Behavioural changes of Atlantic cod (Gadus morhua) after marine boulder reef restoration: Implications for coastal habitat management and Natura 2000 areas

While marine reefs are degraded globally, the responses of fish to marine reef restoration remain uncertain, particularly in temperate waters. This study measured the effect of marine boulder reef restoration on the behaviour of Atlantic cod, Gadus morhua L., in a Natura 2000 area using acoustic telemetry. Cod were tagged and released in the study area before and after the restoration and tracked continuously for six months. A larger fraction of the released fish remained in the study area after restoration (94%) than before (53%). Moreover, throughout the study period, cod spent significantly more hours per day and prolonged their residence time in the study area after the restoration. The study indicates that marine reefs subjected to boulder extraction can be restored and function as favourable cod habitats. Temperate marine boulder reef restoration represents a valuable management tool to improve habitats for temperate fish species.
Changes in distributional patterns of plaice Pleuronectes platessa in the central and eastern North Sea; do declining nutrient loadings play a role?

Since the beginning of the 1990s, there has been a change in the relative distribution of smaller age-classes of plaice Pleuronectes platessa (age 1–3) in the North Sea. The abundances have increased in deeper, more offshore areas, while coastal abundances have been stagnant or declining. For the same time period available time series data on nutrient conditions in the coastal North Sea area show that the freshwater nitrogen loading has decreased by about 50%. While nutrient concentrations in the ambient environment have been shown to influence growth in juvenile plaice through influence on their prey, we here inspect the potential linkage between distributional changes in plaice and the decline in nutrient loading. We compare plaice observations in coastal areas in the eastern North Sea, which have experienced large changes in eutrophication, with observations for the Dogger Bank, a large sandbank in a shallow offshore area of the North Sea. The Dogger Bank was used as a reference location assuming this area has been less influenced from coastal eutrophication but similar regional climate conditions, and here we found no changes in the abundances of juvenile plaice. The increase in the use of offshore habitats as nursery areas by juvenile plaice in the North Sea appears not related to water depth per se but driven by specific processes dominating in near-shore areas and may be related to changes in nutrient loadings. This point to the importance of separating more general depth-related factors from conditions specific for near-shore areas, such as nutrient loadings in coastal waters and export offshore. The concurrent changes in environment and in distribution of juvenile plaice may have implications for environmental and fisheries management.
Feeding behavior and capture success of turbot Psetta maxima larvae during the transition from upright to tilted swimming position

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

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Female nutrition and assisted reproduction in European eel: influences on oogenesis and egg quality

The European eel (Anguilla anguilla) has an enigmatic life-cycle. One of its most unique features is the 5000 to 6000 km separating the growth areas in Europe and North Africa from the spawning grounds in the Sargasso Sea. Even more enigmatic is the fact that naturally matured eels have never been caught and thus, spawning in the wild has never been observed. Because sexual maturation is blocked until the silvering phase and start of spawning migration, eels do not mature spontaneously in captivity and gonad development is induced by the application of exogenous hormones. In female eels, induction of egg production involves a long-term hormonal treatment of salmon or carp pituitary extracts (SPE or CPE) followed by the induction of oocyte maturation and ovulation which includes a SPE primer and a maturation-inducing hormone (MIH), generally 17α, 20β-dihydroxy-4-pregnen-3-one (DHP).

Recent progress in techniques for induction of maturation and fertilization of the eggs has enabled the production of many viable eggs and yolk-sac larvae that are able of exogenous feeding. The present studies have contributed to this progress by addressing some of the challenges commonly associated with the induction of female maturation and egg quality. The main objectives of this PhD study were to improve female response to hormonal treatments and resulting egg quality. These challenges were addressed by working with both cultured and wild female eels, testing different broodstock diets and hormonal treatments, and identifying possible factors associated with egg quality. The results showed that dietary fatty acid composition has a significant influence on ovarian development in response to hormonal treatments. During oocyte maturation and ovulation, the expression of hormone receptors at the time SPE and DHP were administrated differed between high and low egg quality groups. It appears that a mismatch between hormone receptor expression and the administration of SPE and DHP may be determinant for acquisition of oocyte developmental competence. Moreover, lipid analysis of eggs obtained from wild-caught female eels showed that the level of most fatty acids were similar between high and low quality eggs. Additionally, levels of essential fatty acids were considerable different from those reported elsewhere for cultured European female eel. Experiments part of this PhD project resulted in a high number of high quality eggs which enabled us to determine the relation between oocyte stage at the time oocyte maturation and ovulation are induced, and egg quality for the first time. As a result, we presented improved guidelines to induce oocyte maturation and ovulation, based on a lipid droplet-based oocyte maturation scale, which may result in an increase in production of viable European eel eggs. Overall, this PhD project contributed to the development of assisted reproduction procedures by providing new and valuable knowledge about the factors influencing the maturational response of European female eels to hormonal treatments and resulting egg quality.
Feeding in larval fish is influenced by a range of factors and among these are the morphological and behavioral characteristics of their prey. We investigated the influence of the swimming behavior of two species of calanoid copepods, Acartia tonsa and Temora longicornis, on larval turbot feeding. The nauplii of these species represent two contrasting swimming behaviors: A. tonsa is a jump-sink type swimmer, while T. longicornis is a cruise swimming type. Three replicates of ten larvae aged 7 and 9 days post hatch (DPH) were observed feeding on one of the two copepod species using a 2-dimensional video setup. The results showed that the duration of aiming postures by turbot larvae was 2.3 times higher when turbot larvae approached T. longicornis as compared to A. tonsa nauplii, indicating that larvae can more easily position themselves, preparing for attack, when the prey is of the jump-sink type. The attack speed of turbot larvae feeding on A. tonsa nauplii decreased slightly from DPH 7 to DPH 9, whereas it increased when attacking T. longicornis nauplii. Capture success rate by turbot larvae feeding on A. tonsa was 58% and slightly higher, but not significantly different to capture success rate when feeding on T. longicornis (54%). We conclude that the differences between behavior and other characteristics of these prey species have only minor effect on larval fish feeding, suggesting that copepods species for live feed should be selected according to their ease to culture more than to their species-specific characteristics.

Influence of swimming behavior of copepod nauplii on feeding of larval turbot (Scophthalmus maximus)

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

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

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Sustainable management of coastal systems requires an iterative process using a multidisciplinary approach that integrates the three pillars of sustainable development: environmental protection, social progress and economic growth. The Systems Approach Framework (SAF) provides a structure for an Integrated Coastal Management (ICM) process with an effective science-policy interface that embraces the challenge of simulating complex systems and encapsulates citizen involvement from the onset. We analysed the findings of 16 re-analyses studies undertaken in eight Baltic Sea countries to test how well SAF elements had been applied in practice within ICM processes. The results revealed the main ICM driver was ecology or economy. Several ICM elements as defined by the SAF are already standard within the Baltic Sea region. However, in many cases, the omission of stakeholder and institutional mapping as instructed by the SAF led to an unbalanced participation of stakeholders, or in some cases, lack of involvement of stakeholders at the start of the process. Most of the ICM processes failed to include an integrated, cross-sectorial, ecological-socio-economic assessment. This extends from the lack of system thinking when defining the Policy Issue for the problem and when developing the conceptual model, which often leads to one-sectorial solutions, which may not be sustainable. Furthermore, the duration of some of the ICM processes was prolonged due to disagreement and opposition early in the process and/or lack of manager experiences in conducting a stakeholder participatory process. Finally, due to its stringent structure the SAF was found to be a suitable quality assurance for sustainable ICM processes.

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The importance of live-feed traps - farming marine fish species

This article analyses the challenges of different live-feed regimes for the rearing of marine finfish larvae and discusses the potential alternative live feeds to avert a future live-feed trap. Live feeds are indispensable for the successful rearing of larvae of most marine fish species. Brine shrimps (Artemia) and rotifers comprise the live feeds of choice in marine aquaculture today. However, their nutritional composition is deficient in especially essential fatty acids, and enrichment with fish oil is needed. Fish oil is considered a limited resource owing to its origin in fully exploited wild fish stocks. Moreover, fluctuations of the natural population of Artemia will, most likely, influence future availability and prices. This emphasizes the need for optimal exploitation of available live-feed resources and development of new sustainable alternatives, such as copepods. An array of solutions to these problems are presented to avoid a future live-feed trap and to reduce dependence on limited resources that influence future production possibilities, species diversification, price volatility and productivity in the aquaculture sector.

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Approaches to ensure an effective coastal zone management in the Baltic and beyond

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Aquaculture and feeding ecology: Feeding behaviour in turbot larvae
The period of first feeding, characterized by the shift from internal (yolk-sac) to external food sources, is considered particularly critical for the survival of marine fish, but the underlying causes are still unknown. The larval stage, characterized by high mortality rates, is particularly challenging for larval rearing. After the start of exogenous feeding, another intense and likely critical period of change occurs in the early life stages of fish. This stage is the metamorphosis, during which the larvae transform organs and body morphology to become juveniles. Compared to other teleosts, larvae of flatfishes undergo a particularly evident and dramatic metamorphosis, because flatfishes completely reprogram their body to move from the pelagic habitat, in the water column, to the benthic habitat, on the sea floor. Due to the complex morphological and physiological changes, in aquaculture metamorphosis in flatfish species is often unsuccessful, resulting in different types of abnormal development.

The objective of this thesis was to analyse the feeding behaviour of the flatfish species turbot (Psetta maxima L.) larvae during the two crucial life periods, 1) first feeding and 2) metamorphosis. To analyse whether these two periods are critical for the correct development and survival of turbot, feeding behaviours of larvae during the period of first feeding and during the first stages of metamorphosis was studied using video recordings. This provided qualitative and quantitative descriptions of behavioural parameters, including modal action patterns (e.g. Pause, S-shape, and Attack), attack rate, capture success rate, and swimming speeds of predator and prey. The feeding behaviour of turbot larvae could also be influenced by prey swimming behaviours. To test the effect of two common types of copepod swimming behaviours, turbot larvae were exposed to two species of copepod nauplii. The results presented in this thesis indicate that neither the period of first feeding nor the period of transition from an upright to a tilted swimming position seem to be critical for turbot larvae. First feeding and metamorphosis rather represent periods of adjustments to new morphological and physiological conditions, such as the depletion of yolk-sac during first feeding, and the migration of one eye when metamorphosis starts. Moreover, the behaviour of prey appears to have limited or no influence on larval turbot capture success.

This thesis is part of a large international project aimed at improving the rearing techniques of high value fish species larvae fed with calanoid copepods, their natural prey, to achieve high levels of survival and quality. In fact, fish aquaculture is becoming increasingly important as source of food. However, several bottlenecks during the larval stage still affect its production efficiency. The larvae of turbot were chosen as a model species because turbot is a highly prized flatfish species, which is particularly difficult to rear.
Best practice for restoration of stone reefs in Denmark (codes of conduct)
This report includes recommendations for all phases of a boulder reef restoration project. The document includes an initial identification of relevant objectives for restoration, public involvement and identifies possible sources of relevant historic information as well as risks to be considered. A set of specific biological and environmental objectives that can influence the choice of design of the new reef structure is also presented. The report also includes a set of recommendations for the construction phase, requirements for safety navigation when the restoration work is finalized and presents suggestions for monitoring and management efforts.

Development of a broodstock diet to improve developmental competence of embryos in European eel, Anguilla anguilla
We examined the effect of dietary arachidonic acid (ARA) and eicosapentaenoic acid (EPA) on the production of embryos and hatched larvae in the European eel, Anguilla anguilla. Two diets with high and intermediate levels of ARA and low and intermediate levels of EPA (Feed 1: ARA 1.9%, EPA 4.2%; Feed 2: ARA 1.2%, EPA 5.1% of total fatty acids) were tested against a commercial diet (DE: ARA: 0.5%, EPA: 8.2% of total fatty acids). After 24 weeks of feeding, ARA levels in the muscles and ovaries increased to 0.9% and 1.3% of total fatty acids, respectively, in Feed 1 and were significantly higher than in Feed 2 and DE. Female broodstock was not fed during hormonal treatment to induce vitellogenesis and ovulation. EPA levels in females fed the test diets decreased in the both muscle and ovary and were significantly lower in eggs from females fed Feed 1. The highest percentage of stripped females, producing viable eggs and larvae, were those females fed the highest dietary ARA levels (Feed 1). The level of lipid peroxidation products in eggs was similar among treatment, indicating that the lowest dietary levels of vitamin C and vitamin E were sufficient. In the unfertilized eggs, ARA levels were also highest (1.1% of total fatty acids) in the diet with highest ARA levels (Feed 1).
Interactive effects of dietary composition and hormonal treatment on reproductive development of cultured female European eel, Anguilla anguilla

Farmed female eels were fed two experimental diets with similar proximate composition but different n-3 polyunsaturated fatty acid (PUFA) levels. Both diets had similar levels of arachidonic acid (ARA), while levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in one diet were approximately 4.5 and 2.6 times higher compared to the other diet, respectively. After the feeding period, each diet group was divided into two and each half received one of two hormonal treatments using salmon pituitary extract (SPE) for 13 weeks: i) a constant hormone dose of 18.75mg SPE/kg initial body weight (BW) and ii) a variable hormone dosage that increased from 12.5mg SPE/kg initial BW to 25mg SPE/kg initial BW. Results showed a significant interaction between diets and hormonal treatments on gonadosomatic index (GSI), indicating that the effect of broodstock diets on ovarian development depends on both nutritional status and hormonal regime. Females fed with higher levels of n-3 series PUFAs and stimulated with the constant hormonal treatment reached higher GSIs than those receiving the variable hormonal treatment. However, when females were fed lower levels of n-3 series PUFAs there was no difference in the effect of hormonal treatments on GSI. We also found that, independent of hormonal treatment, the diet with higher levels of n-3 series PUFAs led to the most advanced stages of oocyte development, such as germinal vesicle migration. Concentration of sex steroids (E2, T, and 11-KT) in the plasma did not differ between diets and hormonal treatments, but was significantly correlated with ovarian developmental stage. In conclusion, increasing dietary levels of n-3 PUFAs seemed to promote oocyte growth, leading to a more rapid progression of ovarian development in European eel subjected to hormonal treatment.

Grains of sand, a sunken treasure?

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Interactive effects of dietary composition and hormonal treatment on reproductive development of cultured female European eel, Anguilla anguilla

Farmed female eels were fed two experimental diets with similar proximate composition but different n-3 polyunsaturated fatty acid (PUFA) levels. Both diets had similar levels of arachidonic acid (ARA), while levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in one diet were approximately 4.5 and 2.6 times higher compared to the other diet, respectively. After the feeding period, each diet group was divided into two and each half received one of two hormonal treatments using salmon pituitary extract (SPE) for 13 weeks: i) a constant hormone dose of 18.75mg SPE/kg initial body weight (BW) and ii) a variable hormone dosage that increased from 12.5mg SPE/kg initial BW to 25mg SPE/kg initial BW. Results showed a significant interaction between diets and hormonal treatments on gonadosomatic index (GSI), indicating that the effect of broodstock diets on ovarian development depends on both nutritional status and hormonal regime. Females fed with higher levels of n-3 series PUFAs and stimulated with the constant hormonal treatment reached higher GSIs than those receiving the variable hormonal treatment. However, when females were fed lower levels of n-3 series PUFAs there was no difference in the effect of hormonal treatments on GSI. We also found that, independent of hormonal treatment, the diet with higher levels of n-3 series PUFAs led to the most advanced stages of oocyte development, such as germinal vesicle migration. Concentration of sex steroids (E2, T, and 11-KT) in the plasma did not differ between diets and hormonal treatments, but was significantly correlated with ovarian developmental stage. In conclusion, increasing dietary levels of n-3 PUFAs seemed to promote oocyte growth, leading to a more rapid progression of ovarian development in European eel subjected to hormonal treatment.

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Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Norwegian University of Science and Technology, Nofima AS
Authors: da Silva, F. (Intern), Støttrup, J. G. (Intern), Kjørsvik, E. (Ekstern), Tveiten, H. (Ekstern), Tomkiewicz, J. (Intern)
Pages: 17-26
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Animal Reproduction Science
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Kortlægning af fiskenes levesteder i den danske del af Øresund: Rapport til Miljø- og Fødevareministeriet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, University of Copenhagen
Authors: Sørensen, T. K. (Intern), Egekvist, J. (Intern), Brown, E. J. (Intern), Hansen, F. I. (Intern), Carl, H. (Ekstern), Møller, P. R. (Ekstern), Dinesen, G. E. (Intern), Vinther, M. (Intern), Støttrup, J. (Intern)
Number of pages: 104
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Publisher: Miljø- og Fødevareministeriet
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Publication: Research › Report – Annual report year: 2016

Marin fiskepleje – Forskning i fiskøn̈es levesteder
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern), Støttrup, J. G. (Intern), Svendsen, J. C. (Intern)
Publication date: 2016
Event: Poster session presented at Naturmødet, Hirtshals, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Marin fiskepleje – Forskning i fiskøn̈es levesteder
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern), Støttrup, J. G. (Intern), Svendsen, J. C. (Intern)
Publication date: 2016
Event: Poster session presented at Folkemødet 2016, Allinge, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Marin Fiskepleje – Hvad er fiskepleje?
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern), Støttrup, J. G. (Intern), Svendsen, J. C. (Intern)
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Event: Poster session presented at Naturmødet, Hirtshals, Denmark.
Main Research Area: Technical/natural sciences
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Marin Fiskepleje – Hvad er fiskepleje?
General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Christoffersen, M. (Intern), Støttrup, J. G. (Intern), Svendsen, J. C. (Intern)
Publication date: 2016
Event: Poster session presented at Folkemødet 2016, Allinge, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2016

Recent trends in the abundance of plaice Pleuronectes platessa and cod Gadus morhua in shallow coastal waters of the Northeastern Atlantic continental shelf – a review
Shallow, near-shore water habitats on the continental shelf of the Northeast Atlantic have been productive fishing areas in the past. Here, we review the present knowledge about (i) recent trends in the abundance of plaice and cod in these habitats and (ii) hypotheses regarding the factors responsible for any trends. At present, only a few studies exist on the trends of abundance of plaice or cod, namely from the Bay of Biscay, the North Sea and the Skagerrak/Kattegat. They suggest a declining abundance in coastal, shallow areas and – at least for plaice – a latitudinal gradient with an erosion of the southern distribution boundary in the Bay of Biscay and deepening of stocks in the North Sea. In contrast, no trend in shallow water abundance of plaice similar to a decline in deep-water stocks during the 1970s and their slow recovery during the 2000s is apparent in the Skagerrak/Kattegat. Although shallow habitats fundamentally differ from deeper areas by the prevalence of juvenile stages, the declining trends coincide with decreasing abundance/landings and spatial stock relocations in the deeper areas. Whether this indicates a common trend pointing at connectivity between shallow and deep water remains open. Fundamental differences exist in the suggested causes of the trends in different geographical areas. High fishing pressure together with low local recruitment apparently prevents the recovery of overexploited plaice and cod
stocks in the Skagerrak/Kattegat. In contrast, the responses of juveniles and adult fish to increasing seawater temperature are the main hypotheses for changes in distribution and abundance of both fish species in the North Sea/Bay of Biscay. However, temperature alone cannot explain the observed decline of fish in coastal areas, and the causes may be more complex, involving nutrient loading, primary productivity or food availability, although at present, knowledge of these factors is insufficient.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Baltic Sea Research Institute
Authors: Dutz, J. (Ekstern), Støttrup, J. G. (Intern), Stenberg, C. (Intern), Munk, P. (Intern)
Pages: 785-796
Publication date: 2016
Main Research Area: Technical/natural sciences

**Publication information**

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Volume: 12
Issue number: 8
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- Web of Science (2018): Indexed yes
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- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): CiteScore 1.26 SJR 0.638 SNIP 0.725
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 0.8 SNIP 0.835 CiteScore 1.45
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 0.674 SNIP 0.872 CiteScore 1.34
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 0.571 SNIP 0.66 CiteScore 1.09
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 0.672 SNIP 0.737 CiteScore 1.27
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 0.606 SNIP 0.681 CiteScore 1.13
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 0.577 SNIP 0.664
- Web of Science (2010): Indexed yes
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 0.555 SNIP 0.72
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 0.515 SNIP 0.519
- Scopus rating (2007): SJR 0.576 SNIP 0.755
- Scopus rating (2006): SJR 0.378 SNIP 0.536
- Web of Science (2006): Indexed yes
- Web of Science (2005): Indexed yes
Samfunds- og sektørkonomisk analyse af vandmiljøindsatsen i Landdistriktsprogrammet (LDP) og Fiskeriprogrammet (EHF)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Institute Management, Section for Freshwater Fisheries Ecology, Section for Ecosystem based Marine Management, Aarhus University, University of Copenhagen
Authors: Hasler, B. (Ekstern), Dubgaard, A. (Forskerdatabase), Eberhardt, J. M. (Ekstern), Koed, A. (Intern), Martinsen, L. (Forskerdatabase), Nielsen, J. (Intern), Støttrup, J. G. (Intern), Wisz, M. (Intern)
Number of pages: 104
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Publisher: Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi
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Electronic versions:
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Publication: Research › Report – Annual report year: 2016

The importance of habitat structure for the distribution and behaviour of demersal fish

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Novo Nordisk A/S, Aarhus University
Authors: Kristensen, L. D. (Intern), Støttrup, J. G. (Intern), Stenberg, C. (Ekstern), Grønkjær, P. (Ekstern)
Number of pages: 109
Publication date: 2016

Publication information
Publisher: Technical University of Denmark. National Institute of Aquatic Resources
Original language: English
Main Research Area: Technical/natural sciences
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What is the impact on fish recruitment of anthropogenic physical and structural habitat change in shallow nearshore areas in temperate systems? A systematic review protocol

Background: Shallow nearshore marine ecosystems are changing at an increasing rate due to a range of human activities such as urbanisation and commercial development. The growing numbers of constructions and other physical and structural alterations of the shoreline often take place in nursery and spawning habitats of many fish and other aquatic species. Several coastal fish populations have seen marked declines in abundance and diversity during the past two decades. A systematic review on the topic would clarify if anthropogenic physical and structural changes of near-shore areas have effects on fish recruitment and which these effects are. Methods: The review will examine how various physical and structural anthropogenic changes of nearshore fish habitats affect fish recruitment. Relevant studies include small- and large-scale field studies in marine and brackish systems or large lakes in temperate regions of the Northern and Southern hemispheres. Relevant studies may be based on comparisons between undisturbed and disturbed areas, before and after disturbance, or both. Relevant outcomes include measures of recruitment defined as abundance of juveniles of nearshore fish communities. Searches will be made for peer-reviewed and grey literature in English, Dutch,
Danish, Finnish, German, Swedish and Spanish. All fish species and species groups will be considered in this review. Included relevant studies will be subject to a critical appraisal that will assess study validity. From relevant included studies, we will extract information on study characteristics, measured outcomes, exposure, comparators, effect modifiers and critical appraisal. Data synthesis will contain narrative and summary findings of each included study of sufficient quality. Meta-analysis may be possible in cases where studies report similar types of outcomes

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Stockholm Environment Institute, Uppsala University, Umea University, University of Bologna, University of Groningen, Cornell University
Authors: Macura, B. (Ekstern), Lönnstedt, O. (Ekstern), Byström, P. (Ekstern), Airoldi, L. (Ekstern), Eriksson, B. (Ekstern), Rudstam, L. (Ekstern), Støttrup, J. G. (Intern)
Publication date: 2016
Main Research Area: Technical/natural sciences

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Journal: Environmental Evidence
Volume: 5
Issue number: 1
Article number: 61
ISSN (Print): 2047-2382
Ratings:
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Scopus rating (2015): SNIP 1.036 SJR 1.301 CiteScore 2.46
Scopus rating (2014): SNIP 0.9 SJR 0.851
Scopus rating (2013): SNIP 0.225 SJR 0.207
ISI indexed (2013): ISI indexed no
Scopus rating (2012): SJR 0.122 SNIP 0
Original language: English
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10.1186/s13750-016-0061-z
Publication: Research - peer-review › Journal article – Annual report year: 2016

Adfærd hos torsk på et kunstigt stenrev i et baglokale på den Blå Planet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Centre for Ocean Life, Den Blå Planet, Aarhus University, DHI Denmark
Authors: Deurs, M. V. (Intern), Stenberg, C. (Intern), Mariani, P. (Intern), Mohn, C. (Ekstern), Mandviwalla, X. (Ekstern), Hansen, F. T. (Ekstern), Gravlund, P. (Ekstern), Støttrup, J. (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

Ændringer i habitatkvalitet for rødspætteyngel i kystområder langs Nordsøen

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Støttrup, J. (Intern), Kodama, M. (Intern), Stedmon, C. (Intern), Munk, P. (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
Aggregation and attachment responses of blue mussels, *Mytilus edulis*—impact of substrate composition, time scale and source of mussel seed

Survival after transplantation of mussel seeds is crucial for the production output of blue mussels (*Mytilus edulis* L.) in bottom cultures. Hence, an understanding of the interactions between bed formation, habitat structure and performance of mussel seed of different origins can contribute to an optimization of the production. The effect of substrate composition and timing of formation of a mussel bed in relation to aggregation and attachment of mussels were investigated with mussel seeds obtained from two different sources: mussel seed dredged from a natural mussel bed and mussel seed collected from a suspended long line culture. The mussels were applied to experimental units of complex and smooth substrate on the sea bed. Data on aggregation (day 0, day 1 and day 2), attachment strength (day 2 and 30), loss (day 2 and 30) and growth (day 0–30) of mussels were collected during the experiment. The results showed that complex substrate indeed had a stabilizing effect on the mussel structure resulting in less aggregation and increased attachment strength. The 3D matrix forming a mussel bed was achieved faster on complex substrate, and led to reduced mortality of transplanted mussels. Despite significantly lower specific growth rates on the complex substrate, the total biomass of mussels was significantly higher on complex substrate compared to on smooth substrate due to the higher survival of mussels. Furthermore, suspended mussels aggregated more and faster and had a stronger and more rapid attachment as compared to bottom mussels. Consequently, it was concluded that when transplanting mussels, seeding with substrate increases surface complexity on the seabed and increases survival of the mussels.

