator here as in the southern North Sea.
Towards a framework for the quantitative assessment of trawling impact on the seabed and benthic ecosystem

A framework to assess the impact of mobile fishing gear on the seabed and benthic ecosystem is presented. The framework that can be used at regional and local scales provides indicators for both trawling pressure and ecological impact. It builds on high-resolution maps of trawling intensity and considers the physical effects of trawl gears on the seabed, on marine taxa, and on the functioning of the benthic ecosystem. Within the framework, a reductionist approach is applied that breaks down a fishing gear into its components, and a number of biological traits are chosen to determine either the vulnerability of the benthos to the impact of that gear component, or to provide a proxy for their ecological role. The approach considers gear elements, such as otter boards, twin trawl clump, and groundrope, and sweeps that herd the fish. The physical impact of these elements on the seabed, comprising scraping of the seabed, sediment mobilization, and penetration, is a function of the mass, size, and speed of the individual component. The impact of the elements on the benthic community is quantified using a biological-trait approach that considers the vulnerability of the benthic community to trawl impact (e.g. sediment position, morphology), the recovery rate (e.g. longevity, maturation age, reproductive characteristics, dispersal), and their ecological role. The framework is explored to compare the indicators for pressure and ecological impact of bottom trawling in three main seabed habitat types in the North Sea. Preliminary results show that the Sublittoral
mud (EUNIS A5.3) is affected the most due to the combined effect of intensive fishing and large proportions of long-lived taxa

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Web of Science (2004): Indexed yes
An integrated end-to-end modeling framework for testing ecosystem-wide effects of human-induced pressures in the Baltic Sea

We present an integrated end-to-end modeling framework that enables whole-of ecosystem climate, eutrophication, and spatial management scenario exploration in the Baltic Sea. The framework is built around the Baltic implementation of the spatially-explicit end-to-end ATLANTIS model, linked to the high-resolution coupled physical-biological model HBM-ERGOM and the fisheries bio-economic FishRent model. We investigate ecosystem-wide responses to changes in human-induced pressures by simulating several eutrophication scenarios that are relevant to existing Baltic Sea management plans (e.g. EU BSAP, EU CFP). We further present the structure and calibration of the Baltic ATLANTIS model and the operational linkage to the other models. Using the results of eutrophication scenarios, and focusing on the relative changes in fish and fishery production, we discuss the robustness of the model linking with respect to the underlying assumptions, strengths and weaknesses of individual models. Furthermore, we describe how to possibly expand the framework to account for spatial impacts and economic consequences, for instance by linking to the individual-vessel based DISPLACE modeling approach. We conclude that the proposed model integration and management scenario evaluation scheme lays the foundations for developing a robust framework for management strategy evaluation that is of strategic importance to stakeholders from around the Baltic Sea.

Causes and consequences of technical, biological and spatial interactions in fisheries management modelled from the individual distribution of fishing effort

Our individual-vessel based bio-economic modeling approach (www.displace-project.org) evaluates the harvesting dynamics using information about fishing ground preferences and experienced vessel-specific catch rates. The assessment computes the daily decision-making of the fishing vessels and the individual or overall economic and stock status indicators together with the size-based spatial distribution dynamics of the main fishery resources. In this application to the western Baltic Sea sprat, herring and cod fisheries of Danish, Swedish and German commercial vessels (>12 m) the biological interactions (fish predation mortality) are included by a dynamic coupling to the Stochastic Multi Species model (SMS) on annual basis, under the mitigation from the "yet to be implemented" NATURA 2000 zonation in the area. The spatial technical interactions between vessels revealed to be the predominant factors affecting the fishery profit and the energy efficiency while species interactions play a minor role, albeit increasing the final profit estimates. Interestingly, the zonation affects the profit depending on the biological interactions from a spatial effect on the size composition of the stocks, therefore the fish size composition in the landings originating from different fishing areas. Such a model coupling contributes to the integration of different spatial activities in certain sea areas considering the combined effects of technical and biological interactions and dynamics for reducing potential inefficient management and use of space according to the aims of both EU CFP regulation (No 1380/2013) and EU MSP (2014/89/EU) directive.
Competition for marine space: modelling the Baltic Sea fisheries and effort displacement under spatial restrictions

Maritime spatial planning (MSP) and fishery management may generate extra costs for fisheries by constraining fishers activity with conservation areas and new utilizations of the sea. More energy-efficient fisheries are also likely to alter existing fishing patterns, which already vary from fishery to fishery and from vessel to vessel. The impact assessment of new spatial plans involving fisheries should be based on quantitative bioeconomic analyses that take into account individual vessel decisions, and trade-offs in cross-sector conflicting interests. We use a vessel-oriented decision-support tool (the DISPLACE model) to combine stochastic variations in spatial fishing activities with harvested resource dynamics in scenario projections. The assessment computes economic and stock status indicators by modelling the activity of Danish, Swedish, and German vessels (.12 m) in the international western Baltic Sea commercial fishery, together with the underlying size-based distribution dynamics of the main fishery resources of sprat, herring, and cod. The outcomes of alternative scenarios for spatial effort displacement are exemplified by evaluating the fishers' abilities to adapt to spatial plans under various constraints. Interlinked spatial, technical, and biological dynamics of vessels and stocks in the scenarios result in stable profits, which compensate for the additional costs from effort displacement and release pressure on the fish stocks. The effort is further redirected away from sensitive benthic habitats, enhancing the ecological positive effects. The energy efficiency of some of the vessels, however, is strongly reduced with the new zonation, and some of the vessels suffer decreased profits. The DISPLACE model serves as a spatially explicit bioeconomic benchmark tool for management strategy evaluations for capturing tactical decision-making in reaction to MSP.
Detecting ecological-economic effects of marine spatial plans from displacing the bottom fishing pressure

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University
Authors: Thoya, P. (Intern), Bastardie, F. (Intern), Dinesen, G. E. (Intern), Hansen, J. L. (Ekstern), Nielsen, J. R. (Intern)
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Event: Paper presented at ICES Annual Science Conference 2015, Copenhagen, Denmark.
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Effects of recent changes in stock conditions and mixing on sustainability and economic viability of the fishery – The Danish fisheries for Baltic cod

**General information**
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Evaluation of integrated ecological-economic models – Review and challenges for implementation

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, National Oceanographic and Atmospheric Administration, IFREMER, Thünen Institute of Sea Fisheries, Commonwealth Scientific and Industrial Research Organisation, University of Vigo, AZTI-Tecnalia, Agrocampus Ouest, Wageningen IMARES, Spanish National Research Council, National Marine Fisheries Research Institute, Cefas, University of Southern Denmark, Swiss Federal Institute for Aquatic Science and Technology, Swiss Federal Institute of Aquatic Science and Technology, Swedish Agency for Marine and Water Management, University of Kiel, University of Copenhagen, Johann Heinrich von Thünen-Institute, Stockholm University, Lund University

Number of pages: 3

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Event: Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.
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Impacts of the local environment on recruitment – a comparative study of North Sea and Baltic Sea fish stocks

General information
State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Authors: Pécuchet, L. (Intern), Nielsen, J. R. (Intern), Christensen, A. (Intern)

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Publication date: 2015
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Main Research Area: Technical/natural sciences

Publication: Research › Conference abstract for conference – Annual report year: 2015

Impacts of the local environment on recruitment: a comparative study of North Sea and Baltic Sea fish stocks

While the impact of environmental forcing on recruitment variability in marine populations remains largely elusive, studies spanning large spatial areas and many stocks are able to identify patterns common to different regions and species. In this study, we investigate the effects of the environment on the residuals of a Ricker stock-recruitment (SR) model, used as a proxy of prerecruits’ survival, of 18 assessed stocks in the Baltic and North Seas. A probabilistic principal components (PCs) analysis permits the identification of groups of stocks with shared variability in the prerecruits’ survival, most notably a group of pelagics in the Baltic Sea and a group composed of gadoids and herring in the North Sea. The first two PCs generally grouped the stocks according to their localizations: the North Sea, the Kattegat-Western Baltic, and the Baltic Sea. This suggests the importance of the local environmental variability on the recruitment strength. Hence, the prerecruits’ survival variability is studied according to geographically disaggregated and potentially impacting abiotic or biotic variables. Time series (1990-2009) of nine environmental variables consistent with the spawning locations and
season for each stock were extracted from a physical-biogeochemical model to evaluate their ability to explain the survival of prerecruits. Environmental variables explained >70% of the survival variability for eight stocks. The variables water current, salinity, temperature, and biomass of other fish stocks are regularly significant in the models. This study shows the importance of the local environment on the dynamics of SR. The results provide evidence of the necessity of including environmental variables in stock assessment for a realistic and efficient management of fisheries.

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Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, Section for Ecosystem based Marine Management, Department of Physics, Section for Marine Living Resources
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Web of Science (2010): Indexed yes
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Integration of fisheries in marine spatial planning: Quo vadis?

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Leibniz-Institute for Baltic Sea Research, Wageningen IMARES, IFREMER, GEOMAR - Helmholtz Centre for Ocean Research Kiel, Agrocampus Ouest, Thünen Institute of Sea Fisheries, Cefas
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Management of fishery: Importance of fish food web dynamics in coupling of multispecies and bio-economic fisheries management evaluation models

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Ross, S. D. (Intern), Nielsen, J. R. (Intern), Göslason, H. (Intern), Andersen, N. G. (Intern), Vinther, M. (Intern), Bastardie, F. (Intern)
Publication date: 2015
Event: Abstract from 18. Danske Havforskermøde, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2015

Methods for integrated use of fisheries research survey information in understanding marine fish population ecology and better management advice: Improving methods for evaluation of research survey information under consideration of survey fish detection and catch efficiency

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Nielsen, J. R. (Intern)
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Publication date: 2015
New policies may call for new approaches: the case of Swedish Norway lobster (Nephrops norvegicus) fisheries in the Kattegat and Skagerrak

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Publication date: 2015
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Main Research Area: Technical/natural sciences

New policies will require new approaches: the case of the Swedish Norway Lobster (Nephrops norvegicus) fisheries in the Kattegat and Skagerrak

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, SP Technical Research Institute of Sweden, Swedish University of Agricultural Sciences
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Main Research Area: Technical/natural sciences

Social, economic, and ecological impact assessment across marine sectors?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Nielsen, J. R. (Intern), Schmidt, J. (Ekstern), Thunberg, E. (Ekstern), Holland, D. (Ekstern)
Number of pages: 4
Publication date: 2015
Event: Paper presented at ICES Annual Science Conference 2015, Copenhagen, Denmark.
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Sustainability, fuel use, and profitability: interlinked consequences of stock dynamics and choices of individual vessel spatial effort allocation within the Western Baltic

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Nielsen, J. R. (Intern), Schmidt, J. (Ekstern), Thunberg, E. (Ekstern), Holland, D. (Ekstern)
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Sustainable development of the Nephrops fishery in the Kattegat-Skagerrak region

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The Baltic ATLANTIS model: Implementing a holistic framework to evaluate ecosystem wide responses to changes in climate and anthropogenic forcing

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data, Centre for Ocean Life, Aarhus University
Authors: Palacz, A. (Intern), Nielsen, J. R. (Intern), Christensen, A. (Intern), Gislason, H. (Intern), Bastardie, F. (Intern), Geitner, K. (Intern), Maar, M. (Ekstern), Lindegren, M. (Intern), Hufnagl, M. (Intern), Fulton, E. (Ekstern)
Number of pages: 1
Publication date: 2015
Event: Poster session presented at 18. Danske Havforskermøde, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Links: http://www.marine-vectors.eu/Core_pages/The_Baltic_ATLANTIS_model_a_holistic_framework_to
Publication: Research › Poster – Annual report year: 2015

A statistical model for estimation of fish density including correlation in size, space, time and between species from research survey data

Trawl survey data with high spatial and seasonal coverage were analysed using a variant of the Log Gaussian Cox Process (LGCP) statistical model to estimate unbiased relative fish densities. The model estimates correlations between
observations according to time, space, and fish size and includes zero observations and over-dispersion. The model utilises the fact the correlation between numbers of fish caught increases when the distance in space and time between the fish decreases, and the correlation between size groups in a haul increases when the difference in size decreases. Here the model is extended in two ways. Instead of assuming a natural scale size correlation, the model is further developed to allow for a transformed length scale. Furthermore, in the present application, the spatial- and size-dependent correlation between species was included. For cod (Gadus morhua) and whiting (Merlangius merlangus), a common structured size correlation was fitted, and a separable structure between the time and space-size correlation was found for each species, whereas more complex structures were required to describe the correlation between species (and space-size). The within-species time correlation is strong, whereas the correlations between the species are weaker over time but strong within the year.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources
Authors: Nielsen, J. R. (Intern), Kristensen, K. (Intern), Lewy, P. (Intern), Bastardie, F. (Intern)
Publication date: 2014
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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
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
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.369 SNIP 1.23 CiteScore 4.58
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
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DISPLACE: a dynamic, individual-based model for spatial fishing planning and effort displacement - integrating underlying fish population models

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Miethe, T. (Ekstern)
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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
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Evaluation of integrated ecological-economic models - What are they used for?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Lund University
Publication date: 2014
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2014

High-resolution mapping of European fishing pressure on the benthic habitats
Mapping and monitoring of pressure from fishery on the marine benthic environment is necessary to support an ecosystem approach to fisheries management (EAFM). In many cases this need is not reflected in official fisheries statistics and logbooks, where focus typically is on catch rather than effort. Consequently, most logbook information is not well suited for quantitative estimation of seafloor impact (swept area and impact severity) of the different gears and trips. We present a method to overcome this information deficiency of official statistics and develop high-resolution large-scale maps of benthic fishing pressure covering the EU, Norwegian and Turkish waters. First individual logbook observations from 13 countries were assigned to 17 different functional gear groups (métiers) based on target species and gear type information. Secondly, relationships between gear width and vessel size (e.g. trawl door spread and vessel kW) for each métier were used to assign quantitative information of bottom contact
to each logbook trip by translating vessel size information into measures of gear size. Thirdly the extended logbook data was merged with high-resolution activity data (VMS) and gear width estimates were assigned to individual interpolated vessel tracks based on VMS data. The outcome was European wide high-resolution fishing intensity maps (total yearly swept area within grid cells of 1°1 minutes longitude and latitude) for 2010, 2011 and 2012. Finally the high-resolution fishing pressure maps were overlaid with existing marine habitat maps to identify areas of potential ecosystem service conflicts.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, National Marine Fisheries Research Institute, Marine Scotland Science, Johann Heinrich von Thünen-Institute, Marine Institute, Instituto Español de Oceanografía, Institute of Marine Biological Resources and Inland Waters, AFBI, Institute of Marine Research, Aarhus University, Cefas, National Research Council of Italy, Institute for Agricultural and Fisheries Research, Wageningen IMARES, Lund University, IFREMER, Central Fisheries Research Institute
Publication date: 2014
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**How does prey quality affect life-history traits under different temperature regimes?**

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Marine Ecology and Oceanography
Authors: Ross, S. D. (Intern), Holt, R. (Ekstern), Deurs, M. V. (Intern), Andersen, N. G. (Intern), Nielsen, J. R. (Intern), Jørgensen, C. (Ekstern)
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Event: Abstract from 11th International Congress on the Biology of Fish, Edinburgh, United Kingdom.
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**How spatial planning constrains cross-border fisheries: the bio-economic DISPLACE evaluation on the Baltic Sea**

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern)
Publication date: 2014
Main Research Area: Technical/natural sciences

**Impact assessment of a fisheries closure with effort and landings spatial analyses: A case study in the Western Baltic Sea**

Commercial fisheries in the Western Baltic Sea (WBS; ICES Subdivisions 22–24) are dominated by Danish and German vessels. By combining and processing logbook and Vessel Monitoring System (VMS) data for Germany and Denmark, we compare patterns of spatial effort allocation and the origin of the landings before (2005–2007) and during (2008–2010) implementation of the EU long-term management plan (LTMP) for cod. This management plan is likely to have affected the temporal and spatial extent of fisheries in the WBS. Changes that took place between 2005 and 2010 on the large scale of the WBS were therefore considered when selecting an appropriate stable reference period to inform and evaluate small-scale effort-displacement scenarios in the Fehmarn Belt. The WBS fisheries appear not to have been restricted by effort limits until 2010, but rather by total allowable catches (TACs) for cod. The amount of cod landed in the WBS decreased, and the origin of these landings shifted farther east without affecting the seasonaleffort allocation. Landings of cod have
also decreased in the Fehmarn Belt area, and since 2008, sprat has been the species most landed there. The planned construction of the Fehmarn Belt Fixed Link connecting Denmark and Germany could lead to the temporal closure of fishing activities. Three different effort-displacement scenarios were tested to determine how lost landings, caused by a fishing closure of a corridor near the link during construction, could be countered by moving the activities to a nearfield area. To compensate for lost landings, the best strategy appears to be redistributing fishing effort of sprat-targeting métiers to areas that have had relatively high catch rates (landings per unit of effort (LPUE)) or with large absolute sprat landings, assuming spatial stability of sprat distribution in the area. Because high effort did not lead to large sprat landings in all locations, effort displacement to high effort areas may not compensate for lost sprat landings, particularly for mixed fishery métiers that also landed herring.

**General information**

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Thünen Institute of Baltic Sea Fisheries
Authors: Miethe, T. (Ekstern), Bastardie, F. (Intern), Dorrien, C. V. (Ekstern), Nielsen, J. R. (Intern)
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- 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
Importance of food web dynamics in coupling of multispecies models and bio-economic fisheries management evaluation models

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State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Ross, S. D. (Intern), Nielsen, J. R. (Intern), Gislason, H. (Intern), Andersen, N. G. (Intern), Vinther, M. (Intern), Bastardie, F. (Intern)
Number of pages: 1
Publication date: 2014
Event: Poster session presented at Danish Innovation Fund Conference, Copenhagen, Denmark.
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Incorporating the Benthic Ecosystem in Fisheries Management: BENTHIS a European FP7-project

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Central Fisheries Research Institute
Authors: Rijnsdorp, A. (Ekstern), Eigaard, O. R. (Intern), Gregersen, O. (Ekstern), Hammon, K. (Ekstern), Hiddink, J. (Ekstern), Kenny, A. (Ekstern), Laffarque, P. (Ekstern), Nielsen, J. R. (Intern), Piet, G. J. (Ekstern), Polet, H. (Ekstern), Sala, A. (Ekstern), Zengin, M. (Ekstern)
Publication date: 2014
Event: Poster session presented at 9th International Flatfish Symposium 2014, Cle Elum, United States.
Main Research Area: Technical/natural sciences
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Supporting bio-economic evaluation of spatial planning constraining fishing activities: be quantitative, spatially-explicit, vessel-oriented, stochastic, and dynamically coupled to fish populations

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Eigaard, O. R. (Intern), Fock, O. (Ekstern), Jonsson, P. (Ekstern), Bartolino, V. (Ekstern)
The Baltic ATLANTIS model: Implementing a holistic framework to evaluate ecosystem wide responses to changes in climate and anthropogenic forcing

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data, Centre for Ocean Life, Aarhus University
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Critical report of current fisheries management measures implemented for the North Sea mixed demersal fisheries

This present report is an EU-FP7-SOCIOEC Report giving an overview and critical evaluation of the current management measures implemented for the North Sea mixed demersal fisheries and the fish stocks involved in this. Also, this involves review and critical evaluation of the scientific advice supporting the fisheries management for the North Sea mixed demersal fisheries and the stocks involved herein. Management of the demersal roundfish and flatfish fisheries in the North Sea is conducted mainly through the EU Common Fisheries Policy (CFP) and the yearly EU-Norway Bilateral Fishery Agreements. The prevailing management system and principle has been landing quotas (TAC, Total Allowable Catch) mainly based on the EU principle of relative stability in the international sharing of the TAC. Also, general effort limitations and technical measures are set for the EU and Norwegian fisheries on top of the TAC regulations. Technical measures have mainly aimed at reducing the retention and discard of the juveniles through gear measures and to protect the spawners and/or recruits in the fish populations through closures. Furthermore, the management is based on a set of national measures especially concerning control and enforcement measures, national distribution of the overall TAC, individual special technical measures, allocation (distribution) of national TACs to different fisheries and vessels including the share to e.g. Individual Transferable Quotas (ITQs) or Vessel Quota Shares (VQSS). The management of the North Sea demersal fisheries has changed quite a lot over the last decades following the need to rebuild the fish stocks, and in particular the North Sea cod stock in relation to the present case study. The CFP has increasing focus towards implementing multi-annual or long term management plans (MAMPs, LTMPs) partly to avoid the annual political battles over setting the TAC. There has furthermore been a trend during the last decade to move away from the Precautionary Approach and towards Maximum Sustainable Yield as the overarching management objective and Harvest Control Rules (HCRs) based on this. There have been introduced increasingly restrictive fisheries-based effort limitations with possibilities for exemption or for less drastic effort reductions provided that cod avoidance behavior can be demonstrated. Although the decision-makers under the CFP have had a reputation of consistently setting TACs way above the scientific advice, the development in recent years has been towards this gap being reduced. Management of the fisheries has undergone a number of structural and behavioral changes, and these have already yielded some positive results as the state of the demersal stocks in the North Sea have globally improved. The status of main demersal stocks has considerably improved over the last decade. Fishing mortality has globally decreased and biomass has increased, and most of the assessed demersal stocks are now within sustainable limits. Some issues remain with North Sea cod, for which recovery is slower. At present, cod is the limiting species for all the North Sea demersal fisheries. Over a time span from the 1960s landings of demersal stocks have declined with an accelerating decrease since the mid-1990s in line with the falling stock sizes and regulated reductions in total allowable catches (TACs). A clear decrease in the mean fishing mortality (F) is observed in the 2000-2010 period with current F values between Fmsy and Fpa, and the spawning stock biomass (SSB) has on average been above Bpa for the period 1983-2010 for the assessed stocks. The effort in the central North Sea and along the Norwegian waters has decreased as well as the number of operating fishing vessels (capacity). Overall, the nominal effort (kw-days) by European fleets using demersal trawl, seine, beam trawl and gillnet in the North Sea, Skagerrak and the Eastern Channel have been substantially reduced (-20% between 2003 and 2011). Since 2000, the total fish biomass for exploited stocks in the North Sea is about 4-5 million tonnes with an increasing trend in the most recent years. Despite the decrease of landings and fishing mortality in the last recent decade, the overall recruitment has shown a clear decreasing trend from 1985-2010. The recent increase in SSB during the last decase, which is likely to occur landings and fishing mortality levels in the last 15 years, indicate inclinations of the North Sea ecosystem to recover. However, this has not converted in higher recruitment levels in the most recent years in which there may be a time delay. There is a clear trend that both the gross profit and the net profit has improved from 2008-2010 for the main fleets of the North Sea with the only exception of the Dutch beam trawlers 18-24m, for which the gross profit decreased by nearly 90%. The positive development in economic performance measures can be a result of the structural changes that have recently occurred in many fisheries. There are fewer vessels sharing the available resources (reduction in over-capacity). Especially, the movement towards right-based systems is expected to
have had positive effects on reducing the over-capacity and improving the economic performance of many fleets. Historically, EU subsidies over the years have contributed to making the fleet more efficient, so the success of the CFP in the area of developing an efficient fleet has historically contributed to its failure in relation to conserve fish stocks, as overcapacity is consistently mentioned as one of the fundamental reasons for the conservation failure historically. Employment in fishing as a social indicator is shrinking, not least for the North Sea, and has been so for many years. There are multiple explanations for this: i) individual vessels are getting more efficient, ii) consolidation of fleets whereby fewer vessels catch the available resources with noticeable decrease in number of operating fishing vessels, and iii) decreasing fishing opportunities in the shape of lower quotas. The raw number of fishers tells a story of a sector that in reality, at least in the prosperous countries around the North Sea, provides only few jobs. Despite the above trends indicating positive effects of the most recent fisheries management of the North Sea mixed demersal fisheries there are a row of general problems in the present management. Population dynamics with respect to recruitment variations, sub-populations and changes in distribution of several demersal North Sea stocks influenced by environmental factors besides fishery are not fully understood and taken into consideration in management (and management advice). Also, biological multi-species interactions between the stocks are not fully taken into account in the management of the stocks when setting the MSY management and exploitation limits for the stocks. Management is not based on broader ecosystem and multi-species objectives, but based mainly on single stock objectives. Also technical interactions between fisheries are not taken fully into account in management of the North Sea demersal fisheries. The fisheries targeting cod, whiting, haddock, saithe, flatfish and Nephrops in the North Sea and Kattegat-Skagerrak are mixed demersal fisheries for towed gears. Mixed fisheries considerations are of primary importance for the management of North Sea species. Single stock management is a cause of discarding in mixed fisheries, because individual stock management objectives may not be consistent with each other. As such, the TAC of one species may be exhausted before the TAC of another, leading to catches of valuable fish that cannot be landed resulting in over-quotas discard. Overall, present management and fisheries policy is characterized by the CFP having in many ways taken form of a classical intergovernmentalist, state-centric command-and-control, top-down management system, where member states’ ministers in the Council have exercised strong control over the fisheries management measures which have been developed and adopted on the background of proposals from the Commission and the Parliament, though since the ratification of the Lisbon Treaty the Parliament has assumed a role of co-legislator alongside the Council. EC has identified the lack of stakeholder involvement as one of the major weaknesses of the CFP, recognizing that this fact clearly undermine its legitimacy. Establishment of the Regional Advisory Councils (RACs) with the 2003 CFP can be seen as the first formal attempt to generate a network of multi-national, multi-interest advisory organizations with a strong regional focus among other involving resource users in the decision making. However, the RACs have at present only an advisory function on decisions and are not formally integrated directly in management on a regional basis, i.e. the RAC system is primarily intended to provide a regional stakeholder perspective to the Commission’s deliberations rather than providing stakeholders with real decision-making authority. RACs constitute, nevertheless, a move towards regionalization of the fisheries policy. Present management is, furthermore, characterized by a high degree of complexity, bureaucracy, and examples of micro-management where different management systems and measures are implemented in parallel making evaluation of impact of the individual measures and systems very complicated and the system suffers from lack of transparency. With respect to the complexity the different management measures are acting top of each other with impact on the same fisheries and stocks at the same time (and with time overlap in their implementation) creating a very complex management and associated advisory system, where it is difficult to distinguish specific effects and impacts of each individual measures implemented. Accordingly, it is also very difficult to make scientific management evaluation and advice associated to the individual measures

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Does whiting play a central role in the food web of the western Baltic Sea?