**General information**

State: Published

Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Roskilde University, University of Southern Denmark

Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Hansen, B. W. (Ekstern), Holmer, M. (Ekstern), Kristensen, L. (Intern), Poulsen, L. K. (Intern), Stenberg, C. (Intern), Albertsen, C. M. (Intern), Støttrup, J. (Intern)

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Main Research Area: Technical/natural sciences

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Web of Science (2018): Indexed yes

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Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 1

Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 1

Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 1

Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 1
Establishment of blue mussel beds to enhance fish habitats

Human activity has impacted many coastal fjords causing degeneration of the structure and function of the fish habitats. In Nørrefjord, Denmark, local fishermen complained of declining fish catches which could be attributed to eutrophication and extraction of sediments over several decades. This study aimed to establish blue mussel beds (Mytilus edulis) to increase structural complexity and increase the abundance of fish and epifauna in Nørrefjord. It was expected that the mussels would improve water transparency and increase the depth range and coverage of eelgrass (Zostera marina). New methods for mussel production and -bed construction were investigated in collaboration with local volunteer fishermen. The effect of the artificial mussel beds was most evident on a small scale. Video observations directly at the beds (Impact area) demonstrated increased biodiversity and a three times higher abundance of mesopredator fish compared to the Control area. Water clarity and eelgrass coverage were unchanged. Two methods for establishing mussel beds were tested. A total of 44 tons of blue mussels were produced and established in beds over an area of 121,000 m². Production of blue mussels directly on hemp sacs hanging on long-lines was the most effective method. This new method is potentially a useful management tool to improve fish habitats.
Impact of dietary fatty acids on muscle composition, liver lipids, milt composition and sperm performance in European eel

In order for European eel aquaculture to be sustainable, the life cycle should be completed in captivity. Development of broodstock diets may improve the species’ reproductive success in captivity, through the production of high-quality gametes. Here, our aim was to evaluate the influence of dietary regime on muscle composition, and liver lipids prior to induced maturation, and the resulting sperm composition and performance. To accomplish this fish were reared on three “enhanced” diets and one commercial diet, each with different levels of fatty acids, arachidonic acid (ARA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). Neutral lipids from the muscle and liver incorporated the majority of the fatty acid profile, while phospholipids incorporated only certain fatty acids. Diet had an effect on the majority of sperm fatty acids, on the total volume of extractable milt, and on the percentage of motile sperm. Here, our results suggest that the total volume of extractable milt is a DHA-dependent process, as we found the diets with the highest DHA levels induced the most milt while the diet with the lowest DHA level induced the least amount of milt. The diet with the highest level of ARA induced medium milt volumes but had the highest sperm motility. EPA also seems important for
sperm quality parameters since diets with higher EPA percentages had a higher volume of milt and higher sperm motility. In conclusion, dietary fatty acids had an influence on fatty acids in the tissues of male eel and this impacted sperm performance.
Long-term effects of an offshore wind farm in the North Sea on fish communities

Long-term effects of the Horns Rev 1 offshore wind farm (OWF) on fish abundance, diversity and spatial distribution were studied. This OWF is situated on the Horns Reef sand bank in the North Sea. Surveys were conducted in September 2001, before the OWF was established in 2002, and again in September 2009, 7 yr post-establishment. The sampling surveys used a multi-mesh-size gillnet. The 3 most abundant species in the surveys were whiting Merlangius merlangus, dab Limanda limanda and sandeels Ammodytidae spp. Overall fish abundance increased slightly in the area where the OWF was established but declined in the control area 6 km away. None of the key fish species or functional fish groups showed signs of negative long-term effects due to the OWF. Whiting and the fish group associated with rocky habitats showed different distributions relative to the distance to the artificial reef structures introduced by the turbines. Rocky habitat fishes were most abundant close to the turbines while whiting was most abundant away from them. Species diversity was significantly higher close to the turbines. Overall, these results indicate that the artificial reef structures were large enough to attract fish species with a preference for rocky habitats, but not large enough to have adverse negative effects on species inhabiting the original sand bottom between the turbines.
Recent studies of fish distribution patterns highlight shifts in the spatial distributions of particular life-stages. Focus has thus far been on changes in habitat use and possible drivers for these changes. Yet, small-scale shifts in habitat use of certain life stages may have profound consequences on population dynamics through changes in resource use and competition. To explore this, a conceptual stage-structured model was developed with 3 stages and 2 resources and allowing a move of large juveniles from the shallow to the deep habitat. Large juveniles compete with small juveniles in shallow waters and with adults in deeper waters. Alternative stable states occur, with one state dominated by small juvenile biomass and the other dominated by adult biomass. The model results show for both states that while large juvenile biomass responds to a change in time spent in the deep habitat, the biomass of small juveniles and adults is barely affected.

Between the 2 states there is a profoundly different population response to increased fishing mortality. In the adult biomass dominated state, adult biomass is hardly affected while juvenile biomass increases until population collapse, with increased fishing. In the small juvenile dominated state, adult and small juvenile biomass decrease, and large juvenile biomass increases. This state persists at much higher fishing mortality than the adult biomass dominated state. This study highlights that safeguarding nursery functions in a changing environment requires monitoring of juvenile life-stages in a range of habitats and a spatially adaptive management strategy.
Multidisciplinary mapping of fish habitats in the Sound, Denmark for maritime spatial planning

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Natural History Museum of Denmark
Number of pages: 2
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Event: Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
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Relations
Press / Media items:
Tilstandsrapport fra havbunden
Publication: Research › Conference abstract for conference – Annual report year: 2015

Relativ forekomst af fiskesamfund i en dansk fjord – med speciel fokus på Europæisk ål og sortmundet kutling

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology, State Research Centre for Agriculture and Fishery Mecklenburg-Vorpommern
Authors: Christoffersen, M. (Intern), Jepsen, N. (Intern), Pedersen, M. I. (Intern), Støttrup, J. (Intern), Dorow, M. (Ekstern)
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

RevFisk – et projekt som kvantificerer stenrevs betydning for fisk

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Freshwater Fisheries Ecology, Section for Marine Living Resources, Section for Marine Ecology and Oceanography, Centre for Ocean Life, Aarhus University, DHI Denmark
Publication date: 2015
Event: Poster session presented at 18. Danske Havforskermøde, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
- Publishers_version

ReVFisk – et projekt som kvantificerer stenrevs (et lavtliggende stenrev i den fotiske zone og et dybere liggende stenrev i den afotiske zone) betydning for fisk
Cryptic behaviour of juvenile turbot *Psetta maxima* L. and European flounder *Platichthys flesus* L.
The aim of this study was to examine the burying behaviour of hatchery-reared European flounder Platichthys flesus and turbot Psetta maxima, and whether conditioning on a sandy substrate would improve burying efficiency. Both species buried shortly after release on a sandy substrate. However, the study revealed interspecies differences; the flounder buried immediately after release, while the turbot buried gradually. No significant difference in burying efficiency was observed between naïve and conditioned flounder and turbot. An effect of size on burial efficiency was observed for both flounder and turbot with a tendency for larger fish to bury more efficiently than smaller fish, despite previous conditioning. Size at settlement was found to be >2 cm for flounder and >3 cm for turbot.
Depth preference in released juvenile turbot Psetta maxima

Hatchery-reared juvenile turbot Psetta maxima were tagged with Passive Integrated Transponder (PIT) tags and released at three different depths in a sandy bay in Denmark. About 2–7% of the released fish were registered daily to monitor their distribution using a tag antenna mounted on a modified beam trawl, thus avoiding actually sampling the fish. The change in distribution of the three groups was adequately represented by a twodimensional movement model. Movement along the shore was described by a Brownian motion with group specific drift. Movement perpendicular to the shore was described by a Cox–Ingersoll–Ross process with a group specific attraction point. All three groups exhibited similar depth preferences of 1.7 m. Immediately after the release, fish were concentrated around the release points but after one day, fish had moved to the preferred depth and subsequently maintained their position at this depth. Farmed turbot exhibited strong site fidelity and an innate behaviour for selecting a preferred depth.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management
Authors: Albertsen, C. M. (Intern), Støttrup, J. (Intern), Nielsen, A. (Intern), Christoffersen, M. (Intern)
Pages: 179-184
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Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Experimental Marine Biology and Ecology
Issue number: 461
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.03 SJR 0.937 SNIP 0.914
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.043 SNIP 0.823 CiteScore 1.87
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.145 SNIP 1.045 CiteScore 2.41
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.294 SNIP 1.08 CiteScore 2.45
ISI indexed (2013): ISI indexed yes
Development and use of a bioeconomic model for management of mussel fisheries under different nutrient regimes in the temperate estuary of the Limfjord, Denmark

Coastal ecosystems worldwide are under pressure from human-induced nutrient inputs, fishing activities, mariculture, construction work, and climate change. Integrated management instruments handling one or more of these problems in combination with socioeconomic issues are therefore necessary to secure a sustainable use of resources. In the Limfjord, a temperate eutrophic estuary in Denmark, nutrient load reductions are necessary to fulfill EU regulations such as the Water Framework Directive (WFD). The expected outcome of these load reductions is an improved water quality, but also reduced production of the abundant stock of filter-feeding blue mussels, Mytilus edulis. This is expected to have significant economic consequences for the million-euro mussel fishing industry taking place in the Limfjord today. We developed a bioeconomic model that can be used to explore the consequences of load reductions for mussel fishery as practiced today, as well as potential management options, to obtain an economically and ecologically sustainable mussel fishery. Model simulations clearly demonstrate a substantial decrease in mussel production after the nutrient load reductions necessary to obtain the targets in the WFD. With today's practice, the mussel fishery in the Limfjord will not be profitable in a future, less eutrophic estuary. However, model simulations also revealed that mussel fishery can be profitable after implementation of the WFD with a reduction in the total fishing quota, fewer fishing vessels, and a higher fishing quota per vessel.
Effects of dietary fatty acids on the production and quality of eggs and larvae of Atlantic cod (Gadus morhua L.)

Cultivated Atlantic cod (Gadus morhua) entering their first year of gamete maturation were fed diets with different levels of arachidonic acid (ARA) and eicosapentaenoic acid (EPA) for 6.5 months prior to commencement of spawning. Gravid females were stripped three times: at the beginning, peak and end of spawning. Lipid composition and egg and larval quality of 34 family crosses were investigated. Results indicated that ARA uptake into eggs from broodstock diet was highly efficient achieving proportions of ARA up to 84% higher in eggs than in the diet. EPA was 42–76% higher, and DHA was 155–173% higher in eggs than in diets. Cod fed the diet with the lowest EPA/ARA ratio had the greatest egg production. Eggs from fish on a diet with high ARA level had significantly higher fertilization and hatching success than those fed low levels of ARA. This diet produced on average 71 viable eggs g⁻¹ female compared with 32.5 and 4 eggs in diet B and C, respectively. Furthermore, larval survival until 8 days posthatch was higher in diets with lower ARA levels. The combined results showed that ARA dietary supplementation and low EPA/ARA ratio yielded a greater number of viable larvae kg⁻¹ female
KYSTFISK I. Kortlægning af de kystnære fiskebestandes udvikling på basis af fiskernes egne observationer i perioden fra 1980’erne til 2013

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Section for Marine Ecology and Oceanography
Authors: Støttrup, J. (Intern), Lund, H. S. (Ekstern), Kindt-Larsen, L. (Intern), Egekvist, J. (Intern), Munk, P. (Intern), Stenberg, C. (Intern)
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KYSTFISK I. Udviklingen i kystnære fiskebestande. Slutrapport

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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Centre for Ocean Life, Section for Monitoring and Data
Authors: Støttrup, J. (Intern), Lund, H. S. (Ekstern), Munk, P. (Intern), Dutz, J. (Intern), Kindt-Larsen, L. (Intern), Egekvist, J. (Intern), Stenberg, C. (Intern), Nielsen, T. G. (Intern)
Number of pages: 21
Links between implementation of Water Framework Directive and changes in plaice distribution along the Danish west coast

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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: Støttrup, J. (Intern), Kodama, J. (Ekstern), Stedmon, C. (Intern)
Publication date: 2014
Event: Abstract from The International Symposium on Integrated Coastal Zone Management, Antalya, Turkey.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2014

Restoration of a temperate reef: Effects on the fish community

The extraction of large boulders from coastal reefs for construction of harbours and coastal protection has led to habitat degradation for local fish populations through the destruction of cavernous reefs and changes in macroalgal cover resulting from a loss of substrate. The temperate reef at Læsø Trindel in Kattegat, Denmark, has now been re-established with the aim of restoring the reef's historical structure and function. The effects of the restoration on the local fish community are reported here.

Fishing surveys using gillnets and fyke nets were conducted before the restoration (2007) and four years after the
restoration of the reef (2012). Species of the family Labridae, which have a high affinity for rocky reefs, dominated both before and after the restoration. Commercially important species such as cod Gadus morhua, and saithe Pollachius virens, occurred infrequently in the catches in 2007 but were significantly more abundant in the catches in 2012. Cods were especially attracted to the shallow part of the reef that was restored by adding stones. For some species, such as ballan wrasse Labrus bergylta, and cod, the proportion of larger individuals increased after the restoration. The findings highlight the importance of reef habitats for fish communities and the need for their protection.

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State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Aarhus University, University of Copenhagen
Authors: Støttrup, J. (Intern), Stenberg, C. (Intern), Dahl, K. (Ekstern), Kristensen, L. D. (Intern), Richardson, K. (Ekstern)
Pages: 1045-1059
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Where have all the coast fish gone?

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Centre for Ocean Life, Section for Monitoring and Data
Authors: Støttrup, J. (Intern), Munk, P. (Intern), Lund, S. (Ekstern), Kindt-Larsen, L. (Intern), Dutz, J. (Intern), Egekvist, J. (Intern)
Publication date: 2014
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Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2014

A review on broodstock nutrition of marine pelagic spawners: the curious case of the freshwater eels (Anguilla spp.)
To sustain eel aquaculture, development of reproduction in captivity is vital. The aim of this review is to assess our current knowledge on the nutrition of broodstock eels in order to improve the quality of broodstock under farming conditions, drawing information from wild adult eels and other marine pelagic spawners. Freshwater eels spawn marine pelagic eggs
with an oil droplet (type II), and with a large perivitelline space. Compared with other marine fish eggs, eel eggs are at the extreme end of the spectrum in terms of egg composition, even within this type II group. Eel eggs contain a large amount of total lipids, and a shortage of neutral lipids has been implied a cause for reduced survival of larvae. Eel eggs have higher ARA but lower EPA and DHA levels than in other fish. Too high levels of ARA negatively affected reproduction in the Japanese eel, although high levels of 18:2n-6 in the eggs of farmed eels were not detrimental. The total free amino acid amount and profile of eel eggs appears much different from other marine pelagic spawners. Nutritional intervention to influence egg composition seems feasible, but responsiveness of farmed eels to induced maturation might also require environmental manipulation. The challenge remains to succeed in raising European eel broodstock with formulated feeds and to enable the procurement of viable eggs and larvae, once adequate protocols for induced maturation have been developed.
Blue Reef - Reetableret stenrev og deres effekt på fiskefaunen – foreløbige resultater af fiskeundersøgelserne på Læsø Trindel

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Danish Shellfish Centre
Authors: Stenberg, C. (Intern), Støttrup, J. (Intern), Dolmer, P. (Intern)
Publication date: 2013
Event: Poster session presented at 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2013

Comparison of broodstock lipid stores in farmed and wild European eel (Anguilla anguilla) in link with reproductive performance

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography
Authors: Corraze, G. (Ekstern), Støttrup, J. (Intern), Larroquet, L. (Ekstern), Tomkiewicz, J. (Intern), Kaushik, S. (Ekstern)
Publication date: 2013
Event: Poster session presented at Aquaculture Europe 13, Trondheim, Norway.
Main Research Area: Technical/natural sciences
Links: https://www.was.org/easonline/AbstractDetail.aspx?id=2067
Publication: Research › Poster – Annual report year: 2014

Dannelse af bankestruktur hos blåmuslinger: effekt af substrat, tid og muslingernes oprindelse

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Section for Ecosystem based Marine Management, Roskilde University
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Hansen, B. W. (Forskerdatabase), Holmer, M. (Forskerdatabase), Kristensen, L. (Intern), Poulsen, L. K. (Intern), Stenberg, C. (Intern), Støttrup, J. (Intern)
Publication date: 2013
Event: Poster session presented at 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2013

Development of a broodstock diet to improve embryonic development competence in female European eel Anguilla anguilla

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Roskilde University
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Hansen, B. W. (Forskerdatabase), Holmer, M. (Forskerdatabase), Kristensen, L. (Intern), Poulsen, L. K. (Intern), Stenberg, C. (Intern), Støttrup, J. (Intern)
Publication date: 2013
Event: Poster session presented at 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2013
Fish benefits from offshore wind farm development
The studies up until 2006 showed few effects on the fish fauna that could be attributed to the establishment and operation of the wind farms. Fish abundance and diversity were not higher inside the wind farms than in the areas outside the wind farms. One obvious reason for this could be that the studies and investigations were made during the early stages of colonisation of the turbine foundations at Horns Rev that constitute artificial reefs. At Nysted, the effect was weak, presumably because the benthic community consisted of a monoculture of large common mussels (Mytilus edulis) that are only moderately attractive to fish.

Also investigations into the effects on fish and fish behaviour from electromagnetic fields were made at Nysted. Data documented some effects from the cable route on fish behaviour, with some species avoiding the cable, while other species were attracted. However, only flounder (Platichthys flesus) showed correlation between the phenomena observed and the strength of the magnetic fields

Forage fish quality: seasonal lipid dynamics of herring (Clupea harengus L.) and sprat (Sprattus sprattus L.) in the Baltic Sea
This study investigates lipid content and fatty acid composition of two important forage fish, sprat (Sprattus sprattus) and herring (Clupea harengus) in the Baltic Sea ecosystem. Seasonal variation in lipids was studied during three periods following the annual reproductive cycle considering potential differences relating to fish size, sex, and reproductive status. The isopod Saduria entomon, being at times an important prey for predatory fish, was included for comparison. In both sprat and herring, lipid content and absolute contents of essential polyunsaturated fatty acids (PUFAs) varied seasonally with high levels towards the end of the annual zooplankton production cycle, succeeded by a decline. Lipid content and fatty acid composition differed significantly between sprat and herring. Sprat lipid content was higher than herring, increasing with fish size and characterized by large proportions of monounsaturated fatty acids. Herring lipid content was related to the reproductive cycle and proportions of PUFAs were high compared with sprat. Levels of essential PUFAs were high in S. entomon compared with clupeids rendering it a valuable alternative prey species in the Baltic Sea ecosystem. The lipid dynamics of forage fish and benthos, combined with changes in availability and abundance, will affect growth and reproduction of their predators
Global challenges in integrated coastal zone management
Growing pressure from increasingly diverse human activities coupled with climate change impacts threaten the functional integrity of coastal ecosystems around the globe. A multi-disciplinary approach towards understanding drivers, pressures and impacts in the coastal zone requires effective integration of data and information in policy and management, combining expertise from nature and social science, to reach a balanced and sustainable development of the coastal zone.

This important book comprises the proceedings of The International Symposium on Integrated Coastal Zone Management, which took place in Arendal, Norway between 3-7 July 2011. The main objective of the Symposium was to present current knowledge and to address issues on advice and management related to the coastal zone. The major themes of papers included in this book are:

Coastal habitats and ecosystem services
Adaptation/mitigation to change in coastal systems
Coastal governance
Linking science and management

Comprising a huge wealth of information, this timely and well-edited volume is essential reading for all those involved in coastal zone management around the globe. All libraries in research establishments and universities where marine, aquatic and environmental sciences, and fisheries and aquatic sciences are studied and taught will need copies of this important volume on their shelves.
Marine and coastal ecosystem-based risk management handbook

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Fisheries and Oceans Canada, University of Hull, Marine Scotland Science, Helmholtzt Centre Geesthacht Centre for Materials and Coastal Research
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Modification of essential fatty acid composition in broodstock of cultured European eel Anguilla anguilla L.
Farmed eels had lower levels of arachidonic acid (20:4 n-6) (ARA) and higher ratios of eicosapentaenoic acid (20:5 n-3) (EPA):ARA compared to wild European eel were sampled after 0, 5, 10, 14 and 44 weeks of feeding to examine changes in fatty acid composition (FAC) in ovaries, visceral fat and muscle. The results showed a slow but steady incorporation of EFA. Lipids are incorporated in the oocytes early in oogenesis, and the leading cohort of oocytes is rich in lipid droplets before the onset of vitellogenesis. This indicates that feeding with optimized broodstock feeds should start early to allow the incorporation of EFA in the first cohort of oocytes. At least 14 weeks of feeding is required to change lipid EFA in broodstock eel to resemble EFA in the diet or in wild fish. After 44 weeks of feeding, ARA was significantly higher in the neutral lipids of ovaries (1.9%) compared to visceral fat (1.2%) or muscle (1.0%). EPA:ARA ratios decreased two- to threefold in all tissues examined during that time. ARA and docosahexaenoic acid (22:6 n-3) (DHA) had accumulated in ovarian polar lipids

**General information**
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Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, National Food Institute, Section for Population Ecology and Genetics, Division of Industrial Food Research
Authors: Støttrup, J. (Intern), Jacobsen, C. (Intern), Tomkiewicz, J. (Intern), Jarlbæk, H. (Intern)
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General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Dinesen, G. E. (Intern), Tomczak, T. (Ekstern), Hoffmann, E. (Intern), Maar, M. (Ekstern), Støttrup, J. (Intern)
Publication date: 2013
Event: Poster session presented at 17. Danske havforskermøde, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Journal article – Annual report year: 2012
Reproduction of European eel and larval culture: state of the art

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Centre for Ocean Life
Authors: Tomkiewicz, J. (Intern), Støttrup, J. (Intern), Corraze, G. (Ekstern), Kausik, S. (Ekstern), Holst, L. (Ekstern), McEvoy, F. (Ekstern), Dufour, S. (Ekstern), Lafont, A. (Ekstern), Asturiano, J. (Ekstern), Sørensen, S. R. (Intern), Tveiten, H. (Ekstern), De Schryver, P. (Ekstern), Butts, I. (Intern), Munk, P. (Intern), Zambonino-Infante, J. (Ekstern), Politis, S. N. (Intern), Krüger-Johnsen, M. (Intern), Lauesen, P. (Intern)
Publication date: 2013
Main Research Area: Technical/natural sciences
Links: https://www.was.org/easonline/Mobile/Paper.aspx?i=2052
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Rotifers, Artemia and copepods as live feeds for fish larvae in aquaculture

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Ghent University
Authors: Dhont, J. (Ekstern), Dierckens, K. (Ekstern), Støttrup, J. (Intern), Van Stappen, G. (Ekstern), Wille, M. (Ekstern), Sorgeloos, P. (Ekstern)
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Number: 242
Main Research Area: Technical/natural sciences
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Stenrev: Gennemgang af den biologiske og økologiske viden, der findes om stenrev og deres funktion i tempererede områder

General information
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Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Danish Shellfish Centre, Section for Monitoring and Data
Authors: Støttrup, J. (Intern), Stenberg, C. (Intern), Dinesen, G. E. (Intern), Christensen, H. T. (Intern), Wieland, K. (Intern)
Number of pages: 57
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A systems approach framework for the transition to sustainable development: Potential value based on coastal experiments

This article explores the value of the Systems Approach Framework (SAF) as a tool for the transition to sustainable development in coastal zone systems, based on 18 study sites in Europe, where the SAF was developed and tested. The knowledge gained from these experiments concerns the practical aspects of (a) governance in terms of policy effectiveness, (b) sustainability science in terms of applying transdisciplinary science to social-ecological problems, and (c) simulation analysis in terms of quantifying dysfunctions in complex systems. This new knowledge can help broaden our perspectives on how research can be changed to better serve society. The infusion of systems thinking into research and policy making leads to a preference for multi-issue instead of single-issue studies, an expansion from static to dynamic indicators, an understanding of the boundaries between system-dependent and system-independent problems, and the inclusion of non-market evaluations. It also develops a real partnership among research, management, and stakeholders to establish a quantitative basis for collaborative decision making. Furthermore, the article argues that the transition to sustainable development for coastal systems requires consideration of the scale interdependency from individual to global and recognition of the probable global reorganizational emergence of scale-free networks that could cooperate to maximize the integrated sustainability among them.