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Evaluations of management strategies for Norway pout in the North Sea and Skagerrak

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Fisk, fiskeri, fiskeriforvaltning og udnyttelse af marine ressourcer

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How important is whiting in the western Baltic Sea ecosystem?

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Authors: Ross, S. D. (Intern), Nielsen, J. R. (Intern), Gislason, H. (Intern), Andersen, N. G. (Intern)
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Event: Abstract from Baltic Sea Science Congress, Klaipeda, Lithuania.
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Improved management based on stock identification of eastern and western Baltic cod

The objective of this project was to establish an empirically founded knowledge base for the sustainable exploitation of the western Baltic cod stock by including the complex stock structure and migration patterns.

Stock mapping: Extensive immigration of "Eastern" cod into the Arkona Basin (SD 24) within the "Western" cod's management unit was documented using high-powered genetic tools. The majority (91%) of all spawning fish caught in SD 24 in 2011 were "Eastern" cod and only 9% were from the "Western" stock. The results suggest that the stock structure in the Arkona Basin is highly influenced by mixing of genetically separate stocks.

Trends in mixing: Since the 1980's where cod in SD 24 consisted primarily of "Western" type, the proportion of "Eastern" cod has increased, particularly since 2005. Throughout that period, the immigration of "Eastern" cod into SD 24 consisted primarily of adult, older fish. The changes in biological characteristics (mean size at age, condition and maturity) observed in that area since 2005 are thus a direct consequence of the extensive immigration of "Eastern" cod. As no seasonal signals in stock mixing were observed, the immigration is not associated with a change in "Eastern" cod's spawning behaviour.

Management: The stock mixing proportions were successfully implemented in DTU Aqua's modeling framework for management scenarios. "Eastern" immigrants into SD 24 lead the management procedure to advice for higher TACs that enhance the pressure on the fishing mortality level in SD 22. The fishing mortality level in SD 22 in this situation will need to be lowered i.e. by allocating more effort and catch from SD 22 to SD 24. Higher landings are expected if effort is re-directed/re-allocated to SD 24, profiting from the "Eastern" immigrants. By lowering the fishing mortality in SD 22, the SSB in SD 22 is also preserved, which is assumed to be the main source of recruits for the whole "western" stock (i.e. SD 22 + SD 24). In conclusion: Within the frame of this project we showed that substantial immigration "Eastern" cod into SD 24 has occurred and that these stock dynamics should be incorporated in evaluations of future management plans.

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Integrating individual trip planning in energy efficiency – Building decision tree models for Danish fisheries
Danish fishermen have provided information on dynamics in their fuel consumption, running costs, and fishing patterns through a web-based questionnaire. This detailed documentation of the fishing practices is used in spatial modelling tools to improve advice and research for fisheries. The tools integrate detailed information on vessel distribution, catch and fuel consumption for different fisheries with a detailed resource distribution of targeted stocks from research surveys to evaluate the optimum consumption and efficiency to reduce fuel costs and the costs of displacement of effort. The energy efficiency for the value of catch per unit of fuel consumed is analysed by merging the questionnaire, logbook and VMS (vessel monitoring system) information. Logic decision trees and conditional behaviour probabilities are established from the responses of fishermen regarding a range of sequential hypothetical conditions influencing their trip decisions, covering the duration of fishing time, choice of fishing ground(s), when to stop fishing and return to port, and the choice of the port for landing. Fleet-based energy and economy efficiency are linked to the decision (choice) dynamics. Larger fuel-intensive but efficient vessels conducting pelagic or industrial fishing are more inclined to base their decision on fish price only, while numerous smaller and less efficient vessels conducting demersal mixed or crustacean fishery usually consider other flexible factors, e.g., the potential for a large catch, weather, previous knowledge and experience, and the distance to/from port, which affect the number and duration of trips and the fuel consumption. Integration of the results into our recently developed spatially explicit individual-based fishing vessel model (IBM) incorporate the variability and predict the adaptations of individual fishermen to resource availability dynamics, increasing fuel prices, changes in regulations, and the consequences of socioeconomic external pressures on harvested stocks. A new methodology is described here to obtain quantitative information on the
fishermen's micro-scale decisions initially required

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Localisation of nursery areas based on comparative analyses of the horizontal and vertical distribution patterns of juvenile Baltic cod (Gadus morhua)

Knowledge of the spatial distribution of juvenile cod is essential for obtaining precise recruitment data to conduct sustainable management of the eastern and western Baltic cod stocks. In this study, the horizontal and vertical distribution and density patterns of settled juvenile 0- and 1-group Baltic cod are determined, and their nursery areas are localised according to the environmental factors affecting them. Comparative statistical analyses of biological, hydrographic and hydroacoustic data are carried out based on standard ICES demersal trawl surveys and special integrated trawl and acoustic research surveys. Horizontal distribution maps for the 2001–2010 cohorts of juvenile cod are further generated by applying a statistical log-Gaussian Cox process model to the standard trawl survey data. The analyses indicate size-dependent horizontal and distinct vertical and diurnal distribution patterns related to the seabed topography, water layer depth, and the presence of hydrographic frontal zones (pycnoclines) as well as intraspecific patterns in relation to the presence of adult cod. The extent of the nursery areas also depends on the cod year class strength. Juvenile cod (≥3 cm) are present in all areas of the central Baltic Sea (CBS), showing broad dispersal. However, their highest density in the Baltic Basins is found at localities with a 40–70 m bottom depth in waters with oxygen concentrations above 2 ml O₂.l⁻¹ and temperatures above 5°C. The smallest juveniles are also found in deep sea localities down to a 100 m depth and at oxygen concentrations between 2–4 ml O₂.l⁻¹. The vertical, diurnally stratified and repeated trawling and hydroacoustic target strength-depth distributions obtained from the special surveys show juvenile cod concentrations in frontal zone water layers (pycnocline). However, the analyses indicate that in the CBS, juvenile cod of all sizes do not appear to aggregate in dense schooling patterns, which differs from what has been reported from the North Sea.

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, Section for Marine Living Resources
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A review of EU bio-economic models for fisheries: The value of a diversity of models

The lessons learned from a review of thirteen existing European bio-economic models used in the evaluation of EU policies are presented. 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 analysed. The article concludes 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

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Challenges and opportunities for fleet- and métier-based approaches for fisheries management under the European Common Fishery Policy

The inconsistency of single-species objectives in a mixed-fisheries context has repeatedly been highlighted as a key issue in the current European Common Fishery Policy, and it has long been suggested that this issue would be better addressed through fleet (group of vessels) and métier (type of activity) based approaches. Since the late 1980s, when such approaches were first introduced, there have been substantial developments in this area of science, to the point where the concepts of fleet and métier now underpin the whole EC Data Collection Framework. However, their implementation in the management system has been slow and difficult, being hampered by a number of intrinsic issues. Mixed fisheries are an ongoing “governance headache” combining management complexity, scientific uncertainty and political sensitivity.

This paper summarises the current state of play for fleet-based approaches in EU fisheries management, and highlights our views on both their potential and the challenges they face in the context of the future CFP. As a convenient layer between the current single-stock level and the level of the individual vessel, fleet/metier-approaches could potentially address a wide range of issues, especially with regards to the policy emphasis on ecosystem-based fisheries management. However, the rigid categorisation they induce may not properly address the flexibility of individual vessels, and should therefore be supplemented by more detailed considerations at the local scale.
Coupled economic–ecological models for EBFM

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Coupled economic-ecological models for ecosystem-based fishery management: Exploration of trade-offs between model complexity and management needs

Ecosystem based fishery management has moved beyond rhetorical statements calling for a more holistic approach to resource management, to implementing decisions on resource use that are compatible with goals of maintaining ecosystem health and resilience. Coupled economic-ecological models are a primary tool for informing these decisions. Recognizing the importance of these models, the International Council for the Exploration of the Seas (ICES) formed a Study Group on Integration of Economics, Stock Assessment and Fisheries Management (SGIMM) to explore alternative modelling approaches that bring the multiple disciplines of economics, ecology, and stock assessment into integrated ecosystem models. The theme session was designed to be an extension of a series of workshops and theme sessions organized by the SGIMM, but highlighted the economic component of coupled models. Although economic and ecological systems are inherently complex, models are abstractions of these systems incorporating varying levels of complexity depending on available data and the management issues to be addressed. The objective of this special session was to assess the pros and cons of increasing model complexity to incorporate linkages between ecosystem components and processes. While more complex ecosystem models may provide greater insight into how management decisions and human actions propagate through the ecosystem and impact the value of ecosystem services, the resources and
information required to develop and parameterize them is greater and these models tend to require trade-offs such as the inability to quantify uncertainty or model human behaviour as accurately as can be done with models of individual fisheries. The theme session was organized as a moderated panel format representing a progression of economic-ecological models from less to increasingly complex. The panel was selected to represent a range of models from fully integrated, highly detailed and dynamic economic-ecological models such as Atlantis to models that may be less detailed or not fully dynamic or integrated. The special session focused primarily on management issues that are of a longer term strategic nature such as the implications of climate change, fundamental regime change, or the role of forage species in an ecosystem. Each panellist provided an overview of their model including the management questions the model was designed to address, the data and time requirements, as well as any lessons learned. The panellist presentations were followed by an open discussion among the panellists and the audience. The abstracts for each of the panellist presentation are provided below followed by a summary of the issues raised during the moderated discussion session.

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**DISPLACE: a dynamic, individual-based model for spatial fishing planning and effort displacement: Integrating underlying fish population models**

We previously developed a spatially explicit, individual-based model (IBM) evaluating the bio-economic efficiency of fishing vessel movements between regions according to the catching and targeting of different species based on the most recent high resolution spatial fishery data. The main purpose was to test the effects of alternative fishing effort allocation scenarios related to fuel consumption, energy efficiency (value per litre of fuel), sustainable fish stock harvesting, and profitability of the fisheries. The assumption here was constant underlying resource availability. Now, an advanced version couples the vessel model to selected size-based population models and considers the underlying resource dynamics in the distribution and density patterns of the targeted stocks for the cases of Danish and German vessels harvesting the North Sea and Baltic fish stocks. The stochastic fishing process includes direct and local depletion by stock that is specific to the vessel catching power, which is proportional to the encountered size-based population on the visited ground and is based on stock assessment and research survey data. The impact of the potential fishing effort displacement by vessels on the fish stocks, with resulting fishing mortality, and the vessels’ economic consequences are evaluated on high spatial and seasonal disaggregation levels by simulating different individual choices of vessel speed, fishing grounds and ports. All tested scenarios led to increased overall energy efficiency, except for the fishing closures that increased fuel consumption and costs for most of the vessels due to increased travel distance. On an individual scale, the simulations led to gains and losses due to either the technical interactions between vessels exploiting the same stocks or to the alteration of individual fishing patterns. We demonstrate that integrating the spatial activity of vessels and local fish stock abundance dynamics allow for interactions and more realistic predictions of fishermen behaviour, revenues and stock abundance.

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Publication: Research › Conference abstract for conference – Annual report year: 2012
Do Norway pout (Trisopterus esmarkii) die from spawning stress?: Mortality of Norway pout in relation to growth, maturity and density in the North Sea, Skagerrak and Kattegat

The mortality patterns of Norway pout (NP) are not well understood. It has been suggested that NP undergo heavy spawning mortality, and this paper summarizes and provides new evidence in support of this hypothesis. The very low–absent fishing activity in recent years provides a unique opportunity to analyse the natural life-history traits of cohorts in the NP stock in the North Sea. Based on the ICES trawl survey abundance indices, cohort mortality is found to significantly increase with age. We argue that this cannot be explained by selectiveness in the fishery, potential size-specific migrations out of the area, higher predation pressure on older individuals, or differences in survey catchability by NP age from before to after spawning and that it is higher in the main spawning areas than outside. We found that natural mortality (M) is significantly correlated with sexual maturity, sex, growth, and intraspecific stock density. All of this is consistent with a greater mortality occurring mainly from the first to the second quarter of the year, i.e. spawning mortality, which is discussed as being a major direct and indirect cause of stock mortality.
Ecological – economic modelling: Introduction and presentation to World Fisheries Conference (WFC)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Schmidt, J. (Ekstern), Nielsen, J. R. (Intern)
Publication date: 2012
Event: Abstract from World Fisheries Congress, Edinburgh, United Kingdom.
Main Research Area: Technical/natural sciences

Bibliographical note
Publication: Research › Conference abstract for conference – Annual report year: 2012

Evaluations of Management strategies for Norway pout in the North Sea and Skagerrak Report (NOP-MSE)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Public Sector Consultancy, Section for Management Systems
Authors: Vinther, M. (Intern), Nielsen, J. R. (Intern)
Number of pages: 41
Publication date: 2012

Publication information
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea (ICES)
Original language: English
Series: ICES CM
Volume: ACOM:69
Main Research Area: Technical/natural sciences
Publication: Research › Report – Annual report year: 2012

Impact assessment (IA) of alternative HCRs to the current multiannual Baltic Sea plan on the bio-economy of fleets – coupling the SMS model to the FLR Baltic model

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems, Section for Public Sector Consultancy
Authors: Bastardie, F. (Intern), Vinther, M. (Intern), Nielsen, J. R. (Intern)
Pages: 85-118
Publication date: 2012
North Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Nielsen, J. R. (Intern), Kenny, A. (Ekstern), Mackinson, S. (Ekstern), Quesne, W. (Ekstern), Raid, T. (Ekstern), Döring, R. (Ekstern)
Pages: 45-63
Publication date: 2012

Host publication information
Title of host publication: Development of the Ecosystem Approach to Fisheries Management (EAFM) in European seas: EU STECF-EWG-11-13 Report, Rennes, France 16-20 January 2012
Place of publication: Luxembourg
Publisher: Publications Office of the European Union
Editors: Gascuel, D., Döring, R., Kenny, A., Druon, J.
Chapter: 6
Main Research Area: Technical/natural sciences
Publication: Research › Report chapter – Annual report year: 2012


General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Nielsen, J. R. (Intern), Shelton, P. (Ekstern), Schweigert, J. (Ekstern)
Number of pages: 157
Publication date: 2012

Publication information
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea (ICES)
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions: ACOM4312.pdf
Links:

Bibliographical note
ICES CM 2012/ACOM:43
Publication: Research › Report – Annual report year: 2012

Transforming knowledge into quantitative modelling: Danish fishers respond to a web-based survey on dynamics in fuel consumption and fishing patterns

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Andersen, B. S. (Intern), Eigaard, O. R. (Intern)
Publication date: 2012
Use of high resolution spatial analysis of effort and landings for supplementing impact assessment on Western Baltic fisheries

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Miethe, T. (Ekstern), Bastardie, F. (Intern), von Dorrien, C. (Ekstern), Nielsen, J. R. (Intern)
Publication date: 2012
Event: Poster session presented at World Fisheries Congress, Edinburgh, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2012

Evaluation of effort and TAC quota uptake and capacity use by country as well as efficiency of effort measures according to fishing mortality and fishing power in the Western and Eastern Baltic cod fishery during 2005-2010 in relation to the multi-annual cod management plan

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Publication date: 2011
Host publication information
Place of publication: Luxembourg
Publisher: Publications Office of the European Union
Main Research Area: Technical/natural sciences
Conference: EU STECF EWG-11-07a, Hamburg, Germany, 01/01/2011
Source: orbit
Source-ID: 278754
Publication: Research › Article in proceedings – Annual report year: 2011

Influence of grid orientation and time of day on grid sorting in a small-meshed trawl fishery for Norway pout (Trisopterus esmarkii)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Eigaard, O. R. (Intern), Herrmann, B. (Intern), Nielsen, J. R. (Intern)
Pages: 15-26
Publication date: 2011
Main Research Area: Technical/natural sciences
Publication information
Journal: Aquatic Living Resources
Volume: 25
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
Stock-based and fleet-based evaluation of the multi-annual management plan for the cod stocks in the Baltic Sea with respect to cod stock mixing and TAC vs. effort regulation under different constraints and stock conditions

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern)
Publication date: 2011

Host publication information
A statistical discrimination method using sagittal otolith dimensions between sibling species of juvenile cod Gadus morhua and Gadus ogac from the North-West Atlantic

Greenland cod (Gadus ogac) and Atlantic cod (Gadus morhua) co-exist and are caught in the same fisheries in coastal waters off western Greenland and eastern Canada. Juveniles (General information

State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Nielsen, J. R. (Intern), Methven, D. A. (Ekstern), Kristensen, K. (Intern)
Pages: 27-45
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Northwest Atlantic Fishery Science
Volume: 43
ISSN (Print): 1813-1859
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 0.317 SNIP 0.442 CiteScore 0.83
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.831 SNIP 1.67 CiteScore 1.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.448 SNIP 0.634 CiteScore 0.91
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.246 SNIP 0.566 CiteScore 0.75
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.199 SNIP 0.423 CiteScore 0.33
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.646 SNIP 0.816 CiteScore 2.24
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.81 SNIP 0.747
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.609 SNIP 0.467
Web of Science (2009): Indexed yes
Scopus rating (2008): SJR 0.515 SNIP 0.514
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.656 SNIP 0.568
Scopus rating (2006): SJR 0.791 SNIP 0.722
Comparative evaluation of a mixed-fisheries effort-management system based on the Faroe Islands example

Total allowable catch (TAC) management has in many fisheries, especially mixed fisheries, failed to meet conservation objectives. For instance, for the Faroe Plateau mixed demersal fisheries, the TAC system failed to achieve the objective of an average annual fishing mortality of 0.45 for the three gadoid stocks cod (Gadus morhua), haddock (Melanogrammus aeglefinus), and saithe (Pollachius virens). Therefore, in 1996, an effort-regulation system with individual transferable effort quotas was introduced to manage the fisheries. Experience has shown that effort management without additional stock-specific measures may not be appropriate for such fisheries. A management strategy evaluation model was developed to compare an effort-management system based on the Faroese example with a TAC system as currently applied in EU fisheries. Results show that when stocks are considered in isolation, a total allowable effort system does not necessarily perform better than a TAC one. It depends on stock status and dynamics, the level of uncertainty, and the reactivity of the system to changes in scientific advice. When the stocks are considered together in mixed fisheries, effort management seems, however, to be appropriate, and interannual flexibility of the system appears to be the best compromise between short- and long-term objectives, as well as between biological sustainability and economic return.
Detailed mapping of fishing effort and landings by coupling fishing logbooks with satellite-recorded vessel geo-localisation

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Ulrich, C. (Intern), Egekvist, J. (Intern), Degel, H. (Intern)
Publication date: 2010
Event: Poster session presented at Conference on Making the Most of Fisheries Information - Underpinning Policy, Management and Science, 23-26 Aug, Galway, Ireland,
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 268926
Publication: Research › Poster – Annual report year: 2010

Detailed mapping of fishing effort and landings by coupling fishing logbooks with satellite-recorded vessel geo-location

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Ulrich, C. (Intern), Egekvist, J. (Intern), Degel, H. (Intern)
Effects of fishing effort allocation scenarios on energy efficiency and profitability: an individual-based model applied to Danish fisheries

Global concerns about CO2 emissions, national CO2 quotas, and rising fuel prices are incentives for the commercial fishing fleet industry to change their fishing practices and reduce fuel consumption, which constitutes a significant part of fishing costs. Vessel-based fuel consumption, energy efficiency (quantity of fish caught per litre of fuel used), and profitability are factors that we simulated in developing a spatially explicit individual-based model (IBM) for fishing vessel movements. The observed spatial and seasonal patterns of fishing effort for each fishing activity are evaluated against three alternative effort allocation scenarios for the assumed fishermen's adaptation to these factors: (A) preferring nearby fishing grounds rather than distant grounds with potentially larger catches and higher values, (B) shifting to other fisheries targeting resources located closer to the harbour, and (C) allocating effort towards optimising the expected area-specific profit per trip. The model is informed by data from each Danish fishing vessel >15 m after coupling its high resolution spatial and temporal effort data (VMS) with data from logbook landing declarations, sales slips, vessel engine specifications, and fish and fuel prices. The outcomes of scenarios A and B indicate a trade-off between fuel savings and energy efficiency, while scenario C shows increased profits from decreased fuel consumption and larger landings. Based on recent advances in VMS and logbooks data analyses, this paper contributes to improve the modelling of fishing effort allocation, fuel consumption and catch distribution on a much disaggregated level compared to the fleet-based models we developed so far.
Existing bio-economic models review

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Prellezo, R. (Ekstern), Accadia, P. (Ekstern), Andersen, J. L. (Ekstern), Andersen, B. S. (Intern), Buisman, E. (Ekstern), Little, A. (Ekstern), Nielsen, J. R. (Intern), Poos, J. J. (Ekstern), Powell, J. (Ekstern), Röckmann, C. (Ekstern)
Publication date: 2010

Host publication information
Title of host publication: Proceedings of the Fifteenth Biennial Conference of the International Institute of Fisheries Economics & Trade, July 13-16, 2010, Montpellier, France: Economics of Fish Resources and Aquatic Ecosystems: Balancing Uses, Balancing Costs
Place of publication: Corvallis, OR, USA
Publisher: International Institute of Fisheries Economics & Trade
ISBN (Print): 0-9763432-6-6
Main Research Area: Technical/natural sciences
Conference: Fifteenth Biennial Conference of the International Institute of Fisheries Economics & Trade, July 13-16, Montpellier, France, 01/01/2010
Source: orbit
Source-ID: 274467
Publication: Research › Article in proceedings – Annual report year: 2010

Existing bioeconomic models review

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Prellezo, R. (Ekstern), Accadia, P. (Ekstern), Andersen, J. (Ekstern), Andersen, B. S. (Intern), Buisman, E. (Ekstern), Little, A. (Ekstern), Nielsen, J. R. (Intern), Poos, J. J. (Ekstern), Powell, J. (Ekstern), Röckmann, C. (Ekstern)
Pages: 1-12
Publication date: 2010

Host publication information
Title of host publication: IIFET 2010 Montpellier Proceedings
Main Research Area: Technical/natural sciences
Conference: IIFET 2010, Montpellier, France, 01/01/2010
Source: orbit
Source-ID: 268958
Publication: Research › Article in proceedings – Annual report year: 2010


General information
State: Published
Stock-based vs. fleet-based evaluation of the multi-annual management plan for the cod stocks in the Baltic Sea

This study evaluated the EU 2008 multi-annual plan for Baltic cod stock recovery. The plan combines harvest control rules that set TACs with reductions in direct effort (E) and fishing mortality (F). Performance and robustness of the plan are tested with a management strategy evaluation model (MSE). Stochastic simulations are carried out under different scenarios of recruitment and sources of uncertainties. Under the different magnitudes of errors investigated, the plan in its current design is likely to reach precautionary targets for the Eastern and the Western Baltic cod stocks by 2015. It is, however, more sensitive to implementation errors (e.g. catch misreporting) than to observation errors (e.g. data collection) when the (i) current settings of the ICES single-stock assessment model are maintained, (ii) intended fishing effort reduction is fully complied with, and (iii) biological parameters are assumed constant. For the Eastern Baltic stock, additional sources of uncertainties from fishery adaptation to the plan are tested using a fleet-based and spatially explicit version of the model which leads to higher reductions in F and no significant change in management robustness. The relative difference between both approaches is mainly due to differences in exploitation patterns in catching the same amount of fish. The effort control is demonstrated to be more efficient when supplemented with a TAC and avoids unintended effects from fishery responses, e.g. spatial effort reallocation. Medium term economic evaluation of fishery performance shows an initial reduction in profit with effort and TAC reductions, but profit is always positive. (C) 2009 Elsevier B.V. All rights reserved.
The eastern Baltic cod fishery: a fleet-based management strategy evaluation framework to assess the cod recovery plan of 2008

The paper develops a biological-economic evaluation tool to analyse the consequences for trawl fishers of implementing more selective fishing technologies. This is done by merging a dynamic biological population model and an economic cost-benefit evaluation framework to describe the consequences for the fish stocks, fishermen and society. The bio-economic evaluation is applied to the case of the Danish trawl fishery in Kattegat and Skagerrak, which experiences a high level of discards and bycatches of several species. Four different kinds of selectivity scenarios are evaluated in comparison with a baseline. The results from the evaluation are indicators for the consequences on ecological and economic levels. The results show that implementation of different selective fishing gear in the Kattegat and Skagerrak mixed trawl fisheries generally implies a trade off over time between rebuilding the stocks and economic loss. Moreover, the analysis shows that implementation of more selective gear is not always beneficial. (C) 2009 Elsevier Ltd. All rights reserved.