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Authors: Hopkins, T. S. (Ekstern), Bailly, D. (Ekstern), Elmgren, R. (Ekstern), Glegg, G. (Ekstern), Sandberg, A. (Ekstern), Støttrup, J. G. (Intern)
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Scopus rating (2015): SJR 1.933 SNIP 1.571 CiteScore 3.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.64 SNIP 1.478 CiteScore 3.37
Web of Science (2014): Indexed yes
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BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.672 SNIP 1.637 CiteScore 3.29
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Web of Science (2012): Indexed yes
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Scopus rating (2011): SJR 1.48 SNIP 1.51 CiteScore 2.84
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Chronic CO2 exposure markedly increases the incidence of cataracts in juvenile Atlantic cod Gadus morhua L.

A study was undertaken to test the affect of chronic exposure to elevated dissolved carbon dioxide on juvenile Atlantic cod. The CO2 treatment concentrations were designated as low (1–2mgL−1, 1000μatm), medium (8mgL−1, 3500μatm) and high (18mgL−1, 8500μatm), and the fish were reared at 10°C and 20‰ salinity. A marked observation at the end of the 55day trial was that an increase in the incidence of eye lesions correlated with increasing CO2 concentration. Typical lesions included unilateral and bilateral exophthalmos, gas bubbles under the sclera and cataracts, and these were quantified in all fish (n=757 individuals) using field methods. The most notable difference between CO2 treatments was the prevalence and intensity of lenticular cataracts, which were primarily diffuse rather than nucleated. Nearly 75% of all fish from the high CO2 treatment were found to have some degree of cataractous lesion, compared with 10–13% for the other treatments. The severity of the cataract was most pronounced at the highest CO2 concentration, with many fish presenting complete bilateral cataracts. These data indicate that chronic exposure to high CO2 concentrations can cause cataracts in juvenile Atlantic cod. To our knowledge this is the first report of CO2 as a causative agent or aggravating factor for cataracts.

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Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Moran, D. (Intern), Tubbs, L. (Ekstern), Støttrup, J. G. (Intern)
Pages: 212-216
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
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Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
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BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.126
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 0.973
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.627
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.108 SNIP 1.689
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.915 SNIP 1.627
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.016 SNIP 1.627
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.121 SNIP 1.926
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.992 SNIP 1.418
Web of Science (2002): Indexed yes
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Cod reproductive ecology: Effect of dietary fatty acids on ovarian maturation, spawning time and quality of eggs and larvae

In recent decades, Baltic cod has experienced a period of low recruitment. In the same period the pelagic Baltic Sea ecosystem experienced a regime shift, due to hydrographic changes, affecting all trophic levels. The rationale for the thesis is built on the hypothesis that the regime shift has resulted in decreased dietary value of clupeids in terms of lipid content and essential fatty acids (EFA) which originates from phytoplankton and is transferred up through the food web.
Clupeids are main prey for cod in the Central Baltic Sea and a decreased dietary value is hypothesised to affect cod reproduction. The overall objective of the thesis is to investigate the role of lipids in reproduction of cod (Gadus morhua) in the Central Baltic Sea. The first objective is to examine the seasonal variation in content of lipid and EFA in whole prey species of cod (Paper I). The second objective is to investigate the variation in lipid content, EFA and antioxidants of female Baltic cod gonads and livers during the reproductive cycle (Paper II) and to examine whether there is a deficiency in lipid energy and dietary EFA that could explain the delayed spawning time observed in the Baltic cod (Paper III). The third objective is to investigate experimentally if EFA levels, comparable to those observed in Baltic clupeids, delayed timing of spawning and influenced egg production and quality in cod (Paper IV). The study combines field data of cod and its main prey species; sprat (Sprattus sprattus), herring (Clupea harengus) and the isopod Saduria entomon from the Baltic Sea sampled during 2002-2004 and 2008-2009 in different seasons and experimental data of farmed broodstock cod. Lipid composition of whole prey species and ovaries and livers of cod in different maturity stages were analyzed and lipid composition in samples of mature cod was compared with samples of North Sea cod with no delay in spawning time. A feeding experiment was carried out to test the dietary effect of different levels of the essential polyunsaturated n-6 arachidonic acid (ARA) and n-3 eicosapentaenoic acid (EPA) on spawning period, realized fecundity, and egg and larval quality under controlled conditions. Lipid content and fatty acid composition (FAC) differs significantly between sprat, herring and S. entomon (Paper I). Sprat has in general high lipid content and proportion of the monounsaturated fatty acid, oleic acid, compared to herring, which in contrast, has high proportion of the polyunsaturated fatty acid, docosahexaenoic acid (DHA). This suggests that sprat feeds more on the copepods Pseudocalanus sp. than herring which mainly feeds on Temora longicornis. Hence, altered ratios of sprat and herring abundance available for cod may impact lipid content and FAC in cod. High proportions of ARA, EPA and the antioxidant, astaxanthin, in S. Entomon, compared to 9 clupeids, render it a valuable constituent in the diet of Baltic cod. However, the abundance of S. Entomon has declined in recent decades in the Baltic. FAC of ovary and liver varies with maturity stage in Baltic cod (Paper II and III). Low content of ARA in sprat and herring in spring and summer is reflected in cod ovaries and coincide with the timing of the maturation period of cod in the Central Baltic Sea (Paper I and II). Fatty acids trophic markers indicates that dinoflagellates dominated during the years examined which may have resulted in a reduction of ARA level in both sprat and herring compared to periods with dominance of diatoms (Paper I). No limitation in lipid energy is evident in Baltic cod but a deficiency in ARA is indicated (Paper II). Selective retention of ARA in ovaries during ovarian maturation is evident (Paper II) but despite mobilization of ARA from liver, the level is not sufficient to keep up with the requirement in ovaries and ARA decreases in late maturation and during spawning. The antioxidants α-tocopherol and astaxanthin accumulates in cod ovaries compared to prey and decreases in late maturation and spawning due to antioxidant protection activity (Paper II). ARA level, important for eicosanoid activity, is lower in ovaries of Baltic Sea cod than in North Sea cod (Paper III), indicating that this fatty acid may be important for spawning time. However the spawning period is not influenced by different ARA levels and EPA/ARA ratios in farmed cod (Paper IV). Uptake of DHA, EPA and ARA into cod eggs from broodstock diet is highly efficient (Paper IV). Diet with low EPA/ARA ratio has significantly higher realized fecundity and eggs from fish fed a diet with high ARA level has higher fertilization success and survival to 8 days post hatch compared to fish fed low level of ARA. The combined results strongly indicate that the low ARA levels in Baltic cod ovaries, reflecting ARA levels in prey, result in low fertilization success and survival of eggs and larvae. This PhD provides novel information about lipid dynamics in Baltic sprat and herring which is important because these species occupy a central position in the Baltic ecosystem. The results contribute to a better understanding of the lipid requirements and fatty acid mobilization during maturation in cod but do not explain the delayed spawning time in Baltic cod. The improved knowledge of the effect of dietary EFA on realized fecundity and egg and larval quality in cod is of great importance for estimating recruitment but also to cod farming because egg quality in cultured cod is one of the limiting factors for successful mass production of fish fry. EFA proved a useful tool as trophic markers in the Baltic Sea ecosystem and the results indicate that EFA may also be useful as ecosystem state indicators.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Raïbek, M. (Intern), Støttrup, J. (Intern)
Number of pages: 199
Publication date: 2012

Publication information
Place of publication: Charlottenlund
Publisher: DTU aqua. National Institute of Aquatic Resources
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Maria_thesis_final_260612.pdf
Publication: Research › Ph.D. thesis – Annual report year: 2012

Integrated trend assessment of ecosystem changes in the Limfjord (Denmark): evidence of a recent regime shift?
An integrated ecosystem assessment was carried out for the Limfjord over the period from 1984 to 2008 to describe changes in ecosystem structure and potentially important drivers. The Limfjord is an eutrophic transitional Danish fjord...
system with the main inflow from the North Sea in the west and main outflow to the Kattegat in the east. We showed that from 1990 to 1995, the ecosystem structure shifted from dominance by demersal fish species (eel pout, whiting, flounder, plaice) to that of pelagic fish species (sprat, herring, sticklebacks), small-bodied fish species (black goby, pipefish), jellyfish, common shore crab, starfish and blue mussels. We interpret this change as a regime shift that showed a similar temporal pattern to regime shifts identified in adjacent seas. The observed changes in trophic interactions and food web reorganisation suggested a non-linear regime shift. The analyses further showed the regime shift to be driven by a combination of anthropogenic pressures and possible interplay with climatic disturbance.

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Management Systems
Authors: Tomczak, M. T. (Ekstern), Dinesen, G. E. (Intern), Hoffmann, E. (Intern), Maar, M. (Ekstern), Støttrup, J. (Intern)
Pages: 178-187
Publication date: 2012
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Estuarine, Coastal and Shelf Science
Volume: 117
ISSN (Print): 0272-7714
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2016): CiteScore 2.43 SJR 0.997 SNIP 1.127
Web of Science (2016): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.107 SNIP 1.257 CiteScore 2.28
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.323 SNIP 1.439 CiteScore 2.64
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.256 SNIP 1.419 CiteScore 2.52
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.383 SNIP 1.325 CiteScore 2.52
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.231 SNIP 1.202
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.169 SNIP 1.262
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.244 SNIP 1.302
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.114 SNIP 1.355
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.203 SNIP 1.365
Linking lipid dynamics with the reproductive cycle in Baltic cod Gadus morhua

This study describes lipid composition and antioxidants of Baltic cod Gadus morhua L. during the reproductive cycle, and investigates whether they reflect its dominant prey and whether levels of fatty acids important for reproductive performance were low. Reasons for a shift in peak spawning time of Baltic cod from spring/early summer to midsummer since the early 1990s remain unresolved and may partly be diet related. This study demonstrated that a substantial amount of lipid was invested in cod ovarian development, and that lipid composition varied substantially with the reproductive cycle. Selective retention of the essential fatty acids docosahexaenoic acid (DHA) and arachidonic acid (ARA) in ovaries during maturation was evident, but despite mobilization from the liver, ARA levels were low in ovaries during late maturation and spawning. Astaxanthin and α-tocopherol accumulated in cod ovaries and decreased in late maturing and spawning fish, most likely due to their antioxidant protection activity. The fatty acid composition of cod liver reflected its clupeid prey. The ratio of 18:1n-9 to DHA was almost twice as high in sprat as in herring and indicated the ratio of sprat and herring in cod diet, while the level of 16:1n-7 and astaxanthin indicated the presence of the isopod Saduria entomon in cod diet. It is likely that food web alterations in the Baltic ecosystem related to environmental and hydrographic changes caused a decrease in ARA availability. Low ARA content coincides with cod ovarian development in the central Baltic Sea, and may be associated with the delay in spawning and affect egg and larval survival; however, this needs further verification in experimental studies.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, National Food Institute, Division of Industrial Food Research, Section for Population Ecology and Genetics
Authors: Røjbek, M. (Intern), Jacobsen, C. (Intern), Tomkiewicz, J. (Intern), Støttrup, J. (Intern)
Pages: 215-234
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology Progress Series
Volume: 471
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
Lipid dynamics of herring (Clupea harengus L.) and sprat (Sprattus sprattus) as major prey species in the Baltic Sea

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Population Ecology and Genetics, National Food Institute, Division of Industrial Food Research
Authors: Røjbek, M. (Intern), Tomkiewicz, J. (Intern), Jacobsen, C. (Intern), Støttrup, J. (Intern)
Publication date: 2012
Event: Abstract from ICES/PICES Symposium on Forage Fish Interactions, Nantes, France.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2013

Offshore windfarms and their impact on fish abundance and community structure
Deployment of offshore windfarms (OWF) is rapidly expanding. A before–after control impact (BACI) approach was used to study the impact of one of the world’s largest offshore windfarms (Horns Rev Offshore Windfarm) on fish assemblages and species diversity. Fish were generally more abundant in the control than the impact area before the establishment of the OWF. Eight years later fish abundance was similar in both the impact and control area but the abundance of one of the most frequently occurring species, whiting, was much lower compared to 2001. However, the changes in whiting reflected the general trend of the whiting population in the North Sea. The introduction of hard bottom resulted in higher species diversity close...
to each turbine with a clear spatial (horizontal) distribution. New reef fish such as goldsinny wrasse (Ctenolabrus rupestris), viviparous eelpout (Zoarces viviparous), and lumpsucker (Cyclopterus lumpus), established themselves on the introduced reef area. In contrast very few gobies were caught near or at the OWF, presumably owing to the highly turbulent hydrographical conditions in the OWF. We suggest that the lack of this common prey fish is the main reason for the absence of larger predatory fish species.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Population Ecology and Genetics, Department of Informatics and Mathematical Modeling, Mathematical Statistics
Authors: Stenberg, C. (Intern), Dinesen, G. E. (Intern), Deurs, M. V. (Intern), Berg, C. W. (Intern), Mosegaard, H. (Intern), Leonhard, S. (Ekstern), Groome, T. (Ekstern), Støttrup, J. (Intern)
Number of pages: 18
Publication date: 2012
Event: 
Main Research Area: Technical/natural sciences
Electronic versions: O0912.pdf
Publication: Research › Paper – Annual report year: 2012

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**On the edge of death: Rates of decline and lower thresholds of biochemical condition in food-deprived fish larvae and juveniles**

Gaining reliable estimates of how long fish early life stages can survive without feeding and how starvation rate and time until death are influenced by body size, temperature and species is critical to understanding processes controlling mortality in the sea. The present study is an across-species analysis of starvation-induced changes in biochemical condition in early life stages of nine marine and freshwater fishes. Data were compiled on changes in body size (dry weight, DW) and biochemical condition (standardized RNA–DNA ratio, sRD) throughout the course of starvation of yolk-sac and feeding larvae and juveniles in the laboratory. In all cases, the mean biochemical condition of groups decreased exponentially with starvation time, regardless of initial condition and endogenous yolk reserves. A starvation rate for individuals was estimated from discrete 75th percentiles of sampled populations versus time (degree-days, Dd). The 10th percentile of sRD successfully approximated the lowest, life-stage-specific biochemical condition (the edge of death). Temperature could explain 59% of the variability in time to death whereas DW had no effect. Species and life-stage-specific differences in starvation parameters suggest selective adaptation to food deprivation. Previously published, interspecific functions predicting the relationship between growth rate and sRD in feeding fish larvae do not apply to individuals experiencing prolonged food deprivation. Starvation rate, edge of death, and time to death are viable proxies for the physiological processes under food deprivation of individual fish pre-recruits in the laboratory and provide useful metrics for research on the role of starvation in the sea.

**General information**

State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Pages: 11-24
Publication date: 2012
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Journal of Marine Systems
Volume: 93
ISSN (Print): 0924-7963
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.403 SNIP 1.282 CiteScore 2.61
BFI (2015): BFI-level 1
registrering af fangster i de danske kystområder med standardredskaber fra 2008-2010: nøglefiskerrapporten for årene 2008-2010

general information
state: published
organisations: section for coastal ecology, national institute of aquatic resources
authors: støttrup, j. (intern), sparrevohn, c. r. (intern), nicolajsen, h. (intern), kristensen, l. (intern)
number of pages: 95
publication date: 2012

publication information
Reproduction of European Eel in Aquaculture (REEL): Consolidation and new production methods

Project aim: Enhance methods and technology applied to produce and culture European eel larvae as basis for the development of a future self-sustained eel aquaculture.

Background: The severe decline of the European eel stock calls for conservation measures including national eel management plans and establishment of a self-sustained eel aquaculture. In 2005, the National Institute of Aquatic Resources at the Technical University of Denmark (DTU Aqua), the Faculty of Life Sciences at Copenhagen University (KU-Life) and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture. Two major projects: Artificial Reproduction of Eels II and III (ROE II and III) succeeded during 2005-2008 to produce viable eggs and larvae that lived up to 12 days. The larvae thereby accomplished the yolk-sac stage and became ready to start feeding. The results were in particular promising because they evidenced that methods successfully applied to Japanese eel has a potential for application also to the European eel.

ROE II and III were supported by the Ministry of Food, Agriculture and Fisheries and the European Commission through the Financial Instrument for Fisheries Guidance (FIFG) and the Danish Food Research Program 2006, respectively.

Results: The REEL project accomplished through three series of experiments to consolidate previous results. The longevity of larvae was extended from 12 to 20 days after hatch in first feeding experiments thereby entering the leptocephalus phase. Maturation potential and methods to induce maturation were further tested, and farmed and wild eel broodstocks as well as different treatments were compared. In particular, fertilisation procedures to produce fertilised eggs and embryos and monitoring techniques were enhanced. The technology needed to culture embryos and larvae was substantially improved. The potential for new hormonal treatments was explored and recombinant eel hormones have been produced. New broodstock diets were developed with focus on the lipid composition essential for development and survival of fish larvae. In addition, the experimental facility established by DTU Aqua at Lyksvad Fish Farm was enhanced by improving the experimental and laboratory facilities. The REEL project provided the basis for the establishment of an EU collaborative research project: Reproduction of European Eel: Towards a Self-sustained Aquaculture (PRO-EEL) coordinated by DTU Aqua. REEL included the partners DTU Aqua, KU-Life, Danish Eel Farmers Association (DEFA), Billund Aquaculture Service (BA), BioMar, and Bioneer of which four are integrated in the PRO-EEL project that in total has 15 international partners.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Population Ecology and Genetics, Section for Coastal Ecology, Section for Ocean Ecology and Climate, National Food Institute, Division of Industrial Food Research, Section for Aquaculture
Number of pages: 47
Publication date: 2012
Main Research Area: Technical/natural sciences
Electronic versions:
249_2012_reproduction_of_european_eel_in_aquaculture.pdf
Links:
Publication: Research › Report – Annual report year: 2012

Reproduction of European eel: towards a self-sustained aquaculture (PRO-EEL)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Ecology and Oceanography, Section for Ecosystem based Marine Management, Centre for Ocean Life, National Food Institute, Division of Industrial Food Research
Publication date: 2012
Event: Abstract from World Fisheries Congress, Edinburgh, United Kingdom.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2012

Short-term and long-term effects of an offshore wind farm on three species of sandeel and their sand habitat

General information
State: Published
Organisations: Section for Population Ecology and Genetics, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Monitoring
Authors: Deurs, M. V. (Intern), Grome, T. (Ekstern), Kaspersen, M. (Ekstern), Jensen, H. (Ekstern), Stenberg, C. (Intern), Sørensen, T. K. (Intern), Støttrup, J. (Intern), Warnar, T. (Intern), Mosegaard, H. (Intern)
Pages: 169-180
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Volume: 458
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Slutrapport for Projekt BioRev 2010-2012

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Danish Shellfish Centre, Section for Marine Services
Number of pages: 51
Publication date: 2012

Publication information
Place of publication: Charlottenlund
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
ISBN (Print): 978-87-7481-153-4
ISBN (Electronic): 978-87-7481-152-7
Original language: Danish

Series: DTU Aqua-rapport
Number: 251-2012

Note re. dissertation: Projektet blev finansieret af DTU Aqua og Ministeriet for Fødevarer, Landbrug og Fiskeri via LAG Fyn gennem Den Europæiske Fiskenfond: Danmark og EU investerer i bæredygtigt fiskeri og akvakultur

Main Research Area: Technical/natural sciences

Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008

Publication: Research › Report – Annual report year: 2012
Sublethal effects of alizarin complexone marking on Baltic cod (Gadus morhua) eggs and larvae

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Meyer, S. (Intern), Sørensen, S. R. (Intern), Peck, M. (Ekstern), Støttrup, J. (Intern)
Pages: 158-164
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 324-325
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.151 SNIP 1.394
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.941 SNIP 1.263
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.008 SNIP 1.689
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.915 SNIP 1.236
A systems approach for sustainable development in coastal zones

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology and Society
Volume: 16
Issue number: 4
ISSN (Print): 1708-3087
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.805 SNIP 1.469 CiteScore 3.75
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.933 SNIP 1.571 CiteScore 3.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.64 SNIP 1.478 CiteScore 3.37
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.642 SNIP 1.654 CiteScore 3.53
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.672 SNIP 1.637 CiteScore 3.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.48 SNIP 1.51 CiteScore 2.84
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
A systems approach framework for coastal zones

This Special Feature Volume examines the potential value of the Systems Approach Framework (SAF) as a methodological framework for the transition to sustainable development in coastal zones. This article provides insight on the Systems Approach, the theory behind it, and how its practical application to coastal zone systems (CZSs) was developed. The SAF is about information for management through a focus on how to generate a higher, dynamic level of information about complex CZSs and how to render this information more useful to end users through a participatory suite of communication methods. The SAF is an open research methodology that investigates the function of systems in order to simulate specific issues or questions concerning their function. The research articles that are included in this Volume demonstrate examples of coupled multidisciplinary methods integrated into SAF simulations appropriate to a selected policy issue and to the social-environmental conditions of each Study Site Application. Their findings are not the result of funded research projects; instead, they are by-products of pilot applications conducted to develop and improve the SAF methodology. The final article of this Volume synthesizes these results in the context of the SAF as a higher level instrument for integrated coastal zone management.
Effect of the Horns Rev 1 Offshore Wind Farm on Fish Communities. Follow-up Seven Years after Construction: Follow-up Seven Years after Construction

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics, Mathematical Statistics, Department of Informatics and Mathematical Modeling
Number of pages: 96
Publication date: 2011

Publication information
Place of publication: Charlottenlund
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
ISBN (Print): 978-87-7481-142-8
Original language: English
Series: DTU Aqua Report
Epifyt og epifauna på ålegræs (Zostera marina) i Nørrefjord, Faaborg

General information
State: Published
Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Section for Ecosystem based Marine Management
Authors: Thorsen, S. W. (Ekstern), Knudsen, M. (Ekstern), Poulsen, L. K. (Intern), Kristensen, L. (Intern), Dolmer, P. (Intern), Stenberg, C. (Intern), Landes, A. (Intern), Støttrup, J. (Intern), Holmer, M. (Ekstern)
Publication date: 2011
Main Research Area: Technical/natural sciences

Etablering af biogene rev - en vej til nyt liv i danske fjorde?