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, University of Southern Denmark
Authors: Grønbæk Kronbak, L. (Ekstern), Nielsen, J. R. (Intern), Jørgensen, O. A. (Intern), Vestergaard, N. (Ekstern)
Pages: 3665-3674
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Environmental Management
Volume: 90
Issue number: 11
ISSN (Print): 0301-4797
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
By-catch reduction in a small meshed North sea trawl fishery through gear developments

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Eigaard, O. R. (Intern), Nielsen, J. R. (Intern)
Pages: 1-18
Publication date: 2009

Host publication information
Title of host publication: ICES C.M.
Volume: M:22
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 251096
Publication: Research - peer-review › Journal article – Annual report year: 2009

Evaluating biological robustness of innovative management alternatives

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries Advice
Authors: Bastardie, F. (Intern), Baudron, A. (Ekstern), Bilocca, R. (Ekstern), Boje, J. (Intern), Bult, T. P. (Ekstern), Garcia, D. (Ekstern), Hintzen, N. T. (Ekstern), Nielsen, J. R. (Intern), Petursdottir, G. (Ekstern), Sanchez, S. (Ekstern), Ulrich, C. (Intern)
Number of pages: 269
Pages: 119-142
Publication date: 2009

Host publication information
Title of host publication: Comparative Evaluations of Innovative Fisheries Management.
Place of publication: Dordrecht
Publisher: Springer Science+Business Media B.V.
Evaluation of the multiannual plan for the cod stocks in the Baltic Sea

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy, Section for Monitoring
Authors: Bastardie, F. (Intern), Vinther, M. (Intern), Nielsen, J. R. (Intern), Ulrich, C. (Intern), Storr-Paulsen, M. (Intern)
Number of pages: 29
Publication date: 2009

Host publication information
Title of host publication: Book of Abstracts
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 314574
Publication: Research › Conference abstract in proceedings – Annual report year: 2010

Managing fleets and fisheries

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Nielsen, J. R. (Intern), Limborg, M. (Intern)
Pages: 8-9
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: World Fishing
Volume: 58
Issue number: 1
ISSN (Print): 0043-8480
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Links:
http://www.worldfishing.net/analysis/analysis.ehtml?q=2671
Source: orbit
Source-ID: 239779
Publication: Research › Journal article – Annual report year: 2009

Managing fleets and fisheries rather than single stocks – conceptual change in European fisheries management advice

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources
Maturity and growth population dynamics of Norway pout (Trisopterus esmarkii) in the North Sea, Skagerrak, and Kattegat

The population dynamics of the Norway pout stock in the North Sea are investigated by statistical analyses, and GIS of ICES International Bottom Trawl Surveys (IBTS) and Danish commercial catch data from 1983 to 2006. The stock spawns mainly around mid-February along the northeastern English and Scottish coasts and between Shetland and Norway. Sex ratios indicate that males, which mature younger than females (age-at-50%-maturity, respectively, 1.2 and 1.5 years), migrate out of the Skagerrak–Kattegat to the spawning grounds before females. There is a decrease in the 2+-group maturity ratios as well as in weight and female length from before to after spawning. The results indicate spawning mortality. Only some 20% of the 1-group reaches maturity in the first quarter, which is higher than assumed in the stock assessment. Although the maturity ogives are variable over time, this difference should be taken into account when estimating spawning-stock biomass in routine assessments. Growth is also variable, with a tendency for male maximum length to be smaller than that of females, and immature fish to be smaller than mature ones in each age group. The juvenile growth rate is higher when the stock density is low and results in a reduced age-at-50%-maturity. Besides these intraspecific patterns, the growth rates show interspecific links to stock sizes of the important predators: cod, haddock, and whiting.
Potentials and challenges in fleet- and métierbased approaches for fisheries management in the CFP

General information
State: Published
Organisations: Section for Fisheries Advice, National Institute of Aquatic Resources, Section for Management Systems
Authors: Ulrich, C. (Intern), Wilson, D. (Ekstern), Nielsen, J. R. (Intern), Reeves, S. (Ekstern)
Pages: 1-21
Publication date: 2009

Host publication information
Title of host publication: ICES C.M.
Volume: R:06
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252781
Publication: Research › Article in proceedings – Annual report year: 2009

Survey of existing bioeconomic models. Final Consolidated EU Report

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Prellezo, R. (Ekstern), Little, A. (Ekstern), Nielsen, J. R. (Intern), Andersen, B. S. (Intern), Andersen, J. L. (Ekstern), Rockmann, C. (Ekstern), Accadia, P. (Ekstern), Powell, J. (Ekstern)
Publication date: 2009

Publication information
A method for the possible species discrimination of juvenile gadoids by broad-bandwidth backscattering spectra vs. angle of incidence

Measurements were made of the broad-bandwidth (80-220 kHz) acoustic backscattering from free-swimming juvenile gadoids at various orientations and positions in an acoustic beam, under controlled conditions. The experimental apparatus consisted of a stereo-video camera system, a broad-bandwidth echosounder and echo-processor system, a narrowband 120 kHz split-beam echosounder, a large tank, and a fishnet cage. The net cage was centred on the acoustic beams and was virtually transparent, both acoustically and optically. Accurate three-dimensional positions and angular orientations of individual fish were estimated from stereo-images captured synchronously when broad-bandwidth echoes were received from passing fish. Fish positions were also estimated from data collected with a synchronized split-beam echosounder. Software was developed for image analysis and modelling, including calibration, alignment of acoustic and optical-reference frames, and automatic position-fitting of fish models to manually marked fix-points on fish images. The software also performs Fourier spectrum analysis and pulse-shape analysis of broad-bandwidth echoes. Therefore, several measurement series on free-swimming juvenile gadoids were evaluated. The method and data may be used to improve the acoustic identification of fish species and sizes, and thereby improve investigations of spatial prey-predator relationships, and the accuracy and efficiency of acoustic surveys.
EFIMAS. Managing fisheries in a virtual environment in order to provide more reliable scientific advice to stakeholders

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Pages: 48-49
Publication date: 2008

Host publication information
Title of host publication: Compilation of technical leaflets
Volume: FF-ALL-Advice-01
Main Research Area: Technical/natural sciences
Conference: PROFET Policy Transnational Workshops, North Sea Fisheries, Copenhagen, 01/01/2008
Source: orbit
Source-ID: 278712
Publication: Research › Article in proceedings – Annual report year: 2008

Final Consolidated EFIMAS Project Report (Month 48). Final Report of SSP8-CT-2003-502516 EFIMAS Project covering and summarising 20 special subject and task final reports under the project. Final Report to the EU Commission

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 112
Publication date: 2008

Publication information
Original language: English
Implementation of more selective and sustainable fisheries (IMPSEL)

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Secretariat for Management and Communication
Publication date: 2008
Main Research Area: Technical/natural sciences

Bibliographical note
Rasmus Nielsen was also editor
Source: orbit
Source-ID: 252807
Publication: Research › Report – Annual report year: 2009

Implementering af mere selektive og skånsomme fiskerier: Begreber og internationale erfaringer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Number of pages: 143
Publication date: 2008

Bibliographical note
IMPSEL AP1 Project Report
Source: orbit
Source-ID: 225369
Publication: Research › Report – Annual report year: 2008

Implementering af mere selektive og skånsomme fiskerier (IMPSEL)

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Secretariat for Management and Communication
Implementering af mere selektive og skånsomme fiskerier: Konklusioner, anbefalinger og perspektivering

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Number of pages: 52
Publication date: 2008

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-74-81053-7
Original language: Danish
Series: DTU Aqua-rapport
Number: 177-08
Main Research Area: Technical/natural sciences
Electronic versions:
177-08_elektronisk_samlet.pdf
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008

Bibliographical note
IMPSEL AP3 Project Report
Source: orbit
Source-ID: 226886
Publication: Research › Report – Annual report year: 2008

Observed reactions of fish in captivity to replayed vessel-noise sounds from the fisheries research vessel Dana

General information
State: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Stage, B. (Intern), Stæhr, K. (Intern), Nielsen, J. R. (Intern), Lundgren, B. (Intern)
Pages: 217-219
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioacoustics
Volume: 17
ISSN (Print): 0952-4622
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
Et flerårigt grundlag for dansk industrifiskeri: Biologisk vurdering af ressourcegrundlaget og analyse af forvaltningsmodeller

General information
State: Published
Organisations: Institute Management, National Institute of Aquatic Resources, Section for Population- and Ecosystem Dynamics, Section for Fisheries Advice, Section for Management Systems, Section for Monitoring
Authors: Kirkegaard, E. (Intern), Jensen, H. (Intern), Mosegaard, H. (Intern), Vinther, M. (Intern), Payne, M. (Intern), Nielsen, J. R. (Intern), Dalskov, J. (Intern)
Number of pages: 63
Publication date: 2007

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Tekniske Universitet. Danmarks Fiskeriundersøgelser
Original language: Danish
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252804
Publication: Research › Report – Annual report year: 2007
TEMAS: fleet-based bio-economic simulation software to evaluate management strategies accounting for fleet behaviour
TEMAS (technical management measures) is a fleet-based bio-economic software for evaluating management strategies accounting for technical measures and fleet behaviour. It focuses on mixed fisheries in which several fleets can choose among several fishing activities to target different stocks in one or several areas. The software combines a management strategy evaluation framework, using a forward-running operating model and a management procedure with a fleet behaviour module simulating both short-term (effort allocation) and long-term (entry/exit) fleet dynamics. The suite of models behind TEMAS can be thought of as an extension of the traditional ICES forecast model. Alternative management scenarios can be compared and evaluated for their bio-economic consequences and robustness to parameter uncertainty. The software is generic and user-friendly, and can be run at several space and time scales.
Ecological side-effects of fishing from the fisheries management perspective

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Tserpes, G. (Ekstern), Peristeraki, P. (Ekstern), Nielsen, J. R. (Intern)
Number of pages: 476
Pages: 267-294
Publication date: 2006

Host publication information
Title of host publication: The knowledge base for fisheries management
Volume: 10
Place of publication: Amsterdam
Publisher: Elsevier
Editors: Motos, L., Wilson, D.
Edition: 1
ISBN (Print): 04-44-52850-4
Series: Developments in aquaculture and fisheries science series
Number: 36
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227704
Publication: Research - peer-review › Book chapter – Annual report year: 2006

Effort and capacity based fisheries management

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern), Sparre, P. J. (Intern), Hovgård, H. (Intern), Frost, H. (Ekstern), Tserpes, G. (Ekstern)
Pages: 163-216
Publication date: 2006

Host publication information
Title of host publication: The knowledge base for fisheries management
Volume: 7
Place of publication: Amsterdam
Gear technological approaches to reduce un-wanted by-catch in commercial Norway pout fishery in the North Sea

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Nielsen, J. R. (Intern), Madsen, N. (Intern)
Pages: 1-11
Publication date: 2006

Host publication information
Title of host publication: ICES C.M.
Volume: ACFM:35
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Main Research Area: Technical/natural sciences
Conference: Meeting in Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 01/01/2006
Source: orbit
Source-ID: 238645
Publication: Research › Article in proceedings – Annual report year: 2006

Report of discard in the Danish fishery

General information
State: Published
Organisations: Section for Public Sector Consultancy, National Institute of Aquatic Resources, Section for Management Systems
Authors: Dalskov, J. (Intern), Fischer, K. (Ekstern), Løkkegaard, J. (Ekstern), Madsen, A. (Ekstern), Madsen, N. (Ekstern), Nielsen, J. R. (Intern), Pallisgaard, B. (Ekstern)
Publication date: 2006

Publication information
Place of publication: Copenhagen, Denmark
Publisher: Danish Ministry of Agriculture, Fisheries and Food
Original language: English
Series: Ministerial working report
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 260297
Publication: Research › Report – Annual report year: 2006

Direct spectral calibration of an experimental wideband echosounder: Procedures and results

General information
State: Published
Organisations: Section for Monitoring, National Institute of Aquatic Resources, Section for Management Systems
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern)
Publication date: 2005
Main Research Area: Technical/natural sciences
Source: orbit
EFIMAS - Operational Evaluation Tools for Fisheries Management Options

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: EFSA Publication
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: EFIMAS - Operational Evaluation Tools for Fisheries Management Options
Original language: English
Links:
Source: orbit
Source-ID: 260334
Publication: Research › Journal article – Annual report year: 2005

Öresundsförbindelens inverkan på fisk och fiske. Underlagsrapport 1992-2005

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: EFSA Publication
Number of pages: 224
Publication date: 2005

Publication information
Place of publication: Göteborg, Sweden
Publisher: Fiskeriverket
Original language: Swedish
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 260371
Publication: Research › Report – Annual report year: 2005

Virtual fisheries management

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Pages: 31-33
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES/CIEM newsletter
Volume: 42
ISSN (Print): 1684-0011
Original language: English
Source: orbit
Source-ID: 226890
Publication: Research › Journal article – Annual report year: 2005

EFIMAS - Operational Evaluation Tools for Fisheries Management Options

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Experiments for possible hydroacoustic discrimination of free-swimming juvenile gadoid fish by analysis of broadband pulse spectra as well as 3D fish position from video images and split beam acoustics

General information
State: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern)
Pages: 1-16
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES C.M. 2004/
Volume: R:25
Original language: English
Source: orbit
Source-ID: 226483
Publication: Research › Conference article – Annual report year: 2004

Forskningsprojekt skal skaffe bedre fiskeriforvaltning i Europa

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern), Laursen, U. (Ekstern)
Pages: 1-2
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: externForum
Volume: 46
Original language: Danish
Source: orbit
Source-ID: 226882
Publication: Research › Journal article – Annual report year: 2004

Hydroacoustic ex situ target strength measurements of free-swimming juvenile gadoids in relation to variations in 3D fish position and angular orientation obtained from synchronized video images

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Monitoring
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern)
Publication date: 2004
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258087
Publication: Research › Poster – Annual report year: 2004
Survey gear calibration independent of spatial fish distribution
Trawl surveys provide important information for evaluation of relative stock abundance fluctuations over time. Therefore, when survey gears or vessels are changed, it is important to compare the efficiency and selectivity of old and new gears and vessels. A method for estimation of conversion factors is developed based on a survey design where paired hauls are taken in the same trawl track line. The method explicitly accounts for changes in fish density caused by trawling disturbance. A generalized linear model for paired hauls catches is analytically derived and the gear conversion and disturbance parameters with their precision are obtained using standard software. Simulation studies carried out additionally showed that the estimated conversion factors were practically unbiased. Because of the independence of the spatial fish distribution, the new method is preferable to the traditional paired hauls design for which it is generally not possible to obtain the statistical properties of the estimated conversion factors. The paper is concluded with suggestions on how to optimize survey design. The method was used to estimate conversion factors for Atlantic cod (Gadus morhua) from Danish gear calibration experiments in the Baltic Sea.
A bootstrapping method to evaluate research vessel survey indices for XSA-tuning, applied to western Baltic cod

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Sparre, P. J. (Intern), Munch-Petersen, S. (Intern), Nielsen, J. R. (Intern)
Pages: 1-27
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information

Journal: ICES Council Meeting
ISSN (Print): 1015-4744
Ratings:
Vertical migration and dispersion of sprat (Sprattus sprattus) and herring (Clupea harengus) schools at dusk in the Baltic Sea

In populations of herring (Clupea harengus) or sprat (Sprattus sprattus), one typically observes a pattern of schools forming at dawn and dispersing at dusk, usually combined with vertical migration. This behaviour influences interactions with other species; hence a better understanding of the processes could contribute to deeper insight into ecosystem dynamics. This paper reports field measurements of the dispersal at dusk and examines two hypotheses through statistical modelling: that the vertical migration and the dissolution of schools is determined by decrease in light intensity, and that the dissolution of schools can be modelled by diffusion, i.e. active repulsion is not required. The field measurements were obtained during 3 days in March at one location in the Baltic Sea and included continuous hydroacoustical monitoring, trawl samples, and hydrographical CTD data. Echogram patterns were analysed using the school detection module in Echoview® and local light intensities were calculated using a model for surface illuminance. The data and the analysis support that schools migrate upwards during dusk, possibly trying to remain aggregated by keeping the local light intensities above a critical threshold, that schools initiate their dissolution when ambient light intensity drops below this critical threshold, and that fish subsequently swim in an uncorrelated random walk pattern.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology, Section for Management Systems
Pages: 317-324
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquatic Living Resources
Volume: 16
Issue number: 3
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
Experiments for possible hydroacoustic discrimination of free-swimming juvenile gadoid fish by analysis of broadband pulse spectra as well as 3D fish position form video images and split beam acoustics

Measurements were made of the broad-bandwidth (80–220 kHz) acoustic backscattering from free-swimming juvenile gadoids at various orientations and positions in an acoustic beam, under controlled conditions. The experimental apparatus consisted of a stereo-video camera system, a broad-bandwidth echosounder and echo-processor system, a narrow-band 120 kHz split-beam echosounder, a large tank, and a fishnet cage. The net cage was centred on the acoustic beams and was virtually transparent, both acoustically and optically. Accurate three-dimensional positions and angular orientations of individual fish were estimated from stereo-images captured synchronously when broad-bandwidth echoes were received from passing fish. Fish positions were also estimated from data collected with a synchronized split-beam echosounder. Software was developed for image analysis and modelling, including calibration, alignment of acoustic and
optical-reference frames, and automatic position-fitting of fish models to manually marked fix-points on fish images. The software also performs Fourier spectrum analysis and pulse-shape analysis of broad-bandwidth echoes. Therefore, several measurement series on free-swimming juvenile gadoids were evaluated. The method and data may be used to improve the acoustic identification of fish species and sizes, and thereby improve investigations of spatial prey–predator relationships, and the accuracy and efficiency of acoustic surveys.

**General information**
State: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern)
Pages: 297-299
Publication date: 2002
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Bioacoustics
Volume: 12
Issue number: 2-3
ISSN (Print): 0952-4622
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 0.594 SNIP 0.936 CiteScore 1.62
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.589 SNIP 0.957 CiteScore 1.13
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.353 SNIP 0.568 CiteScore 0.79
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.354 SNIP 0.613 CiteScore 0.83
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.392 SNIP 0.612 CiteScore 0.85
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.484 SNIP 0.715 CiteScore 1.31
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.332 SNIP 0.57
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.301 SNIP 0.62
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.326 SNIP 0.874
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.471 SNIP 1.085
Scopus rating (2006): SJR 0.356 SNIP 0.36
Scopus rating (2005): SJR 0.498 SNIP 0.431
Scopus rating (2004): SJR 0.15 SNIP 0.397
Scopus rating (2003): SJR 0.222 SNIP 0.48
Scopus rating (2002): SJR 0.406 SNIP 1.323
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.195 SNIP 0.306
Scopus rating (2000): SJR 0.238 SNIP 0.275
Scopus rating (1999): SJR 0.227 SNIP 0.193
Non-predation natural mortality of Norway pout (Trisopterus esmarkii) in the North Sea

Based on age disaggregated data on catch rates in bottom trawl surveys, commercial catches, and the number consumed by the North Sea piscivorous predators, new estimates of non-predation natural mortality, M1, are obtained for Norway pout [Trisopterus esmarkii (Nilsson)]. Simple log catch ratio analysis and rough maximum likelihood procedures are applied. The analysis focus on the year classes 1977–1981 and 1987–1991, which are represented in the extensive stomach sampling of North Sea piscivorous fish in 1981 and 1991. Although the M1 of Norway pout varied between the two periods, in both periods it increased with age and was very high for age 2 and older fish (0.10 for age 1, 1.74 for age 2, 2.58 for age 3 and 3.05 for age 4 for the 1977–1981 year classes and 0.10 for age 1, 2.03 for age 2, 3.04 for age 3 and 4.39 for age 4 for the 1987–1991 year classes). This difference between the two periods is not significant. Survey data from each quarter of the year show that the main mortality takes place between the 1st and the 2nd quarter of the year, i.e. from before to after spawning, thus pointing at spawning as the main factor.
Results of bottom trawl surveys carried out in Vietnamese waters (20-200 m) in 1996-1997

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Daug, V. (Ekstern), Tran, D. (Ekstern), Nielsen, J. R. (Intern), Riget, F. (Ekstern)
Pages: 15-18
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Naga
Volume: 25
Issue number: 1
ISSN (Print): 0116-290X
Original language: English
Source: orbit
Source-ID: 227481
Publication: Research - peer-review › Journal article – Annual report year: 2002

Verification of multispecies interactions in the North Sea by trawl survey data on Norway pout (Trisopterus esmarkii)

Extensive stomach sampling programmes of North Sea fish during the recent two decades have shown that cod (Gadus morhua), whiting (Merlangius merlangus) and saithe (Pollachius virens) are by far the main predators on Norway pout (Trisopterus esmarkii) of age 1 and older. As the stock sizes of cod, whiting and saithe have decreased significantly over the period, this offers a unique opportunity to test whether the expected decrease in natural mortality of Norway pout can be detected in mortality estimates obtained directly from abundance data. Two surveys, that cover the Norway pout distribution well, have been analyzed and both showed a clear decrease in total mortality consistent with the decline in predator populations. The estimated average predation mortality is similar to that obtained from Multispecies Virtual Population Analysis (MSVPA), but MSVPA does not reflect the variation in mortality over time. It is speculated that this might be a consequence of the model ignoring a potentially high mortality of age 2 and older fish caused by spawning or growth stress.

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Sparholt, H. (Ekstern), Larsen, L. (Ekstern), Nielsen, J. R. (Intern)
Pages: 1270-1275
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 59
Distribution, density and abundance of the western Baltic herring (Clupea harengus) in the Sound (ICES Subdivision 23) in relation to hydrographical features

Biomass and duration of the over-wintering period of the Rugen spring spawning herring stock (RHS) in the Sound (ICES Subdivision 23) were investigated as well as possible hydrographical factors affecting relative distribution and triggering southwards migration towards the spawning grounds. Monitoring was performed during 27 surveys over a 6-year period (1993-1998). Abundance of 45-165 000 t in August-February, 560 000 t in March-May, and
General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Monitoring
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern), Jensen, T. F. (Ekstern), Stæhr, K. (Intern)
Pages: 235-258
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries Research
Volume: 50
Issue number: 3
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
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.944 SNIP 1.023
Web of Science (2004): Indexed yes
Estimation of 3D position, angle of attitude and orientation of free-swimming fish in a hydroacoustic beam field under variable lightning conditions

General information
State: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems, Section for Marine Services
Authors: Lundgren, B. (Intern), Nielsen, H. (Ekstern), Nielsen, J. R. (Intern), Faber, P. (Intern)
Pages: 382-390
Publication date: 2001

Host publication information
Title of host publication: SCIA Proceedings 12th
Main Research Area: Technical/natural sciences
Conference: SCIA 12th, 01/01/2001
Source: orbit
Source-ID: 237636
Publication: Research - peer-review › Article in proceedings – Annual report year: 2001

Feeding habits and density patterns of Greenland cod, Gadus ogac (Richarson 1836) at West Greenland compared to those of the coexisting Atlantic cod, Gadus morhua

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern), Andersen, M. (Ekstern)
Pages: 1-22
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Northwest Atlantic Fishery Science
Volume: 29
ISSN (Print): 0250-6408
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 0.317 SNIP 0.442 CiteScore 0.83
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.831 SNIP 1.67 CiteScore 1.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Final and consolidated Report of the EU Study Projekt No. 98/099 ISDBITS: Improvement of stock assessment and data collection by continuation, standardisation and design improvement of the Baltic International Bottom Trawl Surveys for fishery resources management

**General information**

State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources

Number of pages: 143
Publication date: 2001

**Publication information**

Publisher: [s.n.]
Original language: English

**Series**

EU Study
Number: 98/099
Main Research Area: Technical/natural sciences
Source: orbit
Herring occurrence in the Sound (ICES SD23) in relation to hydrographical features

**General information**

State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology, Section for Marine Services
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern), Jensen, T. F. (Intern), Stæhr, K. (Intern)
Pages: 347-356
Publication date: 2001

**Host publication information**

Title of host publication: Herring: Expectations for a new millennium
Place of publication: Fairbanks, Alaska
Publisher: University of Alaska Sea Grant
ISBN (Print): 978-1-56612-070-8

Series: Sea Grant AK-SG
Number: 01-14
Main Research Area: Technical/natural sciences
Conference: Lowell Wakefield symposium, Anchorage, Alaska, 01/01/2000
Source: orbit
Source-ID: 239160
Publication: Research - peer-review › Article in proceedings – Annual report year: 2001

Non-predation natural mortality of Norway pout in the North Sea

**General information**

State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Sparholt, H. (Ekstern), Larsen, L. (Ekstern), Nielsen, J. R. (Intern)
Pages: 1-13
Publication date: 2001
Main Research Area: Technical/natural sciences

**Publication information**

Journal: ICES C.M. 2001/
Volume: J:39
Original language: English
Source: orbit
Source-ID: 227480
Publication: Research › Conference article – Annual report year: 2001

Time changes in fishing power in the Danish cod fisheries of the Baltic Sea

Using nominal fishing effort to control fishing mortality and using cpue data from commercial fisheries as abundance indices require ability to correct fishing power for temporal development. It is often assumed in ICES stock assessments that fishing power is constant over time. However, experience has suggested that this assumption may be false. This study investigates the time dynamics of an Index of Fishing Power (IFP). This index is based on the fleets cpue. relative to the cpue of a subset of vessels from the same fleet. The primary characteristic of the reference vessels is that their fishing power has not varied much over time. IFP is calculated for some of the Danish cod fisheries in the Baltic Sea. IFP appeared to be independent of the vessel composition of the reference sub- fleet and for the fleets fishing in the Eastern Baltic Sea, but less so for the Western Baltic Sea fleets. Variations in IFP are analysed by a GLM (General Linear Model). Results suggest that fishing power has developed in the Eastern Baltic Sea cod fishery at an annual rate of 2% and 6% for trawlers and gillnetters respectively. Mechanisms of fishing power creeping may include increased technical efficiency and also changes in vessel composition of the fleets over the period of analysis. (C) 2001 International Council for the Exploration of the Sea.