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Poulsen, L. K. (Intern), Stenberg, C. (Intern), Dolmer, P. (Intern), Kristensen, L. (Intern), Aabrink, M. (Intern), Christensen, H. T. (Intern), Holmer, M. (Ekstern), Thorsen, S. W. (Ekstern), Knudsen, M. (Ekstern), Oelschlägel, A. (Intern), Støttrup, J. (Intern)
Publication date: 2011
Main Research Area: Technical/natural sciences

Fritidsfiskere registrerer deres fangster i fjorde og indre danske farvande

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Nicolajsen, H. (Intern), Kristensen, L. (Intern), Sparrevohn, C. R. (Intern), Støttrup, J. (Intern)
Publication date: 2011

Publication information
Source/Publisher: www.fiskepleje.dk
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 276919
Publication: Communication › Internet publication – Annual report year: 2011

Fritidsfiskere registrerer deres fangster i fjorde og indre danske farvande

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Nicolajsen, H. (Intern), Kristensen, L. (Intern), Sparrevohn, C. R. (Intern), Støttrup, J. (Intern)
Pages: 5
Publication information
Journal: Fritidsfiskeren
Volume: 31
Issue number: 3
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 277467
Publication: Communication › Journal article – Annual report year: 2011

Live feed

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Øie, G. (Ekstern), Reitan, K. (Ekstern), Evjemo, J. (Ekstern), Støttrup, J. (Intern), Olsen, Y. (Ekstern)
Number of pages: 448
Pages: 307-334
Publication date: 2011

Host publication information
Title of host publication: Larval Fish Nutrition
Volume: Chapter 11
Publisher: University of Iowa Press
Editor: Holt, J.
ISBN (Print): 978-0-8138-1792-7
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 269338
Publication: Research - peer-review › Book chapter – Annual report year: 2011

Marin fiskepleje

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Nicolajsen, H. (Intern), Sparrevohn, C. R. (Intern), Stenberg, C. (Intern), Kristensen, L. (Intern), Støttrup, J. (Intern)
Publication date: 2011
Event: Poster session presented at 16. danske havforskermøde, Mols, Denmark.
Main Research Area: Technical/natural sciences

Bibliographical note
Poster og abstract
Source: orbit
Source-ID: 278054
Publication: Research › Poster – Annual report year: 2011

Metode til bestemmelse af habitatkompleksitet

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Kristensen, L. (Intern), Stenberg, C. (Intern), Grønkjær, P. (Ekstern), Støttrup, J. (Intern)
Publication date: 2011
Mussel production and Water Framework Directive targets in the Limfjord, Denmark: an integrated assessment for use in system-based management

Growth of human activities often conflict with nature conservation requirements and integrated assessments are necessary to build reliable scenarios for management. In the Limfjord, Denmark’s largest estuary, nutrient loading reductions are necessary to fulfill EU regulations criteria, such as the Water Framework Directive (WFD). Cuts in nutrient loadings do not necessarily result in corresponding reductions in eutrophication impacts or in improving primary and higher trophic-level production. Similarly, the socioeconomic consequences of a mussel fishery and aquaculture production are complex and hard to predict. This study focuses on the usefulness of a System Approach Framework (SAF) implementation for stakeholder understanding of complex systems and development of sustainable management.

Ecological-social-economic (ESE) model simulations clearly demonstrated the potential problems of WFD implementation for mussel fishers and mussel farmers. Simulation of mussel fishery closures resulted in a tenfold increase in the hitherto fishable mussel biomass and a similar decrease in the biomass of shallow-water mussels and medium-sized ones in deep water. A total closure of the mussel fishery could result in an annual profit loss of ~€6.2 million. Scenario simulation of the introduction of one, two, three, and four mussel culture farms of ~19 ha showed that the introduction of line-mussels would decrease the biomass of wild mussels both in shallow and deep waters, affecting the catch and profit of fishers. The SAF, which included consultation with stakeholders at all stages, differs from the traditional public consultation process in that (1) communication was verbal and multilateral, (2) discussion among stakeholders was facilitated, and (3) stakeholder opinions and priorities formed the focus of the ESE assessment.

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Dinesen, G. E. (Intern), Timmermann, K. (Ekstern), Rothen, E. (Ekstern), Markager, S. (Ekstern), Ravn-Jonsen, L. (Ekstern), Hjorth, M. (Ekstern), Holmer, M. (Ekstern), Støttrup, J. (Intern)
Pages: Art. 26
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology and Society
Volume: 16
Issue number: 4
ISSN (Print): 1708-3087
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.805 SNIP 1.469 CiteScore 3.75
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.933 SNIP 1.571 CiteScore 3.92
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.64 SNIP 1.478 CiteScore 3.37
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.642 SNIP 1.654 CiteScore 3.53
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.672 SNIP 1.637 CiteScore 3.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
The effect of carbon dioxide on growth of juvenile Atlantic cod Gadus morhua L.

A trial was undertaken to investigate how exposure to graded hypercapnia affected the growth performance of juvenile (15-80 g) Atlantic cod. Juveniles were grown at 20% salinity and 10 °C for 55 days under three hypercapnic regimes: low (2 ± 0.9 mg L−1 CO2, 0.6 mm Hg, 1000 μatm), medium (8 ± 0.5 mg L−1 CO2, 2.8 mm Hg, 3800 μatm) and high CO2 exposure (18 ± 0.2 mg L−1 CO2, 6.3 mm Hg, 8500 μatm). All water quality parameters were within the range of what might normally be considered acceptable for good growth, including the CO2 levels tested. Weight gain, growth rate and condition factor were substantially reduced with increasing CO2 dosage. The size-specific growth trajectories of fish
reared under the medium and high CO2 treatments were approximately 2.5 and 7.5 times lower (respectively) than that of fish in the low treatment. Size variance and mortality rate was not significantly different amongst treatments, indicating that there was no differential size mortality due the effects of hypercapnia, and the CO2 levels tested were within the adaptive capacity of the fish. In addition, an analysis was carried out of the test CO2 concentrations reported in three other long-term hypercapnia experiments using marine fish species. The test concentrations were recalculated from the reported carbonate chemistry conditions, and indicated that the CO2 concentration effect threshold may have been overestimated in two of these studies. Our study suggests that juvenile Atlantic cod are more susceptible to the chronic effects of environmental hypercapnia than other marine fish examined to date.

**General information**

**State:** Published  
**Organisations:** Section for Coastal Ecology, National Institute of Aquatic Resources  
**Authors:** Moran, D. (Intern), Støttrup, J. (Intern)  
**Pages:** 24-30  
**Publication date:** 2011  
**Main Research Area:** Technical/natural sciences

**Publication information**

**Journal:** Aquatic Toxicology  
**Volume:** 102  
**Issue number:** 1-2  
**ISSN (Print):** 0166-445X  
**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 4.38 SJR 1.612 SNIP 1.393  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): SJR 1.666 SNIP 1.175 CiteScore 3.79  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): SJR 1.597 SNIP 1.337 CiteScore 3.75  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 2  
Scopus rating (2013): SJR 1.88 SNIP 1.503 CiteScore 4.06  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 2  
Scopus rating (2012): SJR 1.904 SNIP 1.487 CiteScore 3.83  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes  
BFI (2011): BFI-level 2  
Scopus rating (2011): SJR 1.995 SNIP 1.393 CiteScore 3.99  
ISI indexed (2011): ISI indexed yes  
Web of Science (2011): Indexed yes  
BFI (2010): BFI-level 2  
Scopus rating (2010): SJR 1.79 SNIP 1.381  
Web of Science (2010): Indexed yes  
BFI (2009): BFI-level 2  
Scopus rating (2009): SJR 2.008 SNIP 1.379  
Web of Science (2009): Indexed yes  
BFI (2008): BFI-level 2  
Scopus rating (2008): SJR 1.644 SNIP 1.346  
Web of Science (2008): Indexed yes  
Scopus rating (2007): SJR 1.663 SNIP 1.42
Influence of lipids and fatty acid composition on Baltic cod (Gadus morhua L.) maturation and timing of spawning

General information
State: Published
Organisations: Section for Population Ecology and Genetics, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Aquatic Lipids and Oxidation, Institute Management
Authors: Tomkiewicz, J. (Intern), Støttrup, J. (Intern), Jacobsen, C. (Intern), Røjbek, M. (Intern), Köster, F. (Intern)
Publication date: 2010
Main Research Area: Technical/natural sciences
Electronic versions:
ICES CM 2009 C10.pdf
Links:
http://www.ices.dk/products/cmdocsindex.asp

Bibliographical note
Extended abstract
Source: orbit
Source-ID: 256650
Publication: Research › Conference abstract for conference – Annual report year: 2010

Integrated assessment for use in system-based management: ecosystem health and restoration through sustainable use of resources

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Number of pages: 345
Pages: 106-107
Publication date: 2010

Host publication information
Title of host publication: ICES Annual Science Conference : 20-24 September 2010
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 267833
Integrated assessment for use in system based management: WFD nutrient targets and mussel production in the Limfjord, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Number of pages: 14
Publication date: 2010
Main Research Area: Technical/natural sciences
Links:
http://www.ices.dk/products/CMdocs/CM-2010/B/B0910.pdf
Source: orbit
Source-ID: 267551
Publication: Research › Paper – Annual report year: 2010

Limfjord, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Dinesen, G. E. (Intern)
Pages: 7
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: SPICOSA
Issue number: 2
Original language: English
Links:
Source: orbit
Source-ID: 269337
Publication: Research › Journal article – Annual report year: 2010

Live and let die - condition indices and starvation-induced mortality thresholds during the early life of marine fish

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Meyer, S. (Intern), Hauss, H. M. (Ekstern), Kanstinger, P. (Ekstern), Peck, M. A. (Ekstern), Støttrup, J. (Intern)
Publication date: 2010
Main Research Area: Technical/natural sciences
Links:
http://www.ices.dk/products/cmdocsindex.asp
Source: orbit
Source-ID: 256655
Publication: Research › Conference abstract for conference – Annual report year: 2010

Ribosomal RNA gene sequences confirm that protistan endoparasite of larval cod Gadus morhua is Ichthyodinium sp.
An enigmatic protistan endoparasite found in eggs and larvae of cod Gadus morhua and turbot Psetta maxima was isolated from Baltic cod larvae, and DNA was extracted for sequencing of the parasite's small Subunit ribosomal RNA (SSU rRNA) gene. The endoparasite has previously been suggested to be related to Ichthyodinium chabelardi, a dinoflagellate-like protist that parasitizes yolk sacs of embryos and larvae of a variety of fish species. Comparison of a 1535 bp long fragment of the SSU rRNA gene of the cod endoparasite showed absolute identity with I. chabelardi, demonstrating that the 2 parasites are very closely related, if not identical. This finding is discussed in relation to some morphological differences that appear to exist between I. chabelardi and the cod endoparasite.
Role of heterotrophic protists in first feeding by cod (Gadus morhua) larvae

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Overton, J. L. (Intern), Meyer, S. (Intern), Støttrup, J. (Intern), Peck, M. A. (Ekstern)
Pages: 197-204
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: Marine Ecology - Progress Series
Issue number: 410
ISSN (Print): 0171-8630
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.4
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.75
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.79
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.9
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.85
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Seasonal lipid dynamics of sprat (Sprattus sprattus) and herring (Clupea harengus) in the Baltic Sea

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Division of Seafood Research, National Food Institute, Section for Population Ecology and Genetics
Authors: Røjbek, M. (Intern), Jacobsen, C. (Intern), Tomkiewicz, J. (Intern), Støttrup, J. (Intern)
Publication date: 2010
Event: Poster session presented at 101st AOCS Annual Meeting, Phoenix, AZ, United States.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 266191
Publication: Research - peer-review › Journal article – Annual report year: 2010

SPICOSA Appraisal Step Scientific Report: SSA 5 - Limfjorden, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Publication date: 2010

Stock enhancement Europe: Turbot Psetta maxima

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Sparrevoorn, C. R. (Intern)
Number of pages: 392
Pages: 219-236
Publication date: 2010

Host publication information
The Limfjord, Denmark. SPICOSA study site 5

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Dinesen, G. E. (Intern), Timmermann, K. (Ekstern), Markager, S. (Ekstern), Rothe, E. (Ekstern), Ravn-Jonsen, L. (Ekstern), Hjort, M. (Ekstern), Petersen, J. K. (Ekstern), Støttrup, J. (Intern)
Publication date: 2010
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 271277
Publication: Research › Poster – Annual report year: 2010

Updated information on impacts of temperature, species, and body size on RNA–DNA ratios of starving marine fish larvae

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Meyer, S. (Intern), Clemmesen, C. (Ekstern), Malzahn, A. (Ekstern), Støttrup, J. (Intern), Peck, M. A. (Ekstern)
Publication date: 2010
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 267498
Publication: Research › Poster – Annual report year: 2010

Determination of fish gender using fractal analysis of ultrasound images

General information
State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: McEvoy, F. J. (Ekstern), Tomkiewicz, J. (Intern), Støttrup, J. (Intern), Overton, J. L. (Intern), McEvoy, C. (Ekstern), Svalastoga, E. (Ekstern)
Pages: 519-524
Growth of juvenile Atlantic cod Gadus morhua in land-based recirculation systems: Effects of feeding regime, photoperiod and diet

The combined effect of feeding regime and photoperiod on the growth of juvenile Atlantic cod Gadus morhua in land-based recirculating aquaculture systems (RAS) was examined using three different commercial diets. Fish of 8–10 g were reared in 1 m³ tanks at an initial density of 10 kg m⁻³ for 78 d. Three RAS units were used to simultaneously test three
feed/photoperiod regimes that might be encountered in the wild or aquaculture; LightDark (LD) 24:0, LD12:11 (+ 1 h crepuscular periods) and LD6:6 (+ 12 h crepuscular periods). Feed was administered during the light period every 30 min for a 3 min feeding duration. In each RAS unit three diets (A, B and C) were tested, which were broadly similar in composition but from different manufacturers. Water exchange rate averaged 10–19% in the three recirculation systems, and key water quality parameters such as NH4+ and CO2 remained at low effect concentrations (<0.4 and <3 mg L− 1, respectively). Final stocking densities were 45–60 kg m− 3. There was a significant influence of both feed/photoperiod regime and diet on specific growth rate (SGR). Fish receiving the LD12:11 and LD6:6 regimes and Diet A grew best (SGR 2.59 and 2.54% d− 1 respectively). Fish fed Diet B and C also grew best under the LD12:11 and LD6:6 feed/photoperiod regimes (SGR range of 2.41–2.46% d− 1). Conversely, fish kept in the LD24:0 feed/photoperiod regime grew relatively slowly irrespective of diet type (SGR range of 2.26–2.32% d− 1). The feed conversion performance of the feed/photoperiod regimes and diets followed the same pattern.
Scopus rating (2008): SJR 0.909 SNIP 1.173
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.019 SNIP 1.318
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.008 SNIP 1.689
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.915 SNIP 1.236
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.016 SNIP 1.627
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.121 SNIP 1.926
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.992 SNIP 1.418
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.049 SNIP 1.317
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.908 SNIP 1.113
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.049 SNIP 1.251

Original language: English
Feeding regime, Growth, Feed conversion, Photoperiod, Recirculation system, Diet
DOIs:
10.1016/j.aquaculture.2009.04.028
Source: orbit
Source-ID: 243329
Publication: Research - peer-review › Journal article – Annual report year: 2009

Integrated coastal zone management

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Moksness, E. (ed.) (Ekstern), Dahl, E. (ed.) (Ekstern), Støttrup, J. (ed.) (Intern)
Number of pages: 342
Publication date: 2009

Publication information
Place of publication: Chichester
Publisher: Wiley-Blackwell
ISBN (Print): 978-1-4051-3950-2
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 246905
Publication: Research - peer-review › Book – Annual report year: 2009

Kryptisk adfærd hos naive og tilvænnete juvenile pighvarrer Psetta maxima (L.) og skrubber Platichthys flesus (L.)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Coastal Ecology, Aarhus University
Authors: Kristensen, L. D. (Intern), Kristensen, J. T. (Ekstern), Sparrevohn, C. R. (Intern), Støttrup, J. (Intern)
Publication date: 2009
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2009
Optimization of fatty acid composition in the diet for female broodstock eels

General information
State: Published
Organisations: Section for Aquatic Lipids and Oxidation, National Institute of Aquatic Resources, Section for Population- and Ecosystem Dynamics, Section for Coastal Ecology
Authors: Jacobsen, C. (Intern), Tomkiewicz, J. (Intern), Støttrup, J. (Intern)
Publication date: 2009
Event: Abstract from 7th EuroFedLipid Congress, Graz, Austria, October, Graz, Austria, .
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 253247
Publication: Research › Conference abstract for conference – Annual report year: 2009

Produktion af torskelarver til udsætning i den østlige Østersø – RESTOCK

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population- and Ecosystem Dynamics, Section for Aquaculture, Section for Fish Diseases
Number of pages: 143
Publication date: 2009
Host publication information
Title of host publication: Program og abstracts
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 253917
Publication: Research › Conference abstract in proceedings – Annual report year: 2009


General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Sparrevohn, C. R. (Intern), Nicolajsen, H. (Intern), Kristensen, L. (Intern), Støttrup, J. (Intern)
Number of pages: 72
Publication date: 2009
Publication information
Place of publication: Charlottenlund
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
ISBN (Print): 978-87-7481-096-4
Original language: Danish
Series: DTU Aqua-rapport
Number: 205-09
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Source: orbit
Source-ID: 256116
Publication: Research › Report – Annual report year: 2009

Seasonal lipid dynamics of herring and sprat in the Baltic Sea and possible implications for cod reproduction
The Baltic Sea experienced a regime shift in the 1980ies with major changes in food web dynamics. These ecosystem alterations were related to climatic driven changes in hydrographic conditions affecting phyto- and zooplankton assemblage and hence the food availability for clupeids. Sprat abundance increased dramatically in the early 1990ies.
The changes in plankton communities in combination with increased competition resulted in a declined condition of clupeids. Polyunsaturated fatty acids originate from phytoplankton and are transmitted through the food web. The present study investigates if the seasonal variation in lipid composition of herring and sprat reflects the changes in plankton. Fish were sampled five times over a year and the lipid composition of different size groups was analyzed. Significant seasonal variation in average lipid content in sprat was found: 14.00% in November, 11.26% in January, 7.47% in March and 9.60% in June. The lipid content in herring also varied within season but was lower than sprat: 7.42% in November, 6.71% in January and 4.70% in March. The seasonal lipid dynamic was reflected in variation of specific fatty acids. Clupeids are the major prey of Baltic cod so deficiencies of essential fatty acids could be a limiting factor for cod reproduction.
Diet, abundance and distribution as indices of turbot (Psetta maxima L.) release habitat suitability

Selection of a suitable release habitat is critical for stock enhancement. As part of the Danish turbot stock enhancement program, individually tagged, artificially reared juveniles were released into three different habitats. Data from the recaptures in the following year revealed a significant effect of release habitat on turbot growth. This raised the question whether such differences in growth could have been predicted before the release by comparing easily measurable characteristics of wild turbot caught in the different habitats. Three characteristics of wild turbot were examined: the diet, natural abundance, and depth distribution within the habitats. A marked difference was found among habitats in the timing of the diet change from the suboptimal exoskeleton carrying prey items such as crustaceans to fish. The habitat where the wild turbot had the lowest occurrence of fish in their diet was also the habitat with the highest natural abundance of age-0 individuals and the deepest distribution of wild turbot. This was the habitat where released turbot grew more slowly than in the other habitats, which indicate that the diet and depth distribution of wild turbot may provide good indicators for the success of turbot enhancement and restocking.
Growth and condition of Eastern Baltic Cod (Gadus morhua) larvae reared at different temperatures and prey levels

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Meyer, S. (Intern), Peck, M. (Ekstern), Støttrup, J. (Intern)
Publication date: 2008
Event: Poster session presented at 32nd Annual Larval Fish Conference, Kiel, Germany.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 229226
Publication: Research › Poster – Annual report year: 2008

Økosystemmodel for Ringkøbing Fjord: Skarvbestandens påvirkning af fiskebestandene

General information
State: Published
Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Freshwater Fisheries Ecology, Section for Management Systems
 Authors: Dalsgaard, A. J. T. (Intern), Christensen, V. (Ekstern), Nicolajsen, H. (Intern), Koed, A. (Intern), Støttrup, J. (Intern), Grooss, J. (Ekstern), Bregnballe, T. (Ekstern), Sørensen, H. (Ekstern), Christensen, J. (Ekstern), Nielsen, R. (Ekstern)
Number of pages: 71
Publication date: 2008
Rationale for restocking the Eastern Baltic cod stock
The Danish Institute for Fisheries Research and Bornholm’s Salmon Hatchery examined the potential for restocking Baltic
cod (Gadus morhua callarias L.) in the eastern Baltic Sea. This cod population has adapted to the unique brackish water
conditions where successful spawning depends on regular inflows of oxygenated saltwater from the North Sea.
Hydrographical conditions are therefore considered to constitute the principal bottleneck for recruitment of this population.
Successful recruitment is also dependent upon food availability and predation pressure from mainly herring (Clupea
harengus L.) and sprat (Sprattus sprattus L.). A 2-to 3-month delay in the spawning period compared to 20-30 years ago
has altered feeding conditions and predation susceptibility in a way that may have exacerbated the decline in recruitment.
Producing and releasing cod larvae during spring would mimic the spawning period recorded in previous times and would
coincide with the spring peak in copepod production. An evaluation of 3 different release scenarios showed that a release
of 474 million first-feeding larvae over 5 months would enhance the average population of 2-year-olds by 10% and be
biologically and economically the most feasible scenario.
Science Policy Integration: local challenges and opportunities

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 6
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Coastline
Volume: 17
Issue number: 2-3
ISSN (Print): 0928-2734
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Links:
Source: orbit
Source-ID: 234187
Publication: Research › Journal article – Annual report year: 2008

SPICOSA Design Step, SSA 5 Limfjorden, Denmark – progress and results

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Shellfish, Section for Management Systems, Danish Shellfish Centre
Publication date: 2008
Event: Poster session presented at SPICOSA SAF Meeting, Faro, Portugal, .
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 251183
Publication: Research › Poster – Annual report year: 2008

SPICOSA Formulation Step Documentation Report

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Number of pages: 39
Publication date: 2008

Publication information
Original language: English
Main Research Area: Technical/natural sciences
SPICOSA Formulation Step Scientific Report: SSA 5 - Limfjorden, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Number of pages: 36
Publication date: 2008

Publication information
Original language: English
Series: SPICOSA
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 259909
Publication: Research › Report – Annual report year: 2008

SPICOSA Formulation Step, SSA 5 Limfjorden, Denmark – progress and results

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Danish Shellfish Centre
Publication date: 2008
Event: Poster session presented at SPICOSA SAF Meeting, Brest, France.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 251182
Publication: Research › Poster – Annual report year: 2008

SPICOSA System Design report: SSA 5 - Limfjorden, Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems, Division of Seafood Research, National Food Institute, Danish Shellfish Centre
Number of pages: 26
Publication date: 2008

Publication information
Original language: English
Series: SPICOSA
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 259941
Publication: Research › Report – Annual report year: 2008

Substratum selection by juvenile flounder Platichthys flesus (L.): effect of ephemeral filamentous macroalgae

General information
Successful production of viable eggs and larvae of European eel (Anguilla anguilla)

General information
State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Ocean Ecology and Climate, Section for Coastal Ecology, Section for Aquatic Lipids and Oxidation
Authors: Tomkiewicz, J. (Intern), Munk, P. (Intern), Støttrup, J. (Intern), Jacobsen, C. (Intern), Lauesen, P. (Ekstern), Graver, C. (Ekstern)
Publication date: 2008
Event: Abstract from Aquaculture Europe 08, Krakow, Poland.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 239103
Publication: Research › Conference abstract for conference – Annual report year: 2008

The production of Baltic cod larvae for restocking in the eastern Baltic. RESTOCK I. 2005-2007

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population- and Ecosystem Dynamics
Authors: Støttrup, J. (Intern), Overton, J. L. (Intern), Sørensen, S. R. (Intern)
Number of pages: 81
Publication date: 2008

Publication information
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
ISBN (Print): 87-74-81076-6
Original language: Danish
Series: DTU Aqua-rapport
Number: 189-08
Main Research Area: Technical/natural sciences
Electronic versions:
189_08_rapport_elektronisk.pdf
Links:
http://www.difres.dk/dk/publication/files/08072008$189_08_elektronisk_samlet.pdf
Source: orbit
Source-ID: 227572
Publication: Research › Report – Annual report year: 2008

Toftesø: 5. Påvirkninger fra skarver på yngel af fladfisk

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Undersøgelse af sammenhængen mellem udviklingen af skarvkolonien ved Toftesø og forekomsten af fladfiskeyngel i Ålborg Bugt

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Nielsen, E. (Intern), Støttrup, J. (Intern), Nicolajsen, H. (Intern), Bregnballe, T. (Ekstern)
Number of pages: 82
Publication date: 2008

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-74-81062-9
Original language: Danish
Series: DTU Aqua-rapport
Number: 179-08
Main Research Area: Technical/natural sciences
Electronic versions:
179-08_elektronisk_samlet.pdf
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Source: orbit
Source-ID: 226810
Publication: Research › Report – Annual report year: 2008

Can stock enhancement enhance stocks?