**General information**

State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Technical University of Denmark
Verification of multispecies interactions in the North Sea by trawl data on Norway pout (Trisopterus esmarkii)

An Atlantic herring (Clupea harengus) size selection model for experimental gill nets used in the Sound (ICES Subdivision 23)

Size selection investigations were performed in the Sound with experimental, multipanel gill nets equipped with a broad range of mesh sizes targeting Atlantic herring (Clupea harengus). Each of the 20 experimental fishery surveys covered the central Sound from Helsingor-Helsingborg (north) to Drogden-Klagshamn (south) during the autumn, winter, and spring periods from 1993 to 1998. There was high variability in catch sizes both between and within surveys. The overall best fits, in terms of minimum total deviance across all sets, were achieved using a unimodal normal scale model. Almost all surveys showed high between-set variation, which was accounted for when estimating the mean selectivity curves using a random effects model. The selectivity curves fitted to individual sets were compared with those fitted to the combined data sets. It was demonstrated that analysing pooled data sets resulted in overdispersion and bias in the selection parameters. Irregular time series of the estimates of the selectivity parameters in the investigation period indicated negative autocorrelation with a seasonal pattern.
An experimental set-up for hydroacoustic discrimination of fish species by analysis of broadband pulse spectra combined with image processing

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern)
Publication date: 2000
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258096
Publication: Research › Poster – Annual report year: 2000

An experimental set-up for possible hydroacoustic discrimination of fish species by analysis of broadband pulse spectra combined with image processing

General information
State: Published
Organisations: National Institute of Aquatic Resources
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern), Faber, P. (Intern)
Pages: 1-12
Publication date: 2000

Host publication information
Title of host publication: Working Documents (ICES FAST WG)
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279022
Publication: Research › Article in proceedings – Annual report year: 2000

An experimental set-up for possible hydroacoustic discrimination of fish species by analysis of broadband pulse spectra combined with image processing

General information
State: Published
Organisations: Section for Fisheries- and Monitoring Technology, National Institute of Aquatic Resources, Section for Management Systems, Section for Software and GIS development
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern), Faber, P. (Intern)
Number of pages: 12
Publication date: 2000

Publication information
Place of publication: Copenhagen
Publisher: ICES
Original language: English
Main Research Area: Technical/natural sciences

Bibliographical note
Source: orbit
Source-ID: 226479
Baltic cod: Resolving processes determining spatial and temporal windows of survival

**General information**
State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Institute Management, Section for Management Systems, Technical University of Denmark
Authors: St John, M. A. (Ekstern), Mosegaard, H. (Intern), Hinrichsen, H. (Ekstern), Grønkjær, P. (Ekstern), Köster, F. (Intern), Hüsey, K. (Intern), Nielsen, J. R. (Intern)
Pages: 1-25
Publication date: 2000
Main Research Area: Technical/natural sciences

**Publication information**
Journal: ICES Council Meeting
ISSN (Print): 1015-4744
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2003): Indexed yes
Original language: English
Source: orbit
Source-ID: 227508
Publication: Research › Conference article – Annual report year: 2000

Indsatsforvaltning med henblik på anvendelse i dansk fiskeri

**General information**
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: EFSA Publication
Number of pages: 32
Publication date: 2000

**Publication information**
Place of publication: Charlottenlund
Publisher: Danish Institute for Fisheries Research
Original language: Danish
Main Research Area: Technical/natural sciences

**Bibliographical note**
Source: orbit
Source-ID: 260372
Publication: Research › Report – Annual report year: 2000

ISDBITS PROJECT: Improvement of stock assessment and data collection by continuation, standardisation and design improvement of the Baltic International Bottom Trawl Surveys for Fishery Resources Assessment

**General information**
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern), Hansen, U. (Ekstern), Larsson, P. (Ekstern), Aro, E. (Ekstern), Ernst, P. (Ekstern), Oberst, R. (Ekstern), Rehme, W. (Ekstern), Feldman, V. (Ekstern), Netzal, J. (Ekstern), Järvik, A. (Ekstern), Sics, I. (Ekstern)
Publication date: 2000

**Publication information**
Place of publication: Hirtshals
Publisher: Danmarks Fiskeriundersøgelser
Spatial distribution and maturity of Norway pout in the North Sea

General information
State: Published
Organisations: Unknown
Authors: Larsen, L. (Ekstern), Lassen, H. (Ekstern), Nielsen, J. R. (Intern), Sparholt, H. (Ekstern)
Pages: 1-19
Publication date: 2000

Host publication information
Title of host publication: Working Documents (ICES WGNSSK)
Main Research Area: Technical/natural sciences
Conference: ICES Working Group on the Assessment of Demersal Species in the North Sea and Skagerrak, 01/01/2000
Source: orbit
Source-ID: 279020
Publication: Research › Article in proceedings – Annual report year: 2000

Standardisering og beskrivelse af sammenhængen imellem fiskeriindsats og fiskeridødelighed for de danske demersale fiskerier i Kattegat

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Hovgård, H. (Intern), Nielsen, J. R. (Intern), Marchal, P. (Ekstern)
Number of pages: 86
Publication date: 2000

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-90968-03-04
Original language: Danish

Series: DFU-rapport
Number: 86-00
Main Research Area: Technical/natural sciences
Electronic versions:
86-00_standardisering_og_beskrivelse_af_sammenhængen_imellem_fiskeriindsats_og_fiskeridødelighed_for_danske_demersale_fiskerier_i_kattegat.pdf
Links:
http://www.difres.dk/dk/publication/files/22122003$86-00%20Indsatsprojektrapport%204.pdf
Source: orbit
Source-ID: 225813
Publication: Research › Report – Annual report year: 2000

Standardisering og beskrivelse af sammenhængen imellem fiskeriindsats og fiskeridødelighed for det danske industrifiskeri i Nordsøen og Skagerrak

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Marchal, P. (Ekstern), Nielsen, J. R. (Intern), Hovgård, H. (Intern)
Number of pages: 34
A herring size selection model for experimental gillnets used in the Sound (ICES Subdivision 23)

General information
State: Published
Organisations: Danish Institute for Fisheries and Marine Research
Authors: Poulsen, S. (Ekstern), Nielsen, J. R. (Intern), Holst, R. (Ekstern), Stæhr, K. (Ekstern)
Pages: 1-19
Publication date: 1999

Host publication information
Title of host publication: Working Documents (ICES FTFB)
Main Research Area: Technical/natural sciences
Conference: ICES FTFB Working Group, Symposium on Gillnet Selectivity, St. Johns, Canada, 19/04/1999 - 19/04/1999
Source: orbit
Source-ID: 226872
Publication: Research › Report – Annual report year: 1999

A longitudinal study of the selectivity parameters estimated from experimental gillnet catch data for herring (Clupea harengus)

General information
State: Published
Organisations: Danish Institute for Fisheries and Marine Research
Authors: Poulsen, S. (Ekstern), Nielsen, J. R. (Intern), Holst, R. (Ekstern)
Publication date: 1999

Host publication information
Title of host publication: Working Documents (ICES FTFB WG)
Main Research Area: Technical/natural sciences
Conference: ICES FTFB Working Group, Symposium on Gillnet Selectivity, St. Johns, Canada, 19/04/1999 - 19/04/1999
Source: orbit
Source-ID: 279027
Publication: Research › Article in proceedings – Annual report year: 1999

Hydroacoustic ex situ target strength measurements on juvenile cod (Gadus morhua L.)
Most TS-measurements on fish have been carried out for 38 kHz, and the existing TS algorithm for 120 kHz on cod is based on measurements on stunned fish. The main objective of these experiments was to establish an empirical estimate of the relation between acoustic reflection (target strength, TS) and length of live juvenile cod (7-10 cm and 15-20 cm) at 120 kHz. This was done by recording the variation in TS of freely swimming cod tracking single fish targets for the two size groups within the acoustic beam held. The experiment was set up in an open air 2000 m(3) tank where the small 5-10 cm long fish were swimming freely during measurement in cages (1 x 1 x 3 m) within the acoustic beam under natural conditions in seawater with a salinity of 30 and a temperature of 11 degrees C. An EY500 split-beam acoustic system was used to detect single fish passing through the acoustic beam field, which was Video recorded in order to isolate the measurements on single targets and to get an indication of their angle. A mean target strength-to-size relation was calculated for small cod based on single fish tracks with total acoustic angles below 3.5 degrees off axis in the beam field. This relationship is compared to other TS measurements on juvenile cod in literature. TS at 120 kHz for the investigated cod size range seems to decrease faster by length than the 20 logL relation used for larger cod. The results were used to check the expected range limits of TS for juvenile cod during survey, and are expected to be taken into consideration in density estimation of juvenile cod during acoustic surveys targeting young gadoids in general. (C) 1999 International Council for the Exploration of the Sea.

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern)
Pages: 627-639
Results of stratified random bottom trawl surveys carried out in Vietnamese waters (20-200 m) in 1996-1997

General information
Time changes in fishing power in Baltic Sea cod fisheries

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Marchal, P. (Ekstern), Nielsen, J. R. (Intern), Hovgård, H. (Intern), Lassen, H. (Ekstern)
Pages: 1-23
Publication date: 1999

Host publication information
Title of host publication: ICES C.M.
Volume: R:10
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258099
Publication: Research › Article in proceedings – Annual report year: 1999

A herring size selection model for experimental gillnets used in the Sound (ICES Sub-division 23)

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Poulsen, S. (Ekstern), Nielsen, J. R. (Intern), Holst, R. (Intern), Stæhr, K. (Intern)
Pages: 1-16
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES CM 1998/
Volume: BB:10
Original language: English
Source: orbit
Source-ID: 227156
Publication: Research › Conference article – Annual report year: 1998

Assessment of the Living Marine Resources in Vietnam, ALMRV Phase I, Final Summary Report

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: EFSA Publication
Number of pages: 432
Publication date: 1998

Publication information
Place of publication: [s.l.]
Distribution, abundance and stock composition of herring (Clupea harengus) in the Sound (ICES subdivision 23) during the autumn, winter and spring periods from September 1993 to May 1998

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Monitoring
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern), Stæhr, K. (Intern), Jensen, T. F. (Ekstern), Pedersen, J. (Ekstern), Poulsen, S. (Ekstern)
Pages: 1-45
Publication date: 1998
Main Research Area: Technical/natural sciences

Evaluation of stock enhancement of marine flatfish

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Støttrup, J. (Intern), Lehmann, K. (Ekstern), Nielsen, J. R. (Intern), Pedersen, C. (Ekstern), Iglesias, J. (Ekstern), Rodríguez, G. (Ekstern), Howell, B. (Ekstern), Ellis, T. (Ekstern), Gidson, R. (Ekstern), Langsdale, J. (Ekstern), Batty, R. (Ekstern), Burrows, M. (Ekstern), Krog, C. (Ekstern), Modin, J. (Ekstern), Hughes, R. (Ekstern)
Number of pages: 59
Publication date: 1998

Ex situ – måling af akustisk reflektionsevne på juvenile torsk

General information
State: Published
Organisations: Section for Monitoring, National Institute of Aquatic Resources, Section for Management Systems
Authors: Lundgren, B. (Intern), Nielsen, J. R. (Intern), Stokholm, H. (Ekstern)
Publication date: 1998

Bibliographical note
Programme, Final and Consolidated Report
Source: orbit
Source-ID: 258766
Publication: Research › Report – Annual report year: 1998

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: EFSA Publication
Publication date: 1998

Publication information
Place of publication: [s.l.]
Publisher: European Commission
Original language: English
Series: EU AIR2
Number: CT94-1226
Main Research Area: Technical/natural sciences

Describing distribution and density patterns of metamorphosed 0- and 1-group cod related to hydrographical conditions, physical frontal zones, and bottom topography using hydroacoustic and trawl sampling methods in the Central Baltic Sea

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern), Lehmann, K. (Ekstern)
Publication date: 1997
Main Research Area: Technical/natural sciences

EXSITU TS measurements on juvenile cod (preliminary results)

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Nielsen, J. R. (Intern), Lundgren, B. (Intern), Stokholm, H. (Ekstern)
Publication date: 1997
Main Research Area: Technical/natural sciences
Acoustic monitoring of herring related to the establishment of a fixed link across the sound between Copenhagen and Malmö: Distribution, migration, density, biomass and stock composition of herring in the sound (ICES Subdiv. 23) during the autumn, winter and spring periods from October 1994 to May 1995. Including comparative results and discussion related to the September 1993 to May 1994 monitoring period.