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Sparrevohn, C. R. (Intern)
Pages: 104-113
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Sea Research
Volume: 57
Issue number: 2-3, spec. issue
ISSN (Print): 1385-1101
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.98 SJR 0.932 SNIP 0.931
Kystfodring og kystøkologi: Evaluering af revlefodring ud for Fjaltring

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Shellfish, Section for Aquaculture
Authors: Støttrup, J. (Intern), Dolmer, P. (Intern), Røjbek, M. (Intern), Nielsen, E. (Intern), Ingvardsen, S. (Ekstern), Sørensen, P. (Ekstern), Sørensen, S. R. (Intern)
As part of the Danish restocking program, an experiment was carried out with four groups of turbot Psetta maxima released on two different occasions at the same location in Arhus Bay, Denmark. One objective was to analyse the duration of post-release mortality and the magnitude of this mortality. In 2003 a group called Large turbot (17.1 cm total length (LT)) and a group called Intermediate (LT = 11.8 cm) were released, and in 2004 two similar-sized groups called Naive and Conditioned (LT = 9.8 cm) were released. The Conditioned differed from the Naive turbot by being transferred to enclosures at the release location six days prior to the actual release. This experiment was performed to investigate whether such a conditioning period had a positive effect on the survival and hence the success of the stocking. All the groups released were monitored daily until day 8, using a juvenile flatfish-trawl to recapture the fish. The catches were analyzed on the basis of a normal distribution approximation method, founded in diffusion theory, from which daily abundance of the released fish and hence post-release mortality could be estimated. The group of Large turbot suffered negligible post-release mortality, but for the Conditioned, Naive and Intermediate groups the loss varied between 34 and 66% d-1. The mortality for the Conditioned group was found to be half that of the Naive turbot released simultaneously. The period of high post-release mortality was estimated to be restricted to three days after release. The only active predators observed in the area were birds. Besides estimating mortality the diffusion model provides an estimate on the catchability of the released turbot when fished with a juvenile flatfish-trawl. Catchabilities varied between 38 and 52% for all releases except for the 17 cm sized turbot released, where catchability was only 12%. The feeding performance of the released fish was also analysed and compared with that of wild fish caught at the same location. These results showed that the proportion of stomachs containing food increased not only with time after release, but also with the size of the turbot. However, whether or not fish was included in the diet was not related to size but to time after release and to whether they had been conditioned or not.
Scopus rating (2001): SJR 1.131 SNIP 0.954
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.127 SNIP 1.021
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.182 SNIP 1.014
Original language: English
DOIs: 10.1016/j.seares.2006.08.010
Source: orbit
Source-ID: 227503
Publication: Research - peer-review › Journal article – Annual report year: 2007

Saltvandsudvalget: Udpluk af mødet i Saltvandsudvalget den 27. februar 2007

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 8-10
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 27
Issue number: 2
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227564
Publication: Research › Journal article – Annual report year: 2007

Successful production of European eel larvae

General information
State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Ocean Ecology and Climate, Research Secretariat, Section for Aquatic Lipids and Oxidation
Authors: Tomkiewicz, J. (Intern), Støttrup, J. (Intern), Munk, P. (Intern), Lauesen, P. (Intern), Graver, C. (Intern), Jarlbæk, H. (Intern), Jacobsen, C. (Intern), McEvoy, F. (Ekstern), Svalastoga, E. (Ekstern)
Publication date: 2007
Main Research Area: Technical/natural sciences

Bibliographical note
Abstract and oral presentation ved European Aquaculture Symposium, Istanbul, October, 2007
Source: orbit
Source-ID: 232873
Publication: Research › Conference abstract for conference – Annual report year: 2007

A review on the status and progress in rearing copepods for marine larviculture: Advantages and disadvantages among calanoid, harpacticoid and cyclopoids copepods

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 567
Danske fritidsfiskere har kortlagt fangster i fjorde og indre farvande

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støtrup, J. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/kortlagtefangster.htm
Source: orbit
Source-ID: 227539
Publication: Research › Journal article – Annual report year: 2006

De kystnære områder er levesteder for mange marine fisk

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støtrup, J. (Intern), Nicolajsen, H. (Intern)
Number of pages: 32
Publication date: 2006

Host publication information
Title of host publication: Øhavets dag
Main Research Area: Technical/natural sciences
Conference: Øhavets dag, 01/01/2006
Source: orbit
Source-ID: 232945
Publication: Research › Conference abstract in proceedings – Annual report year: 2006

Homarus americanus

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Meeren, G. V. D. (Ekstern), Støtrup, J. (Intern), Ulmestrand, M. (Ekstern), Knutsen, J. (Ekstern)
Pages: 1-9
Publication date: 2006

Host publication information
Title of host publication: NOBANIS - Invasive alien species fact sheet
Series: Online database of the North European and Baltic Network on Invasive Alien Species
Main Research Area: Technical/natural sciences
Saltvandsudvalget: Referat af møde i Saltvandsudvalget 6. september 2006

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 12-13
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 26
Issue number: 5
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227562
Publication: Research › Journal article – Annual report year: 2006

Saltvandsudvalget: Saltvandsudvalgsmøde 26. april 2006

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 8-9
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 26
Issue number: 3
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227563
Publication: Research › Journal article – Annual report year: 2006

Changes in nursery area utilisation by flatfish in Danish coastal waters of the Kattegat 1957-2004

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Ocean Ecology and Climate
Authors: Sparrevohn, C. R. (Intern), Nielsen, E. (Intern), Støttrup, J. (Intern), MacKenzie, B. (Intern)
Publication date: 2005
Fangstregistrering og nøglefiskere

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Sparrevohn, C. R. (Intern), Nicolajsen, H. (Intern), Støttrup, J. (Intern)
Pages: 5-7
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Fritidsfiskeren
Volume: 25
Issue number: 1
ISSN (Print): 0906-7752
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227500
Publication: Research › Journal article – Annual report year: 2005

Feeding ecology and growth of age 0 year Platichthys flesus (L.) in a vegetated and a bare sand habitat in a nutrient rich fjord

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Andersen, B. S. (Intern), Carli, J. (Ekstern), Grønkjær, P. (Ekstern), Støttrup, J. (Intern)
Pages: 531-552
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 66
Issue number: 2
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.945 SNIP 1.148
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.937 SNIP 1.096
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176

Original language: English
DOIs:
10.1111/j.0022-1112.2005.00620.x
Source: orbit
Source-ID: 224686
Publication: Research - peer-review › Journal article – Annual report year: 2005

Forsøg skal vise om man ved restaurering kan øge fiskebestandene i de kystnære områder

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: http://www.fiskepleje.dk
Kystfodring og godt fiskeri: Undersøgelse af strandnær kystfodring ved Agger Tange

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Shellfish, Section for Aquaculture
Authors: Støttrup, J. (Intern), Dolmer, P. (Intern), Røjbek, M. (Intern), Nielsen, E. (Intern), Ingvardsen, S. (Ekstern), Laustrup, C. (Ekstern), Sørensen, S. R. (Intern)
Number of pages: 52
Publication date: 2005

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-90968-95-6
Original language: Danish
Series: DFU-rapport
Number: 156-05
Main Research Area: Technical/natural sciences
Electronic versions: 156-05 Kystfodring og godt fiskeri_e.pdf
Links: http://www.difres.dk/dk/publication/files/23122005$156-05%20Kystfordring%20og%20godt%20fiskeri_e.pdf
Source: orbit
Source-ID: 227551
Publication: Research › Report – Annual report year: 2005

Kystfodring påvirker kystens fauna

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Shellfish
Authors: Røjbek, M. (Intern), Dolmer, P. (Intern), Støttrup, J. (Intern), Ingvardsen, S. (Ekstern), Laustrup, C. (Ekstern)
Pages: 3-7
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Miljø og vandpleje
Volume: 31
ISSN (Print): 1397-5951
Original language: Danish
Source: orbit
Source-ID: 227315
Publication: Research › Journal article – Annual report year: 2005

Marin habitatrestaurering: Havets vidundermedicin

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Population- and Ecosystem Dynamics
Authors: Dolmer, P. (Intern), Støttrup, J. (Intern), Olesen, H. J. (Intern)
Pages: 8-13
Publication date: 2005
The potential for enhancing the cod stock in the Eastern Baltic

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Aquaculture, Section for Population- and Ecosystem Dynamics
Pages: 67-71
Publication date: 2005
Conference: Lessons from the past to optimise the future: Extended abstracts and short communications of contributions presented at the International Conference, Aquaculture Europe 2005, Trondheim, Norway, August 5-9, 01/01/2005
Main Research Area: Technical/natural sciences

The quality of release habitat for reared juvenile flounder, Platichthys flesus, with respect to salinity and depth
One prerequisite for a successful stocking programme is the choice of an appropriate release site, which would ensure good growth, survival and recruitment to the local fishery. The influence of different salinity regimes on habitat quality for juvenile flounder, Platichthys flesus (L.), was examined in Danish inshore waters using enclosures to study growth and survival. Three locations were chosen: Virksund (V) - constant low salinity at 10 parts per thousand; Harre Vig (HV) - constant high salinity at 24 parts per thousand; and Hjerk Nor - variable salinity, 0-25 parts per thousand. Fish movement was examined, using a diffusion model, at the first two sites. At HV the fish had unrestricted dispersal opportunity resulting in average individual movement of 45 m day(-1). Fish at V were restricted in dispersal in one direction because of a dam, about which they would concentrate under certain hydrographical conditions. Growth was highest at the locations with stable salinity and mortality highest at the location with variable salinity

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Andersen, A. (Ekstern), Schou, J. (Ekstern), Sparrevohn, C. R. (Intern), Nicolajsen, H. (Intern), Støttrup, J. (Intern)
Pages: 211-219
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries Management and Ecology
Volume: 12
Issue number: 3
ISSN (Print): 0969-997X
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 1.85 SJR 0.843 SNIP 0.88
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
En hjælpende hånd til torsk i Østersøen

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population- and Ecosystem Dynamics, Section for Aquaculture, Technical University of Denmark
Authors: Støttrup, J. (Intern), Tomkiewicz, J. (Intern), Paulsen, H. (Intern), Pedersen, P. B. (Intern), Overton, J. L. (Intern), Möllmann, C. (Ekstern), Lauesen, P. (Intern)
Pages: 62-71
Publication date: 2004
Main Research Area: Technical/natural sciences
Feats and defeats in flatfish stocking: Determinants for effective stocking

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 584
Pages: 71-83
Publication date: 2004

Host publication information
Title of host publication: Stock enhancement and sea ranching: developments, pitfalls and opportunities
Volume: 6
Place of publication: Oxford
Publisher: Blackwell Publishing Ltd
Editors: Leber, K., Kitada, S., Blankenship, H., Svåsand, T.
Edition: 2.
ISBN (Print): 14-05-11119-4
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227545
Publication: Research - peer-review › Book chapter – Annual report year: 2004

Growth rate and nutritional status of wild and released reared juvenile turbot in southern Kattegat, Denmark

General information
State: Published
Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Paulsen, H. (Intern), Støttrup, J. (Intern)
Pages: 210-230
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 65
Issue number: Suppl. A
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.945 SNIP 1.148
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.937 SNIP 1.096
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176
Original language: English
DOIs:
10.1111/j.1095-8649.2004.00541.x
Source: orbit
Source-ID: 227010
Publication: Research - peer-review › Journal article – Annual report year: 2004

**Hvad døde fisken af?**

**General information**
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Rearing of flounder (Platichthys flesus) juveniles in semiextensive systems

General information
State: Published
Organisations: National Veterinary Institute, Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Engell-Sørensen, K. (Intern), Støttrup, J. (Intern), Holmstrup, M. (Ekstern)
Pages: 475-491
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 230
Issue number: 1-4
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.103 SNIP 1.254 CiteScore 2.12
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.002 SNIP 1.34 CiteScore 2.16
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.136 SNIP 1.3 CiteScore 2.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.212 SNIP 1.487 CiteScore 2.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.294 SNIP 1.542 CiteScore 2.39
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Registreringer af fangster i indre danske farvande 2003

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Sparrevohn, C. R. (Intern), Støttrup, J. (Intern), Nicolajsen, H. (Intern)
Number of pages: 19
Publication date: 2004

Publication information
Place of publication: Faaborg
Publisher: Dansk Amatørfiskerforening
Original language: Danish
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 225383
Publication: Research › Report – Annual report year: 2004

Spændende oplæg til fiskepleje!

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Nicolajsen, H. (Intern), Støttrup, J. (Intern)
Pages: 9-11
Publication date: 2004
Main Research Area: Technical/natural sciences
The spawning of plaice Pleuronectes platessa in the Kattegat

Cruises were carried out in the entire Kattegat in early March of 1998 and 2000 to investigate the spawning of plaice Pleuronectes platessa. The data showed that plaice still spawn in the Kattegat, with a main spawning area in the southern Kattegat and an area of less, but variable importance in the northern coastal Kattegat. The results indicate that spawning in the southern part of Kattegat occurs earlier than in the northern Kattegat. The preferred spawning depth was found to be around 30-40 m. Juvenile recruitment in the nursery areas along the Danish east coast derives mainly from the southern stock in the southern Kattegat with low and variable input of Skagerrak plaice. Maturity ogives for both sexes were obtained and both A(50) and L-50 were lower than those estimated 10 years previous to this Study and for plaice in the North Sea. The shift towards earlier maturity and the absence of the larger age groups in the catches indicate that the Kattegat plaice stock is under severe pressure today.

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Udsætning af pighvar ved Begstrup Vig

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Sparrevohn, C. R. (Intern), Støttrup, J. (Intern)
Pages: 20-23
DFU's standardtrawl: Konstruktion og sammenlignende fiskeri

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems, Section for Coastal Ecology
Authors: Eigaard, O. R. (Intern), Støttrup, J. (Intern), Hoffmann, E. (Intern), Hovgård, H. (Intern), Poulsen, S. (Ekstern)
Number of pages: 45
Publication date: 2003

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-90968-51-4
Original language: Danish
Series: DFU-rapport
Number: 126-03
Main Research Area: Technical/natural sciences
Electronic versions:
126-03_d fus_standardtrawl_konstruktion_og_sammenlignende_fiskeri.pdf
Links:
http://www.difres.dk/dk/publication/files/07012004$126-03%20DFUs%20standardtrawl.pdf
Source: orbit
Source-ID: 225363
Publication: Research › Report – Annual report year: 2003

Live feeds in marine aquaculture

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Støttrup, J. (ed.) (Intern), McEvoy, L. (ed.) (Ekstern)
Number of pages: 318
Publication date: 2003

Publication information
Place of publication: Oxford
Publisher: Blackwell Publishing Ltd
ISBN (Print): 0-632-05495-6
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 224758
Publication: Research - peer-review › Book – Annual report year: 2003

Marin fiskepleje - har det nyttet noget?
Marin fiskepleje: Hvor langt er vi nået?

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Nicolajsen, H. (Intern)
Pages: 23
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Amatørfiskeren
Volume: 5
ISSN (Print): 0900-2650
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227555
Publication: Research › Journal article – Annual report year: 2003

Opdræt af marine fisk

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: http://www.fiskepleje.dk
Original language: Danish
Links:
http://130.226.135.19/fiskepleje/opdratmarin.htm
Source: orbit
Source-ID: 227556
Publication: Research › Journal article – Annual report year: 2003
Diffusion of fish from a single release point
In a field experiment, 3529 turbot (Psetta maxima) were released in order to estimate and describe the movements of hatchery-reared fish by applying diffusion theory. After liberation, the development of the population density was estimated during the following 9 days, and from that, the rate of diffusion and the advection were determined. Two approaches were followed to describe the data: a normal distribution approximation (NDA) model and a partial differential equation (PDE) model. In the latter, it was possible to include the effect of sampling. The two models gave similar results, indicating that the sampling of fish during the experiment did not have any detectable effect on the population density. The activity of the released turbot resulted in an individual daily displacement of 151 m-day⁻¹, except for the first 2 days at liberty, where the displacement was estimated to be considerably lower. Advection was significant and was related to the displacement of the water body. Further, it was possible to estimate the postrelease mortality as 14%.day⁻¹ and the catchability of the turbot when caught with a young fish trawl as 28%.

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Sparrevohn, C. R. (Intern), Nielsen, A. (Intern), Støttrup, J. (Intern)
Pages: 844-853
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 59
Issue number: 5
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.451 SNIP 1.196
Effects of marine windfarms on the distribution of fish, shellfish and marine mammals in the Horns Rev area

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Hoffmann, E. (Intern), Astrup, J. (Intern), Larsen, F. (Intern), Munch-Petersen, S. (Intern), Støttrup, J. (Intern)
Number of pages: 45
Publication date: 2002

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
Original language: English

Series: DFU-rapport
Number: 117-02
Main Research Area: Technical/natural sciences
Electronic versions:
117-02_effects_of_marine_windfarms.pdf
Links:
Source: orbit
Source-ID: 225767
Publication: Research - peer-review › Journal article – Annual report year: 2002

Hvordan vokser udsatte pighvar egentlig?

General information
State: Published
Organisations: Unknown
Authors: Paulsen, H. (Intern), Støttrup, J. (Intern)
Hvordan vokser udsatte pighvarrer? - et forskningsprojekt støttet af fiskeplejemidlerne

General information
State: Published
Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Paulsen, H. (Intern), Støttrup, J. (Intern)
Pages: 4-5
Publication date: 2002
Main Research Area: Technical/natural sciences

Impact of habitat quality on 0-group flounder (Platichthys flesus L.)

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Carl, J. (Ekstern), Grønkjær, P. (Ekstern), Mogensen, M. (Ekstern), Nicolajsen, H. (Intern), Rasmussen, T. (Ekstern), Støttrup, J. (Intern), Winther, K. (Ekstern), Tauben, E. (Ekstern)
Publication date: 2002
Event: Poster session presented at 5th International Symposium on Flatfish Ecology, Isle of Man, United Kingdom.
Main Research Area: Technical/natural sciences

The use of releases of reared fish to enhance natural populations: A case study on turbot Psetta maxima (Linné, 1758)

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Sparrevoehn, C. R. (Intern), Modin, J. (Ekstern), Lehmann, K. (Ekstern)
Pages: 161-180
Publication date: 2002
Torskeopdræt - forskningsresultater og kundskab om torskeopdræt

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 94
Publication date: 2002

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-90968-26-3
Original language: Danish
Series: DFU-rapport
Number: 107-02
Main Research Area: Technical/natural sciences
Electronic versions:
107-02_torskeopdræt.pdf
Links:
Source: orbit
Source-ID: 227575
Publication: Research › Report – Annual report year: 2002

Udvalget om Miljøpåvirkninger og fiskeriresourcer : Delrapport vedr. habitatpåvirkninger

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Fisheries- and Monitoring Technology
Authors: Dolmer, P. (Intern), Dahl, K. (Ekstern), Frederiksen, S. (Ekstern), Berggren, U. (Ekstern), Prüssing, S. (Ekstern), Støttrup, J. (Intern), Lundgren, B. (Intern)
Number of pages: 32
Publication date: 2002

Publication information
Place of publication: Lyngby
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-90968-34-4
Original language: Danish
Series: DFU-rapport
Number: 112-02
Main Research Area: Technical/natural sciences
Electronic versions:
112-02_delrapport_om_habitatpavirkninger.pdf
Links:
Source: orbit
Source-ID: 225336
Publication: Research › Report – Annual report year: 2002
The fate of lipids during development and cold-storage of eggs in the laboratory-reared calanoid copepod, *Acartia tonsa* Dana, and in response to different algal diets

The calanoid copepod *Acartia tonsa* was sampled throughout one generation to examine the fate of lipids during development in culture. Effects of dietary input were examined by feeding *A. tonsa* for at least one generation with specific monoalgal cultures. Four different algae were tested: the cryptophyte *Rhodomonas baltica*, the haptophyte *Isochrysis galbana* clone T-iso, the diatom *Thalassiosira weissflogii* and the dinoflagellate *Heterocapsa triquetra*. Further, the effect of cold storage of eggs on the lipid composition of the newly hatched nauplii was examined. During development, the fatty acid composition changes from a tendency towards high levels of long-chain polyunsaturated fatty acids in the early developmental stages towards a tendency to accumulate more saturated and monounsaturated fatty acids in the later developmental stages. However, the content and composition of polyunsaturated fatty acids can be influenced by the dietary input. The highest ratio of 22:6n-3/20:5n-3 was achieved using *H. triquetra* or *I. galbana*. Higher levels of 20:5n-3 were achieved by feeding with *R. baltica* or *T. weissflogii*. *I. galbana* and *T. weissflogii* were particularly suitable for increasing levels of arachidonic acid (20:4n-6; AA) in *A. tonsa*. (C) 1999 Elsevier Science B.V. All rights reserved.
Evaluation of stock enhancement of marine flatfish

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Lehmann, L. (Ekstern), Nielsen, R. (Ekstern), Pedersen, C. (Ekstern), Iglesias, J. (Ekstern), Rodriguez, 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

Publication information
Publisher: [s.n.]
Original language: English
Series: EU Slutrapport
Number: DG XIV 94/1732
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227543
Publication: Research › Report – Annual report year: 1998

Evaluation of stock enhancement of marine flatfish

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Lehmann, L. (Ekstern), Iglesias, J. (Ekstern), Rodriguez, 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)
Pages: 213-217
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries & Aquaculture (AIR:1990-94)
Volume: V
Original language: English

Bibliographical note
Project Synopsis. Selected projects from the research programme for Agriculture and Agro-industry including Fisheries (AIR) 3rd European Scientific and Technical Conference, Lisbon, Portugal, May 1998
Source: orbit
Source-ID: 227542
Publication: Research › Journal article – Annual report year: 1998

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), Rodriguez, 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

Publication information
Place of publication: Bruxelles
Publisher: European Commission
Original language: English
Series: EU AIR2-CT94-1732
Main Research Area: Technical/natural sciences

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

Feødebiologi hos pighvar i det sydlige Kattegat
General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Hvingel, C. (Ekstern)
Publication date: 1998
Main Research Area: Technical/natural sciences

Bibliographical note
Udvidet abstract
Source: orbit
Source-ID: 281793
Publication: Research › Conference abstract for conference – Annual report year: 1998

How does cryptic behaviour of reared turbot Scophthalmus maximus compare with that of their wild counterparts
General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Nielsen, B. (Ekstern)
Pages: 257-258
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: European Aquaculture Society. Special Publications
Volume: 26
ISSN (Print): 0774-0689
Ratings:
Web of Science (2018): Indexed yes
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Source: orbit
Source-ID: 227548
Publication: Research › Journal article – Annual report year: 1998
Is there a case for artificial reefs in Denmark?

**General information**
- State: Published
- Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Unknown
- Authors: Støttrup, J. (Intern), Helmig, S. (Ekstern), Petersen, J. K. (Intern), Krog, C. (Ekstern), Zorn, R. (Ekstern), Madsen, H. (Ekstern), Møller, A. (Ekstern)
- Pages: 1-11
- Publication date: 1998
- Main Research Area: Technical/natural sciences

**Publication information**
- Journal: ICES CM 1998/
- Volume: V:5
- Original language: English
- Source: orbit
- Source-ID: 227549
- Publication: Research › Conference article – Annual report year: 1998

Juvenile quality and adaptive capacity

**General information**
- State: Published
- Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Section for Coastal Ecology
- Authors: Paulsen, H. (Intern), Støttrup, J. (Intern)
- Pages: 17-18
- Publication date: 1998
- Main Research Area: Technical/natural sciences

**Publication information**
- Journal: Aquaculture Europe
- Volume: 23
- ISSN (Print): 1018-9661
- Original language: English

**Bibliographical note**
- Report from Aquaculture Europe 98
- Source: orbit
- Source-ID: 227014
- Publication: Research › Journal article – Annual report year: 1998

Restocking of marine fish in Denmark

**General information**
- State: Published
- Organisations: Section for Aquaculture, National Institute of Aquatic Resources, Section for Coastal Ecology
- Authors: Paulsen, H. (Intern), Støttrup, J. (Intern)
- Publication date: 1998

**Host publication information**
- Title of host publication: Proceedings from the EU Parliament Conference on Free Fish Farming at Sea, Bruxelles, 24-27 April 1998, University of Stirling, Stirling
- Main Research Area: Technical/natural sciences
- Conference: EU Parliament Conference on Free Fish Farming at Sea, Bruxelles, 24-27 April 1998, University of Stirling, Stirling, 01/01/1998
- Source: orbit
- Source-ID: 238769
- Publication: Research › Article in proceedings – Annual report year: 1998

Stocking of marine fish - a growing market for aquaculture

**General information**
- State: Published
The production and use of copepods in larval rearing of halibut, turbot and cod

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Shields, R. (Ekstern), Gillespie, M. (Ekstern), Gara, M. (Ekstern), Sargent, J. (Ekstern), Bell, J. (Ekstern), Henderson, R. (Ekstern), Tocher, D. (Ekstern), Sutherland, R. (Ekstern), Naas, T. (Ekstern), Mangor-Jensen, A. (Ekstern), Naas, K. (Ekstern), van der Meeren, T. (Ekstern), Harboe, T. (Ekstern), Sanchez, F. (Ekstern), Sorgeloos, P. (Ekstern), Dhert, P. (Ekstern), Fitzgerald, R. (Ekstern)
Number of pages: 41-46
Pages: 41-46
Publication date: 1998
Main Research Area: Technical/natural sciences

Turbot, Scophthalmus maximus, stocking in Danish coastal waters

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Lehmann, K. (Ekstern), Nicolajsen, H. (Intern)
Number of pages: 464
Pages: 301-318
Publication date: 1998
Main Research Area: Technical/natural sciences

Host publication information
Title of host publication: Stocking and Introduction of Fish: In Freshwater and Marine Ecosystems
Volume: 26
Place of publication: Oxford
Publisher: Wiley-Blackwell
Editor: Cowx, I.
ISBN (Print): 08-52-38239-1
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227576
Publication: Research - peer-review › Book chapter – Annual report year: 1998

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Lehmann, K. (Ekstern), Nicolajsen, H. (Intern)
Number of pages: 35
Publication date: 1997

Publication information
Place of publication: Hirtshals
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-88047-14-8
Original language: Danish
Series: DFU-rapport
Number: 31-97
Main Research Area: Technical/natural sciences
Electronic versions:
31_97_evaluering_af_uds_tninger_af_pighvarrer_i_limfjorden_odense_fjord_og_ved_nordsj_lland.pdf
Source: orbit
Source-ID: 227544
Publication: Research › Report – Annual report year: 1997

Kunstige rev - review om formål, anvendelse og potentiale i danske farvande

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Stokholm, H. (Ekstern)
Publication date: 1997

Publication information
Place of publication: Hirtshals
Publisher: Danmarks Fiskeriundersøgelser
ISBN (Print): 87-88047-50-4
Original language: Danish
Series: DFU-rapport
Number: 42 og 42a-97
Main Research Area: Technical/natural sciences
Electronic versions:
42a_97_kunstige_rev_bilagsrapport.pdf
42_97_kunstige_rev_review_om_form_l_anvendelse_og_potentiale_i_danske_farvande.pdf
Source: orbit
Source-ID: 227550
Publication: Research › Report – Annual report year: 1997

Production and use of copepods in marine fish larviculture
Batch and continuous cultures of the harpacticoid copepod Tisbe holothuriae have been run for numerous generations in the laboratory at the North Sea Centre and the harvested nauplii used as food in preliminary trials with first-feeding turbot (Psetta maxima syn. Scophthalmus maximus). The naupliar swimming behaviour in terms of vertical distribution in a typical fish larval tank and the use of T. holothuriae nauplii as live food for first-feeding turbot larvae were investigated. It was possible to cultivate harpacticoid copepods in shallow trays or in continuous bioreactors with large area substratum. Two such systems were compared in terms of area productivity and the use of ammonia excretion as a means for controlling feeding of the copepods was investigated. Finally, the potential benefits of the use of copepods as live food for marine fish larvae are discussed. (C) 1997 Elsevier Science B.V

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Norsker, N. (Ekstern)
Utilisation of copepod diets for larviculture of halibut, cod and turbot and a review of published halibut research and cultivation data. Final report

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 63
Publication date: 1997

Publication information
Publisher: [s.n.]
Original language: English
Series: AIR3-CT94-2094
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227577
Publication: Research › Report – Annual report year: 1997

Utilization of copepod diets for larviculture of halibut, cod and turbot, and a review of published halibut research and cultivation data

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Shields, R. (Ekstern), Gillespie, M. (Ekstern), Gara, M. (Ekstern), Sargent, J. (Ekstern), Bell, J. (Ekstern), Henderson, R. (Ekstern), Tocher, D. (Ekstern), Sutherland, R. (Ekstern), Naess, T. (Ekstern), Mangor-Jensen, A. (Ekstern), Naas, K. (Ekstern), van der Meeren, T. (Ekstern), Harboe, T. (Ekstern), Sanchez, F. (Ekstern), Sorgeloos, P. (Ekstern), Dhert, P. (Ekstern), Fitzgerald, R. (Ekstern)
Pages: 116-120
Publication date: 1997

Host publication information
Title of host publication: Project Synopsis
Place of publication: Luxembourg
Publisher: European Commission
Series: Fisheries & Aquaculture (AIR: 1990-94)
Main Research Area: Technical/natural sciences

Bibliographical note
Selected projects from the research programme for Agriculture and Agro-industry including Fisheries (AIR) 3rd European Scientific and Technical Conference, Lisbon, Portugal, May 1998
Source: orbit
Source-ID: 227578
Publication: Research › Book chapter – Annual report year: 1998

Fiskeundersøgelse i Vejle Fjord 1993-1994

General information
State: Published
Marin fiskepleje

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 24-36
Publication date: 1996
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisk & hav
Volume: 47
ISSN (Print): 0105-9211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227553
Publication: Research › Journal article – Annual report year: 1996

Status – 1995: Marin Fiskepleje

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems, Section for Aquaculture
Authors: Støttrup, J. (Intern), Nicolajsen, H. (Intern), Nielsen, J. R. (Intern), Paulsen, H. (Intern), Lehmann, K. (Ekstern), Pedersen, C. (Ekstern)
Number of pages: 31
Publication date: 1996

Publication information
Publisher: DIFRES
Original language: Danish
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258768
Publication: Research › Report – Annual report year: 1996

Marin fiskepleje - udsætning af torsk og pighvarrer i de indre danske farvande
The influence of essential fatty acids compositions on growth of larval cod (Gadus morhua L.) larvae. Preliminary observations

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Grønkjær, P. (Ekstern), Jørgensen, S. (Ekstern), Frederiksen, M. (Ekstern), St John, M. (Ekstern), Clemmesen, C. (Ekstern), Støttrup, J. (Intern)
Pages: 1-8
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES CM 1995/
Volume: J:19
Original language: English
Source: orbit
Source-ID: 225575
Publication: Research › Conference article – Annual report year: 1995

The intensive rearing of turbot (Scophthalmus maximus L.) larvae

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Publication date: 1995

The influence of essential fatty acid composition on growth of larval cod (Gadus morhua L.) larvae. Preliminary observations

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 6-11
Publication date: 1995

Host publication information
Title of host publication: Præsentationer ved det 8. Danske Havforskermøde
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281756
Publication: Research › Article in proceedings – Annual report year: 1995

Stocking: actual situation and prospects for the marine environment

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 159-168
Publication date: 1995

Publication information
Journal: Aquaculture Europe
Volume: 20
Issue number: 3
ISSN (Print): 1018-9661
Original language: English
Source: orbit
Source-ID: 227566
Publication: Research › Journal article – Annual report year: 1995

The role of different microalgae on the growth and survival of turbot larvae in intensive cultivation systems

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Gravningen, K. (Ekstern), Norsker, N. (Ekstern)
Pages: 173-186
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication information
Journal: I C E S Marine Science Symposia
Volume: 201
ISSN (Print): 0906-060X
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 2.46
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Web of Science (2010): Indexed yes
Web of Science (2009): Indexed yes
Web of Science (2008): Indexed yes
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Web of Science (2005): Indexed yes
Web of Science (2004): Indexed yes
Web of Science (2003): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2001): Indexed yes
Web of Science (2000): Indexed yes
Original language: English
Source: orbit
Lokalitetsvurdering for udsætning af pighvaryngel i Limfjorden: Venø Bugt og Nibe Bredning

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 27
Publication date: 1994

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish
Series: DFH rapport
Number: 479
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281789
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
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture and Fisheries Management
Volume: 25
ISSN (Print): 0266-996X
Ratings:
BFI (2008): BFI-level 1
Original language: English
Source: orbit
Source-ID: 258082
Publication: Research - peer-review › Journal article – Annual report year: 1994

Status for marin fiskepleje – 1993

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Nicolajsen, H. (Intern), Hvingel, C. (Ekstern)
Number of pages: 19
Publication date: 1994

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish
Series: DFH rapport
Number: 474
ISSN: 0109-4432
The importance of dietary HUFAs for fecundity and HUFA content in the harpacticoid, Tisbe holothuriae Humes

Fatty acid distribution was investigated in adult and naupliar Tisbe holothuriae, reared on 3 different diets with n−3 HUFA contents constituting 0.1, 1.5 and and 12.8% DW, respectively. Whereas certain characteristic differences in the fatty acid profiles of the 3 diets used clearly were reflected in the copepods, the long-chain n−3 HUFAs 20:5 n−3 and 22:6 n−3 were present in consistently high amounts. When reared on a diet with negligible contents of n−3 HUFAs, but high in 18:3n−3, T. holothuriae appeared to be able to synthesize these fatty acids at significant rates. Also, the reproductive performance of T. holothuriae on the 3 diets was studied. Of the two microalgal diets studied, the one with the high n−3 HUFA content resulted in considerably higher sustained naupliar productivity during the first 15 days of the production period of the cultures. However, no difference in brood size (first two broods) was found.
First feeding in marine fish larvae - nutritional and environmental aspects

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 355
Pages: 123-131
Publication date: 1993

Host publication information
How do reared turbot adapt to the environment? II. Condition indices

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Hvingel, C. (Ekstern), Støttrup, J. (Intern)
Pages: 10
Publication date: 1993
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Council Meeting
Volume: F:20
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: 281762
Publication: Research › Conference article – Annual report year: 1993

Lokalitetsvurdering for udsætning af pighvarrer – Nordsjælland

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Hvingel, C. (Ekstern), Støttrup, J. (Intern)
Number of pages: 17
Publication date: 1993

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish
Series: DFH rapport
Number: 468
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281785
Publication: Research › Report – Annual report year: 1993

Resultater fra udsætning af Nordsøtorsk i Limfjorden 1991

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Results on the extensive production of North Sea cod, Gadus morhua L., and their growth and distribution subsequent to release in the Limfjord

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Støttrup, J. (Intern), Nielsen, J. R. (Intern), Krog, C. (Ekstern), Rasmussen, K. (Ekstern)
Publication date: 1993

Host publication information
Title of host publication: Programme and Abstracts: Reports IMR
Main Research Area: Technical/natural sciences
Conference: Int. Symp. Sea Ranching of Cod and other Marine Species, Arendal, Norway, 01/01/1994
Source: orbit
Source-ID: 279017
Publication: Research › Conference abstract in proceedings – Annual report year: 1993

Resutater fra rødspætteomplantninger fra Nordsøen til Kattegat i 1988 and 1989

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Monitoring
Authors: Støttrup, J. (Intern), Stæhr, K. (Intern)
Number of pages: 20
Publication date: 1993

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish

Series: DFH rapport
Number: 457
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281784
Publication: Research › Report – Annual report year: 1993

Status - marine fiskepleje, 1992

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Nicolajsen, H. (Intern)
Number of pages: 15
Publication date: 1993
The influence of different rotifer and Artemia enrichment diets on growth, survival and pigmentation in turbot (Scophthalmus maximus L.) larvae

An experiment was carried out on turbot larvae fed three different rotifer enrichment diets: Dry Selco, Protein Selco and ICES low-HUFA (an enrichment emulsion containing low amounts of highly unsaturated fatty acids-HUFA). Seven tanks were set up for each diet. After the rotifer stage, approximately seven days after hatching, the larvae were fed newly-hatched Artemia salina nauplii (AT-1; Brazil strain). From day 10, enriched Great Salt Lake Artemia nauplii were introduced. Each set of seven tanks was further subdivided and the larvae fed Artemia nauplii enriched with one of four enrichment diets: Dry Selco, Protein Selco, ICES low-HUFA or Super Selco. The rotifer enrichments had no significant effect on larval growth and survival. The nutritional value of the Artemia stage (day 13 to 26) was more important for the overall larval survival.

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Attramadal, Y. (Ekstern)
Pages: 307-316
Publication date: 1992
Main Research Area: Technical/natural sciences
Mærknings- og udsætningsplaner for pighvar i Limfjorden 1991

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Prince, P. (Ekstern)
Number of pages: 11
Publication date: 1991

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: Danish

Series: DFH rapport
Number: 411
ISSN: 0109-4432
Migration of plaice, Pleuronectes platessa L. transplanted from the North Sea to the Kattegat

General information
State: Published
Organisations: Section for Monitoring, National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Stæhr, K. (Intern), Støttrup, J. (Intern)
Pages: 12
Publication date: 1991
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Council Meeting
Volume: G:39
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: 281781
Publication: Research › Report – Annual report year: 1991

Technical and biological aspects of continuous microalgae cultivation

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Norsker, N. (Ekstern), Støttrup, J. (Intern)
Pages: 87-90
Publication date: 1991
Main Research Area: Technical/natural sciences

Publication information
Journal: European Aquaculture Society. Special Publications
Volume: 15
ISSN (Print): 0774-0689
Ratings:
Web of Science (2018): Indexed yes
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: English
Source: orbit
Source-ID: 281761
Publication: Research › Conference article – Annual report year: 1991

The cultivation of Enteromorpha species in the laboratory and its inter-specific variation in toxicity towards zinc and copper

General information
State: Published
Organisations: Unknown
Authors: Pyne, S. (Ekstern), Støttrup, J. (Intern)
Publication date: 1991
Event: Abstract from Società Botanica Italiana, .
Experimental estimation of food preference in cod - results of a pilot experiment

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Aquaculture, Section for Monitoring
Authors: Degnbol, P. (Ekstern), Christensen, V. (Ekstern), Støttrup, J. (Intern), Paulsen, H. (Intern), Stæhr, K. (Intern)
Pages: 10
Publication date: 1990
Conference: ICES Council Meeting 1990, Copenhagen, Denmark, 03/10/1990
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Council Meeting
Volume: G:63
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: 281760
Publication: Research › Conference article – Annual report year: 1990

Fiskepleje i Danmark: Fra: Torsk i havbeite - seminar om ophjælpning av torskebestanden gennem udsætning

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern), Williams, J. (ed.) (Ekstern)
Publication date: 1990

Publication information
Place of publication: København
Publisher: Nordisk Ministerråd
Original language: Danish
Series: Nordiske seminar- og arbejdsrapporter
Number: 504
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281792
Publication: Research › Report – Annual report year: 1990

Influence of algal diet on feeding and egg-production of the calanoid copepod Acartia tonsa Dana

Threshold concentration, retention efficiency and egg-production in the calanoid copepod Acartia tonsa Dana were examined using the algal species Isochrysis galbana clone T-iso, Dunalietta tertiolecta Butcher, Rhodomonas baltica Karsten, Ditylum brightwellii Grunow and Thalassiosira weissflogii Grun. Feeding and egg-production in A. tonsa was shown to be influenced by the size, quantity and quality of the food particles. The small I. galbana (4.8 μm) were inefficiently retained by A. tonsa and maximum ingestion rates on this species were first obtained at algal concentrations > 1 μg C · ml−1. However, the highest maximum rate of egg-production was obtained when feeding on this algal species with gross efficiencies of 22 and 38% in terms of carbon and nitrogen, respectively. Egg-production in A. tonsa ceased entirely within 4 days of feeding on a sole diet of D. tertiolecta. D. tertiolecta is similar in size to R. baltica but contained only trace amounts of fatty acids higher than C-18 fatty acids. The diatoms D. brightwellii and T. fluviatilis were retained with maximal efficiency but daily egg-production and gross growth efficiency was lower for these species than for I. galbana and R. baltica.
Evaluation of a microencapsulated diet for turbot (Scophthalmus maximus L.) larvae

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Number of pages: 15
Publication date: 1989

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Fiskeri- og Havundersøgelser
Original language: English
Series: DFH rapport
Number: 337
ISSN: 0109-4432
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281780
Publication: Research › Report – Annual report year: 1989

Opdræt af marine fiskelarver

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Publication date: 1988

Host publication information
Title of host publication: Akvakultur manual om opdræt af marine fiskelarver
Main Research Area: Technical/natural sciences
Course: Fiskeriingeniørstuderende på Aalborg Universitet, 01/01/1988
Source: orbit
Source-ID: 281791
Publication: Education › Compendium/lecture notes chapter – Annual report year: 1988

A continuous algal cultivation system

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 32-33
Publication date: 1986
Main Research Area: Technical/natural sciences

Publication information
Research on marine fish larvae in Denmark

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Støttrup, J. (Intern)
Pages: 60-62
Publication date: 1986
Main Research Area: Technical/natural sciences

Publication information
Journal: Nordisk Aquaculture
Volume: 2
Issue number: 2
ISSN (Print): 0801-0730
Original language: Danish

Bibliographical note
The article is in Danish
Source: orbit
Source-ID: 281797
Publication: Research › Journal article – Annual report year: 1986

The cultivation of Acartia tonsa Dana for use as a live food source for marine fish larvae

The marine calanoid copepod Acartia tonsa has been continuously cultivated in the laboratory at the Danish Institute for Fisheries and Marine Research for over 70 generations. A description of the cultivation procedures is presented in this paper. Adult copepods are maintained in 200–450-l tanks and are fed the cryptophyte Rhodomonas baltica. The concentration of adult copepods is held between 50 and 100/l. Eggs are harvested daily and, on average, ca. 25 eggs are collected per female per day.

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Institute Management
Authors: Støttrup, J. (Intern), Richardson, K. (Ekstern), Kirkegaard, E. (Intern), Pihl, N. J. (Intern)
Pages: 87-96
Publication date: 1986
Main Research Area: Technical/natural sciences

Publication information
Journal: Aquaculture
Volume: 52
Issue number: 2
ISSN (Print): 0044-8486
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.75 SJR 1.101 SNIP 1.524
Web of Science (2016): Indexed yes
First feeding of larval herring

The transition period from endogenous to exogenous feeding by larval herring was investigated in the laboratory for four herring stocks in order to evaluate the chances of survival at the time of first feeding. Observations on larval activity, feeding and growth were related to amount of yolk, visual experience with potential prey organisms prior to first feeding and prey density. Herring larvae did not initiate exogenous feeding until around the time of yolk resorption. The timing of first feeding was not influenced by prior exposure to potential prey organisms during the yolk sac stage. In the light of these observations, the ecological significance of the yolk sac stage is discussed. Initiation of exogenous feeding was
delayed by 1-4 days at a low (7.5 nauplii .cntdot. l-1) compared to a high (120 nauplii .cntdot. l-1) prey density, but even at
prey densities corresponding to the lower end of the range experienced by larvae in the sea, larvae were able to initiate
exogenous feeding. There is thus no need to postulate extraordinarily high densities of food in larval nursery areas in
order for the larvae to initiate exogenous feeding and the present observations do not support the comprehension that the
time of yolk resorption is a particularly 'critical period' for larval herring survival.
Projects:

**Forbedring af forvaltningsgrundlaget for bestande i det rekreative fiskeri (39370)**

National Institute of Aquatic Resources

Section for Monitoring and Data

Section for Ecosystem based Marine Management

Section for Freshwater Fisheries Ecology

Institute Management

Period: 14/07/2016 → 14/07/2018

Number of participants: 16

Acronym: REKREA

Project participant:

Olesen, Hans Jakob (Intern)
Storr-Paulsen, Marie (Intern)
Stettrup, Josianne Gatt (Intern)
Skov, Christian (Intern)
Christoffersen, Mads (Intern)
Reeh, Line (Intern)
Stubgaard, Karin (Intern)
Svendsen, Jon Christian (Intern)
Pedersen, Stig (Intern)
Pedersen, Michael Ingemann (Intern)
Jepsen, Niels (Intern)
Aarestrup, Kim (Intern)
Hansen, Frank Ivan (Intern)
Pinna, Line Giovanna Buhl (Intern)
Azour, Farivar (Intern)
Larsen, Peter Vingaard (Intern)

FishHab-II (39345)

The aim of the project is to map fish habitats to improve data and information for Maritime Spatial Planning. The project focuses on mapping the habitats for 9 commercially important fish species and one invertebrate species in the inner Danish waters. Within the project methods will be developed to map habitats in data-poor as well as data-rich areas. Data derived from different sources; surveys, fisheries, citizen science will be used and combined with information derived from fisher interviews. The mapping will include coastal habitats to provide the basis for advice on management of coastal fish nursery areas.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).
A systems approach framework for coastal research and management in the Baltic (BaltCoast) (39201)

The ultimate objective of this project is a coherent and systematic management approach that encompasses multiple impacts in a spatially heterogeneous context.

In BaltCoast we tackle this complex task using the Systems Approach Framework (SAF). The SAF is an issue oriented investigation and methodology that applies a holistic perspective. It investigates and quantifies the functions of systems in order to simulate specific questions concerning their functions or policies. It comprises the process from issue identification through system analyses to policy implementation.

This Systems Approach can, hence, competently address implementation of international directives (e.g. Water Framework Directive (WFD), Marine Strategy Framework Directive (MSFD)). In BaltCoast we address multiple issues through case studies that reflect current regional management challenges and develop a generic tool for integrated system assessment.

This project is coordinated by Leibniz-Institute for Baltic Sea Research (IOW).

The project is funded by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Leibniz-Institute for Baltic Sea Research
Klaipeda University
Tallinn University
University of Latvia
Polish Academy of Sciences
Swedish University of Agricultural Sciences

Period: 01/03/2016 → 28/02/2018
Number of participants: 7
Research areas: Coastal Ecology & Ecosystem based Marine Management
Project participant:
Wisz, Mary (Intern)
Sørensen, Thomas Kirk (Intern)
Vinther, Morten (Intern)
Egekvist, Josefine (Intern)
Svendsen, Jon Christian (Intern)
Phd Student:
Brown, Elliot John (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)
Contact person:
Støttrup, Josianne Gatt (Intern)
Project participant:
Dinesen, Grete E. (Intern)
Wisz, Mary (Intern)
Neuenfeldt, Stefan (Intern)
Hüssy, Karin (Intern)
Kristensen, Kasper (Intern)
Vinther, Morten (Intern)
Sørensen, Thomas Kirk (Intern)

**Mapping of fish habitats with Øresund as a case study (FISKEHAB) (39206)**
Mapping of fish habitats in the Danish part of Øresund, based on existing data on fish and habitats, interviews with gillnet fishermen, anglers and workshop participants. The project was commissioned as a response to widespread protest over sand extraction activity in several designated sites in the area. Øresund is a relatively data poor sea area that is fished primarily by fishermen with vessels below 12 meters, i.e. vessels without satellite location data. The project succeeded in creating maps indicating the distributions of 7 key commercial fish species within Øresund with direct association to benthic habitats.