Do herring use the Sound as migration route?

Preliminary results on the distribution of metamorphosed 0-group cod in the central Baltic Sea within the AIR Baltic Core project.
Acoustic identification of O-group cod in the Baltic Sea

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Lehmann, K. (Ekstern), Nielsen, J. R. (Intern)
Publication date: 1995
Main Research Area: Technical/natural sciences

Acoustic monitoring of herring migration in relation to the establishment of a fixed link across the Sound between Denmark and Sweden

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 25
Publication date: 1995
An analysis of the Danish fishery in the Sound. Analysis of landing and effort data from Danish professional and recreational fishery in the Sound during the period 1987-1993

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 158
Publication date: 1994

Publication information
Place of publication: Charlottenlund
Publisher: Danish Institute for Fisheries and Marine Research
Original language: English
Series: DFH-rapport
Number: 478
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 278713
Publication: Research › Report – Annual report year: 1994
Description and Comparison of Eggs and Yolk Sac Larvae of Greenland Cod (Gadus ogac), Atlantic Cod (Gadus morhua) and Arctic Cod (Boreogadus saida) from West Greenland Waters

Laboratory reared eggs and yolk sac larvae of Greenland cod (Gadus ogac) from West Greenland are described and compared to wild-caught larvae from West Greenland presumed to be G. ogac, to wild-caught larvae of Atlantic cod (Gadus morhua) from West Greenland waters and in the literature, to larvae of Arctic cod (Boreogadus saida) in the literature and wild-caught in West Greenland waters and to a literature description of larvae of toothed cod (Arctogadus borisovi). The almost total absence of external pre-anal pigmentation with none dorsally in late stage embryos and yolk sac larvae of G. ogac up to 5.2 mm notochord length (NL) distinguishes them from the other species, where extensive external pre-anal pigmentation is always present, at least dorsally. Also, a larger maximum yolk sac larval size of at least 5.2 mm NL (based on reared specimens) compared to a maximum of 4.0-4.5 mm NL and post-anal length/total length ratios of 0.55-0.59 compared to 0.51 respectively in G. ogac and G. morhua distinguish these species. Concerning the post-anal pairs of dorsal and ventral pigment bars and ventral and dorsal caudal melanophores posterior to these, in G. ogac the first dorsal bar is usually shorter than the ventral bar, while the second dorsal bar is usually the longer of the pair, and there are 2-6 ventral and 0-1 dorsal melanophores. In G. morhua the ventral bars are the wider and there are 1-2 ventral melanophores. In B. saida both of the dorsal pigment bars are wider than the ventral ones, and there are 0-1 ventral and 0-2 dorsal melanophores. Three 6-12 mm NL G. morhua larvae from West Greenland have a 24-38% greater horizontal eye width than larvae of similar sizes from boreal North Atlantic waters.

General information
State: Published
Organisations: Danish Institute for Fisheries and Marine Research
Authors: Andersen, O. G. N. (Ekstern), Nielsen, J. R. (Intern), Smidt, E. L. B. (Ekstern)
Pages: 19-32
Publication date: 1994
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Northwest Atlantic Fishery Science
Volume: 16
ISSN (Print): 0250-6408
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 0.317 SNIP 0.442 CiteScore 0.83
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.831 SNIP 1.67 CiteScore 1.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.448 SNIP 0.634 CiteScore 0.91
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.246 SNIP 0.566 CiteScore 0.75
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.199 SNIP 0.423 CiteScore 0.33
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.646 SNIP 0.816 CiteScore 2.24
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.81 SNIP 0.747
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.609 SNIP 0.467
Web of Science (2009): Indexed yes
Scopus rating (2008): SJR 0.515 SNIP 0.514
Research vessels and borders. Research activities in and admittance to marine waters subjugated the jurisdiction of other Nordic nations

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 107
Publication date: 1994

Publication information
Place of publication: Copenhagen
Publisher: Nordic Council of Ministers
ISBN (Print): 92-9120-434-x
Original language: English

Series: TemaNord
Number: 1994:524
ISSN: 0908-6692
Main Research Area: Technical/natural sciences

Bibliographical note
In English and in Danish
Source: orbit
Source-ID: 278715
Publication: Research Report – Annual report year: 1994

Results on the extensive production of North Sea cod, Gadus morhua L., and their growth and distribution subsequent to release in the Limfjord, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Støttrup, J. (Intern), Nielsen, J. R. (Intern), Krog, C. (Ekstern), Rasmussen, K. (Ekstern)
Pages: 143-159
Publication date: 1994
Host publication information
Title of host publication: ICES C.M.
Volume: G:32
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258147
Publication: Research › Article in proceedings – Annual report year: 1993

Forvaltning af fiskeriressourcerne i Skagerrak og Kattegat

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern), Andersen, M. (Ekstern)
Number of pages: 220
Publication date: 1993

Publication information
Place of publication: København
Publisher: Nordisk Ministerråd
ISBN (Print): 92-9120-228-2
Original language: Danish

Series: Nordiske seminar- og arbejdsrapporter
Number: 1993:550
ISSN: 0906-3668
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 278719
Publication: Research › Report – Annual report year: 1993

Hellefisk ved Østgrønland: forsøgsfiskeri efter hellefisk med hundeslæde ved Østgrønland vintrene 1991/1992

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 30
Publication date: 1993

Publication information
Place of publication: København
Publisher: Grønlands Fiskeriundersøgelser
ISBN (Print): 87-87838-97-4
Original language: Danish

Series: Fiskeriundersøgelser i Grønland
Main Research Area: Technical/natural sciences

Bibliographical note
In Danish with a summary in Greenlandic
Source: orbit
Source-ID: 278723
Publication: Research › Report – Annual report year: 1993

Results on the extensive production of North Sea cod, Gadus morhua L., and their growth and distribution subsequent to release in the Limfjord
Growth of Greenland cod, Gadus ogac, in the Nuuk area of West Greenland

Lokalitetsbedømmelse for udsætning af pighvar - Nordkysten ved Thyborøn

Lokalitetsbedømmelse for udsætning af rødspætter - Langesundet og Omø Tofte samt det Sydfynske Øhav 1992
Opstilling af lokalitetsvurderingskriterier for udsætning af marin fiskecyngel til bestandsstyrkelse

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 20
Publication date: 1992

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish
Series: DFH rapport
Number: 438
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 278739
Publication: Research › Report – Annual report year: 1992

Uvakkens biologi Gadus ogac (Richardson)

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 119
Publication date: 1992

Publication information
Place of publication: København
Publisher: Grønlands Fiskeriundersøgelser
ISBN (Print): 87-87838-93-1
Original language: Danish
Series: Fiskeriundersøgelser i Grønland
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 278746
Publication: Research › Report – Annual report year: 1992

Forsøgsfiskeri efter heliefisk med langlinefartøjet "Vestfart" i Davisstrædet november 1989

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Nielsen, J. R. (Intern)
Number of pages: 25
Publication date: 1990
Projects:

**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

**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

**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)
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: Anden EU-finansiering
Project: PhD

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)
Saurel, Camille (Intern)
Project Manager, academic:
Payne, Mark (Intern)
Project

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) Tyrrenhian 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
Institute of Marine Science of the National Research Council
Italian National Institute for Environmental Protection and Research
International Research Institute of Stavanger
Institute of Marine Research
Hellenic Centre for Marine Research
National Institute for Marine Research and Development “G. Antipa” Constata

University of Porto
Period: 01/03/2016 → 31/12/2018
Number of participants: 2
Research area: Fisheries Management
Contact person:
Bastardie, Francois (Intern)
Project participant:
Nielsen, J. Rasmus (Intern)

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
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).
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 of Environment and Food (under Framework Contract with DTU).

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management
Period: 01/07/2015 → 01/03/2017
Number of participants: 5
Research areas: Fisheries Management & Marine Living Resources
Project participant:
Pedersen, Martin Wæver (Intern)
Berg, Casper Willestofte (Intern)
Kokkalis, Alexandros (Intern)
Phd Student:
Bossier, Sieme (Intern)
Project Coordinator:
Nielsen, J. Rasmus (Intern)

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)

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 Opollili Ndahafa (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

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 Hægsbro (Intern)
Examiner:
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 (Eksternt)
Law, Richard (Eksternt)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

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 synthesised 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.
**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)

**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:
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).

National Institute of Aquatic Resources
Section for Ecosystem based Marine 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)

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 betweeneastern 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 up 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.

Stockidentification 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 2016, 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
Project participant:
Hansen, Jakob Hemmer (Intern)
Huwer, Bastian (Intern)
Bastardie, Francois (Intern)
Eero, Margit (Intern)
Nielsen, J. Rasmus (Intern)
Worsøe Clausen, Lotte (Intern)
Mosegaard, Henrik (Intern)
Storr-Paulsen, Marie (Intern)
Olesen, Hans Jakob (Intern)
Kirkegaard, Eskild (Intern)
Larsen, Peter Vingaard (Intern)
Hansen, Frank Ivan (Intern)
Lundgaard, Louise Scherffenberg (Intern)
Willandsen, Maj-Britt (Intern)
de Jong, Noortje (Intern)
Mensberg, Karen-Lise Dons (Intern)
Meldrup, Dorte (Intern)
Project Coordinator:
Hüssy, Karin (Intern)

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)
- Nielsen, J. Rasmus (Intern)

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.
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 Sølgaard (Intern)  

**Project Manager, academic:**  
Nielsen, J. Rasmus (Intern)  

**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**  
**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:**  
Støttrup, 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)  

**Project**

**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 process began with the construction of standardized data formats for logbook (EFLALO) and VMS (TACSAT). The software for analyzing the data took the form of a fully documented package called vmstools, built using the freeware package, R (http://cran.rproject.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.

We have included a range of complimentary methods for determining fishing activity from VMS position registrations. 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  
Cefas
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 Bælt 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 key-led-ge: 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 hydrographical 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 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.

WP 4 evaluated variability in recruitment and important spawning areas according to hydrographic features and in relation to impact of the fixed link among others by use and further development of complex hydro-dynamic models.

WP Sevaluated herring stock occurrence and migration patterns in the Baltic area by use of genetic identity markers, otolith microstructures 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
Development of fisheries with minimized emission of greenhouse gases (38686)

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
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.
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:
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
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
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)
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)
**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
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:
**Hoffmann, Erik (Intern)**
**Mosegaard, Henrik (Intern)**
**Vestergaard, Ole (Ekstern)**
**Jensen, Henrik (Ekstern)**
**Kraus, Gerd (Ekstern)**
**Møllmann, Christian (Ekstern)**
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. (Ekstem)
Project Manager, academic:
Ulrich, Clara (Intern)

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 Sølgaard (Intern)
Nielsen, Jacob (Ekstern)
Blaesbjerg, Mette (Intern)
Vestergaard, Ole (Intern)
Project Manager, academic:
Ulrich, Clara (Intern)
Degnbol, Poul (Ekstern)
Sparre, Per Johan (Intern)
Project Coordinator:
Nielsen, J. Rasmus (Intern)

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

Activities:

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 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
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Workshop on Probabilistic Assessments for Spatial Management - WKPASM (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 - Workshop on Probabilistic Assessments for Spatial Management - WKPASM
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

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 - 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 - 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