This project was coordinated by DTU Aqua.

The project was commissioned directly by the Danish Ministry of Food, Agriculture and Fisheries.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

University of Copenhagen
Period: 03/12/2014 → 31/08/2015
Number of participants: 6
Research area: Ecosystem based Marine Management & Coastal Ecology
Project participant:
Egekvist, Josefine (Intern)
Støttrup, Josianne Gatt (Intern)
Vinther, Morten (Intern)
Dinesen, Grete E. (Intern)
Phd Student:
Brown, Elliot John (Intern)
Project Coordinator:
Sørensen, Thomas Kirk (Intern)

**Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters**

National Institute of Aquatic Resources
Period: 01/12/2014 → 30/11/2018
Number of participants: 3
Phd Student:
Brown, Elliot John (Intern)
Supervisor:
Stenberg, Claus (Intern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: Offentlig finansiering

**Relations**
Press / Media items:
Tilstandsrapport fra havbunden
Eel hatchery technology for a sustainable aquaculture (EEL-HATCH) (39181)

Hatchery and rearing technology for commercial production of glass eels is fundamental to sustainable and profitable eel aquaculture. The vision is to enhance existing technology to rear European eel larvae to the glass eel stage, thereby closing the lifecycle in captivity. Pioneering research of the consortium has raised eel breeding from a state of reproductive failure to stable production of viable larvae.

Objectives include: Design “state of the art” hatchery facilities, optimize broodstock feeds, enhance assisted reproductive technology, and develop larval culture systems and diets. The main success criterion is achievement of large scale culture of larvae throughout the larval stage, leading to glass eel production. The establishment of sustainable aquaculture of this endangered species, presently relying on captive glass eel will rebuild the highly profitable market for eel aquaculture and suppliers as well as assist in conservation and stock management plans.

Results obtained during the half of the project period include the design and establishment of a dedicated research facility in relation to DTU Aqua in Hirtshals, involving several partners. The facility applies recirculation aquaculture systems with emphasis on matured water technology and microbial control. Scientific highlights include successful production of recombinant European eel gonadotropic hormones; enhanced reproduction, fertilization and incubation procedures; and optimized larval culture conditions, including e.g. temperature, salinity, and light regime. Larval diets have been developed and tested in first feeding and behavioral experiments, leading to the first published work on larval feeding for this species. Experiments on improved diets and optimized rearing tanks for larval growth are ongoing.

This project is coordinated by DTU Aqua.

The project is funded by Innovation Fund Denmark.

National Institute of Aquatic Resources
Section for Marine Living Resources
Billund Aquaculture Service Aps
BioMar A/S
North Sea Science Park
Bioneer A/S
STMI
Danish Aquaculture Association
Period: 01/04/2014 → 30/09/2017
Number of participants: 9
Research areas: Fish Biology & Aquaculture & Coastal Ecology
Project participant:
Butts, Ian (Intern)
Støttrup, Josianne Gatt (Intern)
Lund, Ivar (Intern)
Krüger-Johnsen, Maria (Intern)
Sørensen, Sune Riis (Intern)
Kottmann, Johanna Sarah (Intern)
Project Manager, organisational:
Haslund, Ole Henrik (Intern)
Phd Student:
Politis, Sebastian Nikitas (Intern)
Project Coordinator:
Tomkiewicz, Jonna (Intern)
Coastal mussel banks: The importance for the fish fauna and possibilities for habitat restoration (MusFisk) (39133)

Coastal mussel banks are commonly assumed to be good areas for recreational fishing, but few quantitative studies have investigated how fish abundance and diversity covary with mussel coverage. In many Danish coastal waters, mussel coverage is reduced compared to historic records, but the impact of the reduction on coastal fisheries remains largely unknown.

This project investigates fish abundance and diversity in various coastal habitats to predict possible effects of mussel bank restoration projects. Because it is increasingly recognized that restoration of coastal habitats support both pelagic and benthic fisheries, this study hypothesized that mussel banks may provide important shelter and foraging habitats for various trophic levels of fish. Covering different habitats, catch per unit effort (CPUE) was quantified using fyke nets, and fish abundance and behaviours were measured using stationary underwater video cameras. These studies revealed that blue mussel (Mytilus edulis) banks support fish abundance and diversity comparable to areas covered by eel grass (Zostera marina), indicating that mussel bank restoration projects could benefit fisheries in a fashion similar to eel grass habitats. Moreover, fish abundance, but not diversity, differed between mussel banks exposed to different current velocity regimes, suggesting that mussel banks exposed to higher current velocities support higher fish abundances. These findings indicate that mussel bank restoration carried out in high current velocity regimes may provide the most favorable habitats for fish. Surprisingly, fish behaviours were similar in different current velocity regimes, suggesting comparable ecological function of the habitats.

Planned data collection in 2016 includes experimental manipulations of mussel coverage in laboratory studies where habitat preferences and stress levels (cortisol) will be examined in a number of fish species. These findings will be useful to test findings from the field studies and help predicting the effects of mussel bank restoration in coastal areas.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2014 → 31/12/2016
Number of participants: 4
Research areas: Coastal Ecology & Oceanography
Project participant:
Støttrup, Josianne Gatt (Intern)
Mariani, Patrizio (Intern)
Project Coordinator:
Svendsen, Jon Christian (Intern)
Stenberg, Claus (Intern)

Investigation of causes for declines in fish abundance in coastal areas (Kystfisk II) (39164)

The project aims to describe changes in distribution of different age groups of cod and plaice in coastal areas. Changes in the distribution of plaice off the Danish west coast were documented and correlated to changes in nutrient loadings. These results were submitted for peer review. Potential changes in the distribution of cod of different size classes in inner Danish waters are being modelled to see if there are any consistent patterns. Datamining has been undertaken to provide environmental data to conduct analyses of potential causes for changes observed.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries ("Bæredygtighedspuljen").

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2014 → 31/12/2016
Number of participants: 4
Research areas: Coastal Ecology & Marine Living Resources & Oceanography
Project participant:
Munk, Peter (Intern)
Stedmon, Colin (Intern)
Stenberg, Claus (Intern)
Boulder reefs as spawning and nursery areas for fish (RevFisk) (39144)
The project aimed to build knowledge about marine boulder reefs and their biological function for fish as spawning and nursery areas.

The field work was conducted on a stone reef, Hatter Barn at two depths 6-12 m and 13-17 m. These two depths were chosen to provide information on fauna and flora in the upper photic zone and a deeper zone. The dominant fish were labrids, which also spawned in the area and juvenile cod. Acoustic tagged cod provided information on their presence around the reef. Many exhibited a diurnal rhythm, concentrating on the reef during nighttime, although some cod were stationary on the reef the whole time. The deeper reef was more frequently visited (fourfold) by cod than the shallower reef.

Experimental work conducted at the Blue Planet aquarium revealed that corkwing wrasse are highly territorial and able to prevent juvenile cod from occupying their crevices. Goldsinny wrasse showed little interaction with cod and generally utilized very small crevices. Both labrids and cod utilized shelter from current flows provided by the structures and cod were often seen in high concentrations near the bottom where the current flows were laminar.

The results are useful for further developing models that quantify boulder reefs impact on fish (larvae, juvenile, adult) as a function of the reefs condition, size and depth location. The results are useful in helping plan and design the restoration of destroyed boulder reefs but also to manage existing boulder reefs.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
DHI Denmark
Aarhus University
Period: 01/12/2013 → 01/02/2015
Number of participants: 7
Research areas: Coastal Ecology & Marine Living Resources & Oceanography
Project participant:
Mariani, Patrizio (Intern)
Dinesen, Grete E. (Intern)
Project Manager, academic:
Christoffersen, Mads (Intern)
van Deurs, Mikael (Intern)
Nielsen, Anders (Intern)
Project Coordinator:
Støttrup, Josianne Gatt (Intern)
Project

Stone reefs: Review of the biological and ecological knowledge on stone reefs and their function in temperate areas (Stenrev) (39038)
Boulder reefs have been the subject of extensive mining where a number of reefs have been wholly or partially removed from the marine areas, especially the shallow coastal waters less than 10 m depth. A review on the importance of cold temperate reefs was requested. The review summary highlighted the following. Reefs are known for their high species richness and are biologically very productive. They are home to many fish using reefs for refuge. In particular cavernous reefs with high complexity and many small niches (between and around stones) are characterized by high species diversity, high productivity and have an important function as a feeding area for many species of fish and marine mammals. There are no quantitative estimates of the impact and effects of reefs for fish stocks in Danish waters. However, the relationship between refuge options and survival was shown for goby, as well as for juvenile cod. Larger cod are attracted to reefs during autumn before they start their spawning migration. Results of the first reef restoration project in Danish waters showed a clear development of both macro-algae and benthic fauna and in fish abundance for fish normally associated with reefs. The many fish had probably attracted porpoises, which are now observed more frequently and for longer periods in the area. The European lobster occurs in salty water (> 25 parts per thousand) at 2-40 m depth around vegetated reefs or rocky ground, and therefore, this habitat is an important habitat for lobster. Of the sessile
invertebrates highlighted, mussels were found in several different types of habitats, including reefs and is one of the species that are first to colonize new habitats - such as newly established reefs.

This project was coordinated by DTU Aqua.
The project was funded by the Danish Minestry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2013 → 15/02/2013
Number of participants: 5
Research area: Costal Ecology
Project participant:
Stenberg, Claus (Intern)
Christensen, Helle Torp (Intern)
Wieland, Kai (Intern)
Dinesen, Grete E. (Intern)
Project Coordinator:
Støttrup, Josianne Gatt (Intern)

Pre-feasibility study regarding establishment of hatchery facility for production of juvenile lobsters (Homarus Gammarus) (39035)
Pre-feasibility study to obtain "state of the art" knowledge and to determine the biological as well as physical requirements and economic costs for establishing a lobster hatchery at the North Sea Research Centre for restocking purposes and for public communication.

The project was coordinated by the North Sea Science Park.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Aquaculture
North Sea Science Park
Danish Shellfish Centre
Period: 01/12/2012 → 01/04/2013
Number of participants: 2
Research areas: Aquaculture & Coastal Ecology
Project participant:
Støttrup, Josianne Gatt (Intern)
Project Manager, academic:
Lund, Ivar (Intern)
Project Coordinator:
Støttrup, Josianne Gatt (Intern)

Investigation of causes for declines in fish abundance in coastal areas (KYSTFISK-I) (39031)
Danish fishermen complained of drastic declines in coastal fish populations, negatively impacting their fisheries opportunities but the nature and magnitude of the problem was uncertain.

This project aimed to collate information from fishers to map the problem, including which species and geographical areas involved. In total 74 fishers were interviewed and the problem mapped in Støttrup et al. (2014a). The project further aimed to explore existing survey data that could support the observed changes in fish distribution (Støttrup et al. 2014b) and conduct a literature review to explore if similar trends had occurred in neighboring countries and potential causes for the developments had been identified (Dutz et al. in revision).

The project is coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
Period: 01/11/2012 → 01/10/2013
Number of participants: 7
Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics
Project participant:
Munk, Peter (Intern)
Dutz, Jörg (Intern)
Stenberg, Claus (Intern)
Kjørvik, Josefine (Intern)
Nielsen, Torkel Gissel (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)

BALTIFIMA generic tool (39001)
The objective of the BALTIFIMA project (Managing Fisheries in Baltic Marine Protected Areas) was to develop a generic decision making assisting tool to give guidance and advice on impacts of different fishing practices and gear on protected habitats and species in the Baltic Sea. This was based on a comprehensive review of the existing literature. The tool has the form of a matrix of fishing gear types against habitats and species, and includes a generic level, a detailed level and a technical level in addition to a list of the relevant literature. At the generic and detailed levels impacts are scored in traffic light categories (red, yellow, green), whereas the technical level includes summaries of actual impacts.

The project was lead by DTU Aqua.

The project was funded by the Helsinki Commission (HELCOM).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Helsinki Commission - Baltic Marine Environment Protection Commission
Period: 01/08/2012 → 01/04/2013
Number of participants: 5
Research areas: Ecosystem based Marine Management & Coastal Ecology & Fisheries Technology
Project participant:
Sørensen, Thomas Kirk (Intern)
Dolmer, Per (Intern)
Frandsen, Rikke (Intern)
Støttrup, Josianne Gatt (Intern)
Project Manager, academic:
Larsen, Finn (Intern)

Reproduction capacity of European eel in captivity: Fecundity, follicular maturation and developmental competence of embryos and larvae
National Institute of Aquatic Resources
Period: 01/05/2012 → 30/09/2017
Number of participants: 7
Phd Student:
da Silva, Filipa (Intern)
Supervisor:
Kjørvik, Elin (Ekstern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)
Examiner:
Hansen, Jakob Hemmer (Intern)
Improving larval feeding in aquaculture: feeding behaviour in marine larval fish

National Institute of Aquatic Resources
Period: 01/04/2012 → 17/11/2016
Number of participants: 7
Phd Student:
Bruno, Eleonora (Intern)
Supervisor:
Hansen, Benni Winding (Ekstern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)
Examiner:
Nielsen, Torkel Gissel (Intern)
Geffen, Audrey Jacheline (Ekstern)
Van der Meeren, Terje (Ekstern)

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

Flatfish nursery grounds (38176)
The aim of the project is to determine what constitutes a good nursery area for specific flatfish in coastal soft bottom areas in the inner Danish waters using a combination of empirical and theoretical approaches. Field studies on juvenile flatfish feeding, growth and condition use both wild and released fish. One approach is to explore different statistical methods to determine potential nursery grounds for different flatfish based on physical parameters such as wave exposure, sediment type and abiotic variables such as temperature, salinity and depth. This research coupled with the development of tools to map different coastal habitats will provide the basis for advice on management of coastal fish nursery areas. Implementation of PIT-tag technology in coastal marine waters will be developed in order to build up expertise to sample released individuals in different habitats.

The project was coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Organization for Amateur Fishermen
Aarhus University
Period: 01/01/2011 → 31/12/2013
Number of participants: 5
Research areas: Coastal Ecology & Freshwater Fisheries and Ecology & Marine Living Resources
Project participant:
Kristensen, Louise Dahl (Intern)
Kristensen, Kasper (Intern)
Aarestrup, Kim (Intern)
Phd Student:
Brown, Elliot John (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)
Improvement of aquaculture high quality fish fry production (IMPAQ) (38904)

IMPAQ aims at increasing the sustainability of the Danish marine aquaculture farms producing high value fish through the development of large-scale cultures of copepods as start feed for larval fish. Copepods represent an important alternative food to present classical live feed organisms in marine fish hatcheries. Their use is known to improve survival, growth, and development of fish larvae.

The specific aims of DTU Aqua contributions to the project have been (i) to describe copepod behaviors that are mediated through water-borne chemical cues (pheromones, grazing attractants); (ii) to chemically characterize these chemical cues and develop bioassays that can facilitate the identification of water fractions containing active substances; and (iii) to test the quality of developed live feeds in pilot-scale fish larval cultures.

IMPAQ is built on knowledge transfer and direct collaboration between fundamental and applied scientists and private enterprises (SMEs and industries) and has devoted substantial effort into PhD and Postdoc training.

External partners of the project are Roskilde University (coordinator), University of Copenhagen, Aarhus University, universities in France and Taiwan and four Danish private enterprises.

The project is funded by the Danish Council for Strategic Research.
Marine habitats and restorations methods (MaHaR) (38817)

Restoration of habitats in marine areas is a new research area. DTU Aqua has in recent years worked to develop and restore biogenic reefs (mussel) (project BioReef), boulder reefs (project BlueReef), habitat complexity (project Vejle Fjord), effects and solutions of coastal areas affected by suction dredging (Project Nørrefjord). The project will compile and review these projects and gather knowledge on how to further develop the concept of area "marine habitat restoration methods". Focus will be on the areas structures and functions as nurseries, refuge and feeding opportunities for fish and shellfish.

The project is coordinated by DTU Aqua.

Nørrefjord: A case study of coastal habitat status and restoration possibilities (38171)

Nørrefjord has been used as a case study to study to analyze Danish coastal habitats and their fate and ecological function for fish. As many other Danish coast areas the fjord has undergone dramatic changes in its biological structure and function due to human activities and influences. The fjord is nutrient loaded and eutrophication has led to reduction in the photic zone and frequent hypoxia in fjord deeper parts (>10 m). In addition, there has formerly been extraction of gravel and sand in shallow areas of the fjord (<5 m). These activities have created suction holes which still stand despite the fact that they were created over 15 years ago. The project aims to study local fish fauna community, fish distribution and ecological structure and function for different habitat types in the fjord in order to suggest how local fish fauna could be restored.

The project is coordinated by DTU Aqua.
Population genetics of flounder in Danish waters (38819)

Knowledge about population structure and local adaptation is central for successful management of both freshwater and marine fisheries. For instance, recently accumulated knowledge about the geographical scale and extent of local adaptation in anadromous fishes has resulted in the abandonment of fish transplants and releases of foreign fish into natural populations, because such activities threaten the survival of natural populations. In coastal habitats, local fishermen have expressed interests in moving marine fish between geographically distant areas, but until now a lack of scientific knowledge about the scale and extent of local adaptation has prevented any detailed advice on the scale that such movements may be possible. In one particular case, it was proposed to move European flounder from the western parts of the Limfjord to the Bay of Aarhus in order to support a fishery in the bay where the species had reached very low abundances. Since these two areas are both geographically distant and environmentally different, it is possible that fish are also adapted to local environmental conditions. However, although earlier work has strongly suggested that populations of European flounder may be locally adapted, no study had directly compared samples from these areas.

In this project, we aimed to use a combination of genetic markers previously found not to be affected by selection (so-called “neutral markers”) and markers situated in or close to genes which may be important for local adaptation. The application of such a combination of genetic markers may allow the assessment of geographical patterns and scales of both population structure and local adaptation in natural populations. The first stage of the project was the development of new genetic markers through screening candidate genes, identified as differentially expressed in relation to various stressors in laboratory experiments, for the presence of suitable genetic markers. Genetic markers were subsequently analyzed in individuals collected from the target as well as reference populations in 2011 and in additional reference samples available from 2003/2004. Results showed markedly different levels of genetic variation in putatively neutral and candidate gene associated markers throughout the species’ distribution. Furthermore, different frequencies of genetic variants near the stress response candidate gene, Hsc70, were observed between the Limfjord and the Bay of Aarhus, suggesting local adaptation to the two areas. Consequently, it was advised that fish were not moved between these two regions. In addition to providing information about the specific case, these results could also be important for guiding future research on finer geographical scales in this and other marine fishes.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Northwest Jutland Recreational Fishermen’s Association

Period: 01/01/2011 → 31/12/2012
Number of participants: 5
Research areas: Population Genetics & Coastal Ecology

Project participant:
Meldrup, Dorte (Intern)
Stætrup, Josianne Gatt (Intern)
Sparrevohn, Claus Reedtz (Intern)
Nicolajsen, Hanne (Intern)

Project Manager, academic:
Hansen, Jakob Hemmer (Intern)

The population of whitefish (Coregonus lavaretus) in Ringkøbing Fjord: Effects of fishery, stocking and natural reproduction (38827)

Objectives of the project are to improve our knowledge on the whitefish population in the Ringkøbing Fjord Lagoon and effects associated with the commercial exploitation of the population, i.e. to what extent the traditional gill-net (46 mm monofilnet) fishery for whitefish affect both the whitefish population and otherspecies of fish in the lagoon. Another goal is to establish how much natural reproduction and stocking of hatchery reared fry contributes to the adult population. These results will provide a much better basis for the management of whitefish populations in Denmark in general and in Western Jutland in particular.
Thenatural population of whitefish in the Ringkøbing Fjord Lagoon has been the subject of an extensive fishery for more than 100 years. The fishery is primarily performed by commercial fishermen, but estimated from the number of recreational fishers in the area, a substantial amount is caught by this group as well. The lagoon holds the largest population of whitefish in Denmark. The official landing statistics (only covering the commercial catches) shows that the catch through the 20th century typically has varied between 10 and 60 tons per year (e.g. mean 1980-2000 25.1 tons per year). Since 2001 the landings have increased to a mean of 55 tons per year (range 14-94 t), with a mean value of 1.2 m DKK. This constitutes 75-95 % of the total Danish whitefish fishery.

Since 1986 ca. 4 million hatchery reared fry has been stocked in the lagoon each year. 3.6 million are stocked as newly hatched larvae in April. 0.4 million are raised to a size of 3-4 cm before stocking in late May. The population of sea trout (Salmo trutta) in the main tributary of the lagoon, the River Skjern, is much smaller than expected, considering the environmental conditions of both the river and the lagoon and the size of the river. One possible reason is by-catch in the whitefish fishery. The landing of sea trout and the endangered salmon (Salmo salar) from the lagoon is prohibited and the discard mortality for sea trout is considered to be very high. Investigations on the subject of by-catch in gill-nets set for whitefish in the Baltic Sea supports this hypothesis.

In the project we estimate the catch of whitefish and the by-catch of other fish species in the whitefish gill-net fishery, with special emphasis on salmonids, by a combination of experimental fishery, monitoring selected commercial fishing trips and a questionnaire the fishermen on their effort. A number of different approaches re time and place of fishing and net construction is tested to describe how much by-catch can be minimized.

The result of natural spawning in River Skjern is investigated by a combination of catching newly hatched larvae with drift-nets and e-DNA analysis of water samples from the river. The latter method is a very novel approach. Through the experimental fishing, supplemental data on the whitefish, salmonids as well as other species (less detailed) are collected to describe population dynamic parameters (size and age distribution, growth, condition etc.), primarily of whitefish and salmonids.

The results shows, that by-catch of sea-trout in the whitefish gill-net fishery is unavoidable, but also that the by-catch can be reduced substantially by employing specific gears and methods. The by-catch of salmon is insignificant while the by-catch of other species, especially flounder is substantial. These results will be reported in autumn 2016. Their investigation on natural reproduction in the River Skjern is still ongoing and will be reported in 2017.

This project is coordinated by DTU Aqua.
The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2011 → 31/12/2016
Number of participants: 4
Research areas: Freshwater Fisheries and Ecology & Population Genetics
Project participant:
Eg Nielsen, Einar (Intern)
Phd Student:
Hansen, Brian Klitgaard (Intern)
Project Manager, academic:
Berg, Søren (Intern)
Støttrup, Josianne Gatt (Intern)

Physical-biological influence on the spawning and larval development for an inshore population of cod (Gadus morhua) in Greenland
National Institute of Aquatic Resources
Period: 01/02/2010 → 27/11/2013
Number of participants: 6
Phd Student:
Swalethorp, Rasmus (Intern)
Supervisor:
Nielsen, Torkel Gissel (Intern)
Main Supervisor:
Munk, Peter (Intern)
Examiner:
Støttrup, Josianne Gatt (Intern)
Interaction in coastal waters: A roadmap to sustainable integration of aquaculture and fisheries (COEXIST) (38789)

The project aims to provide a roadmap towards improved integration, sustainability and synergies among different activities in the coastal zone.

The project will study interactions between capture fisheries and aquaculture, and evaluate mutual benefits and possible bottlenecks for concomitant development of these activities in the coastal zone within the context of the ecosystem approach to management.

The project will also develop and evaluate different forms of coastal aquaculture and fisheries at different scales and exploit mutual opportunities within a concept of competition for space by multiple users.

Furthermore, the project will address differences in acceptance of activities by society and develop a strategy for communication and involvement of stakeholder as well as for dissemination of results to general and targeted audiences. Six case studies are involved. Individual processes and their interaction will be investigated in each case study using spatial management tools and an array of models.

The project is coordinated by Institute of Marine Research, Norway.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Johann Heinrich von Thünen-Institute
University College Cork
IFREMER
National Institute of Biological Resources
Finnish Game and Fisheries Research Institute
Consiglio Nazionale delle Ricerche
Cefas
Wageningen IMARES
Aqua TT UETP Ltd
Finnish Environment Institute
Institute of Marine Research, Denmark
Wageningen University & Research
Period: 01/01/2010 → 31/12/2012
Number of participants: 7
Research area: Coastal Ecology
Project participant:
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)
Reproduction of European eel: Towards a self-sustained aquaculture (PRO-EEL) (38793)

Reproduction of European eel (Anguilla anguilla) in culture has become a research priority area due to a severe decline of natural stocks and an increasing interest to breed eels for a self-sustained aquaculture. As eels do not reproduce naturally in captivity, development of methodology and technology was needed for production of viable eggs and larvae from broodstock in a regular and predictable way.

Focus of PRO-EEL project was on the primary bottlenecks in a controlled reproduction of eels, which concern deficiencies in knowledge about eel reproductive physiology and methods applied to induce and finalize gamete development. During a 4-year period, the project significantly expanded current knowledge on the eel reproductive mechanisms and hormonal control of sexual maturation. The consortium developed standardized protocols for assisted production of high quality gametes (egg and sperm) and artificial fertilization, thereby obtaining a stable production of viable embryos. Furthermore, egg incubation procedures and culture of yolksac larvae were established for the first time for European eel, leading to the first feeding stage. The project disseminated novel literature on early life stages, including their ontogeny and requirements thereby describing egg and larval stages still unknown in nature and providing important information for future development of larval diets and rearing technology. Methodology and technology was established using small scale tests and validated in full scale experimental facilities managed by DTU.

The project was an international, EU-funded research project characterized by an integrative and multidisciplinary approach. The consortium brought together leading experts in eel reproduction complemented by expertise in disciplines filling gaps in knowledge and technology. The consortium included 15 partners, comprising European research institutes and industry partners as well as an international collaboration partner country (ICPC). Within DTU, the project involved DTU Food, Research Group for Bioactives – Analysis and Application, and several DTU Aqua research areas including Fish Biology, Aquaculture, Marine Populations and Ecosystem Dynamics, and Coastal Ecology.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

National Food Institute
National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Wageningen IMARES
Leiden University
National Centre for Scientific Research "Demokritos"
Polytechnic University of Valencia
NOFIMA
Ghent University
University of Copenhagen
National Institute for Agronomic Research
Billund Aquaculture Service Aps
National Institute of Sciences and Technologies of the Sea
Institute of Marine Research
Norwegian University of Science and Technology
BioMar A/S
Period: 01/01/2010 → 31/07/2014
Number of participants: 9
Research areas: Fish Biology & Aquaculture & Marine Populations and Ecosystem Dynamics & Coastal Ecology
Project participant:
Butts, Ian (Intern)
Støttrup, Josianne Gatt (Intern)
Sørensen, Sune Riis (Intern)
Skov, Peter Vilhelm (Intern)
Steenfeldt, Svend Jørgen (Intern)
Hornum, Inger (Intern)
Project Manager, academic:
Tomkiewicz, Jonna (Intern)
Munk, Peter (Intern)
Krüger-Johnsen, Maria (Intern)

Project

**Restoration of fish habitats by recreation of biogenic reefs in Nørre fjord (blue mussel reefs) (38788)**

The aim of the project was to improve fish habitats and fish populations in Nørre fjord by restoring blue mussel reefs in the fjord. This was based on the assumption that blue mussel reefs would provide complex habitats for fish, and improve the conditions and availability of prey organisms and hiding places for both juvenile and adult fish in the fjord.

Blue mussels (~ 44 ton) were produced on ropes in the fjord from the indigenous mussel larvae stock in 2 years, 2010 and 2011. Harvested mussels were distributed on sandy-muddy seabed in a study area in the southern part of the fjord mainly by use of volunteer, local fishermen. The mussel reefs were laid out as small patches (3 m in diameter) with 5 to 7 m in between to increase the complexity of the fjord substrate and covered in total an area of 121,000 m². The design mimicked the observed distribution of existing mussel beds in the fjord. Different approaches for production of the mussels and deployment of the reefs were investigated to minimize costs and labor.

The production of blue mussels on suspended long lines/on hemp sacks was a more ecologically sustainable method compared to transplanting blue mussels by destructive dredging. Crowdsourcing allowed us to conduct the experiments cost-effectively although it did cause challenges in the planning and implementation processes.

A scientific monitoring program monitored the distribution of fish populations and prey organisms in the study area and a control area in 2010 and 2011, before and after the restoration of the mussel reefs in the study area. The establishment of blue mussel beds increased the abundance and diversity of fish on the mussel structures (Kristensen et al. 2015). Video observations revealed the presence of gobies were around the structures for extended periods but also larger fish such as cod, trout and flatfish were observed near the established mussel beds.

The project relied on a strong stakeholder involvement and cooperation with the local fisheries association and local users of the fjord. Field work, including mussel production and deployment of the mussel reefs was carried out by volunteers from the local Fisheries Association supervised by the Nordshell consultant and DTU Aqua staff.

The project was coordinated by DTU Aqua.

The project was funded by the Fishery LAG Funen (established under the Rural District Program in EU Fisheries Development Program) and the Danish Ministry of Food, Agriculture and Fisheries.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Faaborg Recreational Fishery Association
University of Southern Denmark
Nordshell IS
Period: 01/01/2010 → 14/04/2012
Number of participants: 4
Research area: Coastal Ecology
Project participant:
Støttrup, Josianne Gatt (Intern)
Project Manager, academic:
Poulsen, Louise K. (Intern)
Stenberg, Claus (Intern)
Kristensen, Louise Dahl (Intern)

**The effect of habitats on the distribution and behaviour of flatfish and cod**

National Institute of Aquatic Resources
Period: 01/01/2010 → 02/06/2016
Number of participants: 7
Phd Student:
Kristensen, Louise Dahl (Intern)
Effect of the Horns Rev 1 offshore wind farm on fish communities (38734 and 38735)
The present project focuses on the fish community at the Horns Rev 1 Offshore Wind Farm. The objective of the present study was to document possible refuge effects or changes in local fish communities, seven years after the establishment of the wind farm at a time where wind farm effects on the physical and biological environment could be assumed to have stabilized. Fish communities and sandeel assemblages were compared inside and outside the wind farm area, with the null-hypothesis that the introduction of an offshore wind farm does not affect species composition, temporal or spatial distribution of species or relative abundance.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Orbicon
Period: 01/01/2009 → 31/12/2011
Number of participants: 5
Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics
Project participant:
Støttrup, Josianne Gatt (Intern)
vandeurs, Mikael (Intern)
Dinesen, Grete E. (Intern)

Project Manager, academic:
Stenberg, Claus (Intern)
Mosegaard, Henrik (Intern)

Marine fish atlas of Denmark (38852)
This project will produce an atlas of all the marine fish species found in waters around Denmark. The species occurrence data for the atlas will be based on all types of observational data, such as; fisheries research surveys, commercial fish landings data, recreational fishermen’s landings and diver observations. Users and target audience of the atlas are university and high school students and instructors, scientists, government officials, private companies, NGOs, and the wider Danish public. The atlas will be a reference for scientific outreach product and is a collaboration between DTU Aqua, the Zoological Museum of the Natural History Museum of Denmark and a small private consulting company operated by the former biologist of the Danish Fishermen’s Association. The atlas will contain photographs and maps of the distributional area each species and a short (3-5 page) text describing current knowledge of species’ biology and life history in Danish waters.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Centre for Ocean Life
University of Copenhagen
Krog Consult ApS
Period: 01/01/2009 → 31/12/2013
Number of participants: 3
Reproduction of European eel in aquaculture: Consolidation and new production methods (REEL) (38398)

Project aim: Enhance methods and technology applied to produce and culture European eel larvae as basis for the development of a future self-sustained eel aquaculture.

Background: The severe decline of the European eel stock calls for conservation measures including national eel management plans and establishment of a self-sustained eel aquaculture. In 2005, DTU Aqua, University of Copenhagen and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture.

Two major projects: Artificial Reproduction of Eels II and III (ROE II and III) succeeded during 2005-2008 to produce viable eggs and larvae that lived up to 12 days. The larvae thereby accomplished the yolk sac stage and became ready to start feeding. The results were in particular promising because they evidenced that methods successfully applied to Japanese eel have a potential for application also to European eel. ROE II and III LC were supported by the Danish Ministry of Food, Agriculture and Fisheries and the Financial Instrument for Fisheries Guidance (FIFG) and RO III by the Danish Food Research Program 2006.

Results: The REEL project has accomplished through three series of experiments to consolidate previous results and extend the longevity of larvae from 12 to 20 days after hatch in first feeding experiments. Methods to induce maturation were further tested, and farmed and wild eel broodstocks and different treatments were compared. In particular, fertilization procedures to produce fertilized eggs and embryos and monitoring techniques were enhanced. The technology needed to culture embryos and larvae was substantially improved. The potential for new hormonal treatments was explored and recombinant eel hormones have been produced. New broodstock diets were developed with focus on the lipid composition essential for development and survival of fish larvae. In addition, the experimental facility established by DTU Aqua at Lyksvad Fishfarm was enhanced by improving the experimental and laboratory facilities. The REEL project has provided the basis for the establishment of an EU research project: Reproduction of European Eel: Towards a Self-sustained Aquaculture (PRO-EEL) (38793) coordinated by DTU Aqua. REEL included the partners DTU Aqua, the Danish Eel Producers Association, Billund Aquaculture, BioMar, Bioneer and Copenhagen University of which four are integrated in PRO-EEL.

The project was coordinated by DTU Aqua.
Reproductive Ecology: Effect of dietary fatty acids on ovarian maturation, spawning time and quality of eggs and larvae in Eastern Baltic cod

National Institute of Aquatic Resources
Period: 01/10/2008 → 27/06/2012
Number of participants: 6
Phd Student:
Røjbek, Maria (Intern)
Supervisor:
Jacobsen, Charlotte (Intern)
Tomkiewicz, Jonna (Intern)
Main Supervisor:
Støttrup, Josianne Gatt (Intern)
Examiner:
Grønkjær, Peter (Ekstern)
Kraus, Gerd (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Artificial reproduction of eels: Phase III (ROE III) (38187)

The steady decline of the European eel stock has adverse consequences for the Danish eel aquaculture as all eel farming is at present capture based relying on wild caught glass eels. In 2005, DTU Aqua, University of Copenhagen and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture.

The focus of ROE III was to follow up the pioneering work on artificial reproduction of European eels performed in the preceding pilot projects ROE I and II. The projects ROE II and III were a collaboration among DTU Aqua, University of Copenhagen and the eel aquaculture industry following up an initial survey ROE I of suited methodology lead by University of Copenhagen.

ROE III comprised the following activities:
(i) Experimental series with different treatment schemes and hormone dosage to improve the maturation process and optimize gamete quality;
(ii) Development of methods to monitor the maturation process on individual level using ultrasound scanning technology and ovary biopsy;
(iii) Analysis of broodstock fishes and improvement of the dietary fatty acid composition;
(iv) Investigation of parameters determining egg quality during incubation;
(v) First-feeding trials with eel larvae testing both artificial and live feed.

Three experimental series were completed focusing on methods for broodstock enhancement, maturation and fertilization plus culture of eggs and larvae. Already during the first experimental series, larvae accomplishing the entire yolk sac stage were achieved for the first time in history for European eel. The yolk sac larvae developed successfully during the period were they entirely depend on nutrition sources i.e. yolk and lipid of maternal origin. The larvae were ready to start feeding day 12 post hatch. During the second experimental series, larval longevity was extended to 18 days during first feeding experiments. These recent results are a major breakthrough because they show for the first time that artificial hormone treatment can lead to viable offspring in European eel. Eggs and yolk sac larvae were obtained from different hormonal treatments and mass hatchings were regularly obtained. Larval feeding using live and artificial larval feeds developed in collaboration with the food company BioMar were developed towards the end of the experiments and are ready for testing in new and coming projects.

The success of this project on improved methods, quality criteria and larval survival has led to form the basis of the project: Reproduction of European eel in aquaculture: Consolidation and new production methods and later (REEL) (38398) and later the EU FP project: Reproduction of European eel in Aquaculture: Towards a self-sustained aquaculture (PRO-EEL) (38793).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
Science and policy integration for coastal systems assessment (SPICOSA) (38180)

The objective of SPICOSA was to develop a self-evolving, holistic research approach, for integrated assessment of Coastal Systems so that the best available scientific knowledge could be mobilized to support deliberative and decision-making processes towards improving the sustainability of Coastal Systems by implementing Integrated Coastal Zone Management policies. Based on a System Approach, a multidisciplinary assessment framework was developed with a balanced consideration of the Ecological, Social and Economic (ESE) sectors of Coastal Systems.

The System Approach Framework (SAF) developed in the project was then used to explore dynamics of Coastal-Zone Systems and potential consequences of alternative policy scenarios in 18 different Study Sites. We demonstrated that achieving this objective required a restructuring of the science needed to understand the interactions between complex natural and social systems at different spatial and temporal scales including the overall economic evaluation of alternative policies. The software used for the modeling was furthermore developed with the aim to support transfer of scientific products to policy decision-makers, stakeholders and end-users. The SAF Portfolio consisted of generic assessment methodologies, specific tools, models and model blocks and new knowledge useful for ICZM provided in a user-friendly manner and updateable for future CZ researchers and professionals. In addition SPICOSA generated new training curricula, training modules and training opportunities for academics and professionals involved in Sustainability Science and ICZM implementation.

The project was organized into 5 Nodes with DTU Aqua leading one of these 5 Nodes.

In total the project had 54 partners from 22 EU countries.

The project was coordinated by University of Western Brittany, France, Institute of Coastal Marine Environment of CNR, Italy and French National Institute of Marine Research (IFREMER), France.

The project was funded by EU, Framework Programme 6.
Understanding the mechanisms of stock recovery (UNCOVER) (38104)
The UNCOVER project has produced a rational scientific basis for developing Long-Term Management Plans (LTMP) and recovery strategies for 11 of the ecologically and socioeconomically most important fish stocks/fisheries in the Norwegian and Barents Seas, the North Sea, the Baltic Sea and the Bay of Biscay and Iberian Peninsula.

UNCOVER's objectives were to:
(i) identify changes experienced during stock depletion/collapses,
(ii) to understand prospects for recovery,
(iii) to enhance the scientific understanding of the mechanisms of fish stock/fishery recovery, and
(iv) to formulate recommendations how best to implement LTMPs/recovery plans.

The project recommends that such plans ideally should include:
(i) Consideration of stock-regulating environmental processes,
(ii) Incorporation of fisheries effects on stock structure and reproductive potential,
(iii) Consideration of changes in habitat dynamics due to global change,
(iv) Incorporation of biological and technological multispecies interactions,
(v) Integration of economically optimized harvesting,
(vi) Exploration of the socio-economic implications and political constraints from existing and alternative recovery plans,
(vii) Investigations on the acceptance of plans by stakeholders and specifically incentives for compliance by the fishery,
(viii) Agreements with and among stakeholders.

UNCOVER has provided imperative policy support underpinning the following fundamental areas:
(i) Evolution of the Common Fisheries Policy with respect to several aims of the 'Green Paper';
(ii) Contributing to the Marine Strategy Framework Directive with respect to fish stocks/communities;
(iii) achieving Maximum Sustainable Yield (MSY) for depleted fish stocks. This has been done by contributing to LTMPs/recovery plans for fish stocks/fisheries, demonstrating how to shift from scientific advice based on limit reference points towards setting and attaining targets such as MSY, and furthering ecosystem-based management through incorporating multispecies, environmental and habitat, climate variability/change, and human dimensions into these plans.

The project was coordinated by Institut für Ostseefischerei, Bundesforschungsanstalt für Fischerei, Germany.

National Institute of Aquatic Resources
Section for Marine Living Resources
Bundesforschungsanstalt für Fischerei
Marine Research Unit, Marine and Food Technological Centre
Cefas
University of Portsmouth
Marine Laboratory
Instituto Español de Oceanografía
Aalborg University
Leibniz Institut für Meereswissenschaften, Universität Kiel
IFREMER
Institute of Marine Research
Sea Fisheries Institute
Knipovich Polar Research Institute of Marine Fisheries and Oceanography
Nederlands Instituut voor Visserij Onderzoek b.v.
University of Aberdeen
University of Bergen
University of Hamburg

Period: 01/01/2006 → 31/12/2010
Number of participants: 14
Research areas: Marine Living Resources & Fish Biology
Contact person:
The overall project objective was to restore a rare marine habitat at a strategically important locality (Læsø Trindel) with the purpose of conservation of marine biodiversity.

The more specific objectives include:
- Stabilization and restoration of a cave-forming stone reef to favorable conservation status.
- Conservation and proper management of a reef donor area (larval dispersal) for the oxygen depleted inner Danish waters.
- Implementation through dissemination and cross-sectoral co-operation among authorities and local stakeholders.

Offshore boulder reefs have a high biodiversity and are a biologically important reef type at national and European level. At national levels these reef types are rare and Læsø Trindel constitutes one of 51 reef areas included in the Danish Natura 2000 network. In Denmark, shallow water boulder reefs have been extensively exploited for about a century, targeted for their easily accessible large boulders for constructing sea defenses and harbor jetties. A cautious estimate is that at least 34 km² of boulders from predominantly shallow cavernous reefs have been extracted from Danish waters and national monitoring programs indicate that only around 5 ha of the total original cavernous reefs have been left untouched.

The field experimental work was based on baseline surveys to be followed up by a survey 4 years after the deployment of the boulders; i.e. a “Before-After” approach. One role that DTU Aqua had in the project was to participate in the design of the restoration together with the other project partners. Based on the results from the multi-beam echo-sounder survey of the area conducted by GEUS in 2005, the reef restoration design was developed through several meetings between engineers and biologists/ecologists (Støttrup et al. in prep.). DTU Aqua’s main role in the project, however, was to document the ecology and biodiversity status of Læsø Trindel with focus on fish and shellfish assemblages before and after the restoration (Støttrup et al. 2014; Kristensen et al. 2 papers close to submission). This work was carried out in close collaboration with Aarhus University who is responsible for monitoring bottom fauna and flora. The baseline study has been carried out in 2007, just before the deployment of the boulders that should stabilize the remains of the original reef and restore its earlier shallow-water cavernous reef function. In 2012 the area was revisited using the same methodology and sampling program as in the baseline study.

The project was coordinated by Danish Nature Agency.

The project was funded by EU LIFE.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Nature Agency
Aarhus University
Geological Survey of Denmark and Greenland

Period: 01/01/2005 → 01/07/2012
Number of participants: 2
Research areas: Coastal Ecology & Marine Living Resources
Coastal habitats (3117)
The aim of the project was to characterize coastal habitats based upon their function as optimal areas for stock enhancement projects, where artificially reared individuals are released with the purpose of increasing local stock sizes.

Towards this aim, the basic criteria for stocking were reviewed and discussed (Støttrup & Sparrevohn, 2007). Habitat suitability was examined (Carl et al. 2008) and methods for estimating mortality of newly released fish were developed together with means of securing the highest possible survival after release (Sparrevohn & Støttrup, 2007).

The potential of linking available prey items to growth of released individuals was examined together with potential for this linkage as a parameter to identify areas suitable for stock enhancement (Sparrevohn & Støttrup, 2008). Predation impact was explored through field experiments (avian predators; Sparrevohn & Støttrup, 2007; Støttrup & Sparrevohn, 2007) and theoretically using ecosystem modeling (Dalsgård et al. 2008 and Nielsen et al., 2008 (both reports).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Local fishermen associations
Danish Organization for Amateur Fishermen
Aarhus University
Wageningen IMARES
Period: 01/01/2005 → 31/12/2010
Number of participants: 4
Research area: Coastal Ecology & Danish Shellfish Centre

Limfjord regime shift (38181)
The aim of the project was to reveal causes and mechanisms related to a regime shift in the Limfjord, including the relationship with nutrient loading and fish production in the Limfjord. Furthermore management scenarios for ensuring good environmental conditions and sustainable use of the living resources would be examined and discussed. DTU Aqua’s share of the project was through models to demonstrate a regime shift and to explore potential causes of this. The project made it possible to combine different types of data across sub-basins with different physical-chemical conditions and trophic groups and to explore various methods. We chose to use an Integrated Trend Assessment approach and a series of statistical tests were applied (sequential t-test analyses of regime shifts (STARS), principle component analyses (PCA), STARS on PCA scores and Chronological Clustering). A Traffic Light Plot was used to visualize changes in the ecosystem. A regime shift was identified starting in 1990 and fully developed by 1996. It impacted the whole food-chain structure in the fjord. Possible causes were identified as climatic causes (temperature, salinity and wind) and eutrophication (nutrient N, P loadings and bottom oxygen conditions). To a lesser extent fishery of demersal fish species could also have been a contributory factor. The regime shift caused a decrease in the fishery of large demersal fish, whereas there was a general increase in the stock size of pelagic and small demersal fish species, crustaceans (crabs, lobster), echinoderms, starfish and jelly fish. After the regime shift primary production in the water column decreased. In the present project it was not possible to determine if the decrease in large demersal fish stocks was caused by failure in recruitment or by over-fishing. At the management level it was pointed out that it was important to study sub-basins of the fjord due to the high variation of parameters between sub-basins. The fundamental changes that had occurred in the system further suggested that it may not be possible for the system to revert back to its original condition even if the nutrient loadings were brought back to their original levels. However, this needs to be further investigated.

The project was coordinated by DTU Aqua.
RESTOCK (38566) (38400 pre-project)

The aim of the pre-project was to explore the potential for restocking the cod stock in the eastern Baltic. A theoretical study was conducted to explore the potential for restocking bringing together scientists from the aquaculture sector, fisheries managers, ecological scientists and scientists with a background in stock enhancement. The ecology, biology and fisheries biology of the eastern Baltic was reviewed and provided the basis for the study. The results indicated a good potential for restocking with first-feeding cod larvae (Støttrup et al. 2008). This was the first example of a study to examine the potential for large-scale restocking prior to the release of fish. A 2-3 month delay in the spawning period compared to 20-30 years ago has altered feeding conditions and predation susceptibility in a way that may have exacerbated the decline in recruitment. Producing and releasing cod larvae during spring would mimic the spawning period recorded in previous times and would coincide with the spring peak in copepod production. An evaluation of 3 different release scenarios showed that a release of 474 million first-feeding larvae over 5 months (covering the historic and present day spawning period) would enhance the average population of 2 year old by 10% and be biologically and economically the most feasible scenario.

Three years of a six year follow up project (RESTOCK) to verify the theoretical findings was funded, but due to political changes, funding for the final three years was not possible and the project was unable to empirically ascertain the potential for restocking. During the three years, 3 cod broodstocks were established with different photoperiods and subsequent spawning periods, together with the development of a technique to determine fish gender non-invasively (McEvoy et al., 2009). Egg and larval incubation techniques were developed and several investigations on temperature, salinity and food impacts on first feeding cod larvae to define the “window of opportunity” for release (i.e. time when the larvae were ready to start feeding to when they began to be too poor in condition to feed) (Støttrup et al., 2008; Overton et al. 2010; Meyer et al. 2011a). A release strategy was developed and the first successful release of first-feeding fish larvae at 23 m depth was conducted, but needed further adjustments (Støttrup et al., 2008). An extensive disease monitoring program was established (Støttrup et al., 2008) and the presence of a protistan endoparasite generated a further study (Skovgård et al., 2010). Studies were also conducted to determine explore marking techniques for identification of released fish (Meyer et al., 2011b) and explore growth characteristics in cod larvae (Meyer et al., 2011a).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
National Veterinary Institute
Danish Fishermen's Association
University of Copenhagen
University of Hamburg
University of Caen
Period: 01/01/2005 → 31/12/2007
Number of participants: 9
Research area: Coastal Ecology
Project participant:
Sørensen, Sune Riis (Intern)
Rejbek, Maria (Intern)
Pedersen, Per Bo Bovbjerg (Intern)
Tomkiewicz, Jonna (Intern)
Møllmann, Christian (Ekstern)
Sichlau, Morten (Ekstern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)
Paulsen, Helge (Intern)
Dalsgaard, Inger (Intern)
Project

Activities:

ICES - Working Group on marine planning and coastal zone management - WGMPCZM (External organisation)
Period: 2015
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)
Period: 2015
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2014
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation

ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM (External organisation)
Period: 2012 → …
Josianne Gatt Støttrup (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation
ICES - Working Group for Marine Planning and Coastal Zone Management - WGMPCZM
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar