In the beginning of the project all available information will be collected on fish species and environmental conditions of the area. More importantly, the project will collect new information from a scientific survey using DTU Aqua’s Havfisken and fishing of participating commercial vessels. Combining historical and newly acquired information will help improve management of commercial species that utilise the coastal area.

Finally, the project will investigate potential fishing opportunities in the area.

The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.

Kokkalis, A., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Støttrup, J. G., Project Participant, National Institute of Aquatic Resources
Munk, P., Project Participant, National Institute of Aquatic Resources
Dinesen, G. E., Project Participant, National Institute of Aquatic Resources
Olesen, H. J., Project Participant, National Institute of Aquatic Resources
Egekvist, J., Project Participant, National Institute of Aquatic Resources
Olsen, J., Project Participant, National Institute of Aquatic Resources
14/12/2018 → 14/12/2020
Keywords: Research areas: Ecosystem based Marine Management & Marine habitats

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**Marine litter in the water column of the North Sea (MARLINS) (39561)**

MARLINS (Marine litter in the water column of the North Sea) will utilize a unique collection of marine litter, sampled in connection with annual herring larvae surveys, to investigate the composition, amount, distribution and potential sources of marine litter in the North Sea. In contrast to most other investigations on marine litter which are largely focussed on beach surveys, bottom trawl surveys or sampling in surface waters, the present project will provide information about marine litter in the entire water column.

The main output of the project will be a marine litter database and a detailed description of the composition of the marine litter by different categories, colours and sizes as well as maps of the spatial distribution, amount and where applicable weight of the different litter categories in the entire North Sea area. In addition, drift model runs will be conducted to further investigate potential source and sink areas of the litter.

The knowledge gained from the project is expected to be relevant for various stakeholders and authorities such as Ministries of Environment and Fisheries, nature conservation organizations, tourism organizations as well as the International Council for the Exploration of the Sea (ICES) and the scientific community in general, in particular in relation to the Marine Strategy Framework Directive. For example, information about the most likely sources of litter and identification of potential source areas for certain litter types may allow responsible authorities and stakeholders to investigate if actions can be taken to reduce or entirely prevent the continuing, future introduction of certain types of litter into the marine environment by diminishing or completely shutting down the sources.

The project is coordinated by DTU Aqua and funded by Velux Fonden.

Huwer, B., Project Coordinator, National Institute of Aquatic Resources, Section for Marine Living Resources
Christensen, A., Project Participant, National Institute of Aquatic Resources
Eigaard, O. R., Project Participant, National Institute of Aquatic Resources
01/10/2018 → 30/09/2020
Keywords: Research areas: Fish Biology, Marine Living Resources & Ecosystem based Marine Management

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**Protecting bycaught species in mixed fisheries (PROBYFISH) (39549)**

PROBYFISH aims to develop a modelling framework and a support tool to assess whether proposals for regionalised management measures in the North Sea, Southwestern and Northwestern waters are in accordance with the objectives of the CFP. The project approaches this aim by developing agreed and robust methods to define target and bycatch species, identifying the bycatch species for which TAC management of target species would be sufficient, identifying measures that will lead to the sustainable development of the bycatch stocks (technical, spatial etc), producing agreed reference levels to safeguard stocks and combining the results of all activities in a user-friendly and flexible tool.

The project is coordinated by DTU Aqua and is funded by EU Executive Agency for Small and Medium-sized Enterprises (EASME).
Development and demonstration project for ecosystem based marine spatial planning (ØKOMAR) (39530)

Following the decision of the EU Marine Framework Directive in 2014, Denmark has to transpose the Directive into Danish legislation. By 2021, a strategy for the Danish marine areas needs to be implemented to achieve the objectives including how to obtain the goals for growth and exploitation of the territorial sea taking into account the interaction between land and sea, environmental and economic aspects and organizes the use of the best available data.

The ØKOMAR project will develop and test data-based tools for ecosystem-based marine planning in the Danish waters, partly to explore the use of these tools, partly to make these tools available to relevant users and authorities. The project is coordinated by NIVA Denmark and funded by the VELUX Foundation.

Keywords: Research area: Ecosystem Based Marine Management
Collaborators: Aarhus University, University of Copenhagen, Geological Survey of Denmark and Greenland, NIVA Denmark Water Research
Project: Research

Other pressure factors in the marine environment than nutrients (39529)

Anthropogenic pressures are potentially of major importance to the ecological state of the marine environment. In coastal areas, ecological state of the marine environment is assessed according to the EU Water Framework Directive (WFD) using the quality elements phytoplankton, angiosperms (eelgrass), macro algae and benthic fauna. Additional supportive parameters like Secchi depth and occurrence of anoxia or hypoxia can be included in the assessment. Extensive research efforts have shown that excessive loading of the nutrients nitrogen and phosphorous are the most important pressure factors in the coastal marine environment of Denmark. However, other pressure factors like e.g. fisheries, gravel and sand extraction, invasive species, run-off of micro plastics and hazardous substances and physical modifications like sluices and dams. For Danish coastal areas, there is no overarching perspective to other pressure factors than nutrients and assessment of their potential impact on environmental status.

In the present project, the aim is to assess the potential impact of a number of expected pressure factors other than excess loading of nutrients and effects of climate changes on environmental state of the Danish water bodies according to the WFD. The assessment will be based on existing knowledge and existing data. The assessment will be performed as a review of documented effects of the different pressure factors on the quality elements and supportive parameters, assessment of data availability for analysis on water body level and documentation of dependence on the pressure factor of external environmental parameters like salinity and temperature. Based on the review of each pressure factor, an analysis will be performed to assess the impact of the pressure factor on the indicators depth limit of eelgrass, DKI and concentration of chlorophyll a during the summer period. The analysis will only be performed if an effect of the pressure factor is well documented and sufficient data are available. Finally, the project will assess how pres factors can be cumulated.

The project is funded by the Danish Environmental Protection Agency and is coordinated by DTU Aqua.

Keywords: Research area: Fisheries Management & Ecosystem based Marine Management
Project: Research

Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

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Bastardie, F., Project Participant, National Institute of Aquatic Resources
Nielsen, J. R., Project Participant, National Institute of Aquatic Resources
Kokkalis, A., Project Participant, Section for Ecosystem based Marine Management
Haslund, O. H., Project Participant, National Institute of Aquatic Resources

24/05/2018 → 23/05/2021

Keywords: Research areas: Fisheries Management & Ecosystem based Marine Management
Project: Research
**Sand banks and fisheries impact in relation to EU fisheries and environmental policy (39519)**

Objective of the project: The project will improve the knowledge base for ongoing and upcoming Natura 2000 and MSFD implementations in the North Sea. For nature-type ‘sand banks’, in particular Danish sandeel and plaice fishing will be affected. Activities in the project: The key activities of the project are targeted method developments and knowledge production in relation to EU fisheries and environmental policy:

1. Development of a gear and sediment-specific model for bottom impact from all types of mobile bottom-contacting fishing gears in the North Sea.
2. Field trials to document short-term impact on sandbank fauna from demersal seine fishery.
3. Analyses of data from the seine gear field trials and of existing data for the impact of sandbanks from trawlers, including impact differences between bottom and floating trawl doors.
4. Estimation of sediment impact from natural disturbance on sand banks (e.g. tide and wave impact) as well as scaling of these in relation to physical effects of different types of gear.
5. Integrated analysis of the impact of different fisheries and other pressure factors on sand banks.

Project Expected Effects: The project’s results and method developments can be used directly in the management to separate different fisheries with regard to bottom impact; e.g. by nature conservation via area restrictions. Activity 4 and 5 will generate management tools that can quantitatively address descriptor 6 under the Marine Strategy Framework Directive relative to sand banks.

The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.

Eigaard, O. R., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Dinesen, G. E., Project Manager, National Institute of Aquatic Resources

Gislason, H., Project Participant, National Institute of Aquatic Resources

Bastardie, F., Project Participant, National Institute of Aquatic Resources

Nielsen, J. R., Project Participant, National Institute of Aquatic Resources

Egekvist, J., Project Participant, National Institute of Aquatic Resources

Pedersen, E. M., Project Participant, National Institute of Aquatic Resources

Stættrup, J. G., Project Participant, National Institute of Aquatic Resources

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Hansen, F. T., Project Participant, National Institute of Aquatic Resources

O’Neill, B., Project Participant, National Institute of Aquatic Resources

Noack, T., Project Participant, National Institute of Aquatic Resources

Lundgaard, L. S., Project Participant, National Institute of Aquatic Resources

Hansen, A. D., Project Participant, National Institute of Aquatic Resources

01/02/2018 → 31/01/2020

**Analysis of protected areas in the North Sea and the Central Baltic (Beskyttede områder) (39425)**

The project aims at delivering a report on the scientific basis and coherence of the current system of marine protected areas in the Danish North Sea, Skagerrak and central Baltic Sea EEZ’s. This will enable the Danish Nature Agency to decide whether the existing network of protected areas is coherent (representative, adequate and connected) with respect to the requirements of the MSFD art. 13 part 4.

The most important biodiversity elements, habitats and ecological processes of the North Sea/Skagerrak and the central Baltic Sea will be addressed including selected ecosystem components, oceanographic features and seabed habitats. The work will be based on available data, literature studies and results from recent investigations. Furthermore, ecologically valuable – “hot-spots” – and areas of economic value are to be identified.

The network of ecologically valuable areas will be analyzed based on data, distribution mapping, weighting of data and connectivity consideration using several types of software. Areas of economic value inside and outside the Natura2000 network will be identified based on existing data collected by the partners and located at the partner’s database. Finally, areas of economic importance will be combined to suggest marine protected areas.

The project is coordinated by DTU Aqua.

The project is funded by Danish Agrifish Agency.

Edelvang, K., Project Coordinator, National Institute of Aquatic Resources, Section for Oceans and Arctic

Gislason, H., Project Participant, National Institute of Aquatic Resources

01/01/2017 → 31/12/2017
Investigation of causes affecting distribution and density of cod and plaice in Danish coastal areas (Kystfisk 3) (39413)

Danish coastal fishermen have for several years wondered at the apparent drastic decrease in coastal fish abundance and have raised the question of the reason for these changes.

The objective of Kystfisk 3 is to investigate the causes of the decline in coastal cod and plaice by providing:

- A thorough analysis of the stock structure of plaice and cod.
- A description of the spatial distribution of plaice and cod.
- A description of the historical development in spatial distribution.
- A model of the distribution and density of cod and plaice stocks in relation to environmental conditions.

Kystfisk3 is a continuation of the work conducted in Kystfisk 1 and Kystfisk 2. In Kystfisk 1 and Kystfisk 2, interviews with fishermen were conducted and the issues reported confirmed by analysis of survey trawl data. In Kystfisk 3 a combination of spatial models and genetic analyses are used to determine the contribution of migration, environment and decreased stock abundance. The project analyses are based on existing data, including otoliths collected in the 1990’s. Data are compared to current data collected from specific areas in Kattegat, Skagerrak and the North Sea.

The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.

Mariani, P., Project Manager, National Institute of Aquatic Resources
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Kokkalis, A., Project Participant, National Institute of Aquatic Resources
Nielsen, A., Project Participant, National Institute of Aquatic Resources
Christensen, A., Project Participant, National Institute of Aquatic Resources
Gislasen, H., Project Participant, National Institute of Aquatic Resources
Hansen, J. H., Project Participant, National Institute of Aquatic Resources
Svendsen, J. C., Project Participant, National Institute of Aquatic Resources
Stætrup, J. G., Project Participant, National Institute of Aquatic Resources
Eero, M., Project Participant, National Institute of Aquatic Resources
Vinther, M., Project Participant, National Institute of Aquatic Resources
Munk, P., Project Participant, National Institute of Aquatic Resources
22/12/2016 → 30/09/2019
Keywords: Research areas: Marine habitats, Fisheries Management & Ecosystem based Marine Management
Project: Research

Seal-safe fishing (39421)
The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.

Larsen, F., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Krag, L. A., Project Participant, National Institute of Aquatic Resources
Rindorf, A., Project Participant, National Institute of Aquatic Resources
Berg, C. W., Project Participant, National Institute of Aquatic Resources
Kindt-Larsen, L., Project Participant, National Institute of Aquatic Resources
Kroner, A., Project Participant, National Institute of Aquatic Resources
22/12/2016 → 30/09/2019
Keywords: Research areas: Ecosystem Based Marine Management & Fisheries Technology
Collaborators: Swedish University of Agricultural Sciences
Project: Research

Eastern Baltic cod - New knowledge of growth and mortality is the way to improved management advice (39366)
The aim of the project is to improve the knowledge and data basis for stock assessment and management for cod in the eastern Baltic Sea. In later years, changes in growth and natural mortality of cod have presumably taken place and new knowledge on these parameters is essential for restoring analytical stock assessment for Eastern Baltic cod that is currently lacking. Improved knowledge on cod growth and mortality is therefore a prerequisite for being able to evaluate the stock status in relation to management targets and implement management plans that are built on quantitative stock assessment. Ecological situation in the Baltic Sea has changed in later years, which requires updated biological information. This is done in the project using different approaches, bringing together expertise of different research areas. The approaches applied include molecular-genetic analyses of cod growth, bioenergetic modelling, and analyses of monitoring data on predation and condition/growth of cod. An important component of the project is cooperation with fishing industry to support tagging experiments of Baltic cod, to obtain updated estimates of cod growth. Finally, the project combines the new knowledge on cod that becomes available from this and other relevant projects to ensure that the assessment of stocks status and management advice is based on best available scientific information.
The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.

Eero, M., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Storr-Paulsen, M., Project Participant, National Institute of Aquatic Resources
Tomkiewicz, J., Project Participant, National Institute of Aquatic Resources
Hansen, J. H., Project Participant, National Institute of Aquatic Resources
Neuenfeldt, S., Project Participant, National Institute of Aquatic Resources
Christensen, A., Project Participant, National Institute of Aquatic Resources
Kindt-Larsen, L., Project Participant, National Institute of Aquatic Resources
Berg, C. W., Project Participant, National Institute of Aquatic Resources
15/08/2016 → 15/08/2018
Keywords: Research areas: Ecosystem based Marine Management & Fish Biology & Marine Populations and Ecosystem Dynamics & Population Genetics & Marine Living Resources & Fisheries Management
Collaborators: University of Copenhagen, Danish Fishermen's Association
Project: Research

Bycatch of marine mammals and seabirds - Assessment and mitigation (39337)
The aim of the project is to develop innovative mitigation methods to reduce the unintended bycatch of marine mammals and seabirds in Danish gillnet fisheries. The project includes the following components:- determine the distribution in time and space of the bycatches;- identify the factors that determine the occurrence of the bycatch and its distribution;- identify behaviour that are correlated with bycatch;- conduct pilot trials of mitigation methods;- propose further mitigation methods to test in a continuation of the project.
The results of the project will contribute to a better management of protected species of marine mammals and seabirds, as well as placing Denmark in a better position with respect to its obligations in relation to the EU Habitats Directive, the EU Bird Directive, the EU Marine Strategy Framework Directive, the EU Council Resolution 812/2004 and the EU Action Plan for reduction of seabird bycatch.

The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.
Larsen, F., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Kindt-Larsen, L., Project Manager, National Institute of Aquatic Resources
Serensen, T. K., Project Participant, National Institute of Aquatic Resources
Rindorf, A., Project Participant, National Institute of Aquatic Resources
Wisz, M., Project Participant, National Institute of Aquatic Resources
01/03/2016 → 28/02/2018
Keywords: Research areas: Ecosystem based Marine Management & Coastal Ecology
Collaborators: Kolmården Wildlife Park
Project: Research

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.

The project is coordinated by DTU Aqua and is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).
Stettrup, J. G., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Brown, E. J., PhD Student, National Institute of Aquatic Resources
Wisz, M., Project Participant, National Institute of Aquatic Resources
Serensen, T. K., Project Participant, National Institute of Aquatic Resources
Vinther, M., Project Participant, National Institute of Aquatic Resources
Egekvist, J., Project Participant, National Institute of Aquatic Resources
Svendsen, J. C., Project Participant, National Institute of Aquatic Resources
01/03/2016 → 28/02/2018
Keywords: Research areas: Coastal Ecology & Ecosystem based Marine Management
Collaborators: University of Copenhagen, Danish Fishermen's Association
Project: Research
Investigations of the potential "nitrogen effect" of stone reefs, and contribution to the re-establishment of a stone reef in the Natura 2000 area "Løgstør Broad, Vejlerne and Bulbjerg" (The Stone Reef Project I & II) (39354 & 39450)

As well as many inner Danish waters, Limfjorden is highly eutrophied due to land-based nutrients runoff, and some areas in the fjord often suffer from anoxia events. The current project evaluates the effect of stone reefs as a possible complementary tool in water planning related to the water framework directive (2000/60/EF) to reduce the negative outcome of such events. For this purpose, the project involves the establishment of a stone reef in Løgstør Broad in 2017 as well as comprehensive analysis of the potential "nitrogen effect" of already existing stone reefs in the broad. The outcome of the project will help to assess whether stone reefs can be a future use as an instrument of retaining nitrogen in water management plans.

The project is coordinated by Limfordsrådet, Aalborg Municipality
Petersen, J. K., Project Participant, National Institute of Aquatic Resources, Danish Shellfish Centre Nielsen, M. M., Project Participant, National Institute of Aquatic Resources
1/1/2016 → 31/12/2020

Keywords: Research areas: Marine Habitats & Ecosystem based Marine Management
Collaborators: Aarhus University, DHI Water - Environment - Health, Geological Survey of Denmark and Greenland, Limfordsrådet, NIVA Denmark Water Research
Project: Research

Forward management of sandeel in the North Sea (39316)
The project will define and align the management of sandeel considering the goals and desires of the fishing industry, administration and science while taking the biology and importance of the sandeel in the ecosystem into account. The project is structured by several work-packages, each dealing with specific aspects of sandeel biology and/or fishery relevant for management. Among these will the sandeel population structure and its influence on stock assessment, CPUE and counselling be discussed. Analyses of fisheries development and sandeel availability over the fishing season will enable a more accurate calculation of fishing mortality. Furthermore, it is examined whether the increasing concentration of fishing effort on certain banks potentially causes an error in the stock assessment in relation to recruitment from unfished banks. The project will perform a statistical evaluation of fisheries-independent data for sandeel in the North Sea and evaluate existing and alternative methods of stock assessment for sandeel in the North Sea with current and alternative management areas, including implementing an analytical stock assessment of sandeel in sandeel area 4. Finally the project will evaluate existing biological and management reference points, and discuss these in relation to ecosystem reference points. Throughout the project period, a series of workshops and meetings will be held in order to discuss possible management strategies for sandeel in the North Sea. These discussions will imply a number of fundamental prerequisites defined in collaboration between management, fisheries and science in order to form the basis for an optimal management of sandeel.

The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.
Worsøe Clausen, L., Project Coordinator, National Institute of Aquatic Resources, Section for Marine Living Resources Rindorf, A., Project Participant, National Institute of Aquatic Resources van Deurs, M., Project Participant, National Institute of Aquatic Resources Berg, C. W., Project Participant, National Institute of Aquatic Resources Mosegaard, H., Project Participant, National Institute of Aquatic Resources Bekkevold, D., Project Participant, National Institute of Aquatic Resources Mortensen, L. O., Project Participant, National Institute of Aquatic Resources Christensen, A., Project Participant, National Institute of Aquatic Resources
11/11/2015 → 17/08/2018

Keywords: Research areas: Marine Living Resources & Population Genetics & Fish Biology & Marine Populations and Ecosystem Dynamics & Fisheries Management & Ecosystem based Marine Management
Collaborators: Danish Fishermen's Association, Danish Pelagic Producers Organisation, Marine Ingredients Denmark
Project: Research

Baltic Sea Check Point (BSCP) (39294)
The overall aim of this project is to examine the current data collection, observation, surveying, sampling and data assembly programs in the Baltic Sea basin, assess and demonstrate how they can fit into purpose in the 11 challenge areas in terms of data uncertainty, availability, accessibility and adequacy, and deliver the findings to stakeholders through an internet portal with dynamic mapping features and a stakeholder workshop. The Baltic Sea region is as defined by the Marine Strategy Framework Directive, i.e., the semi-enclose sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.43.

The project is coordinated by the Danish Meteorological Institute and is funded by the EU Executive Agency for Small and Medium-sized Enterprises (EASME), the European Maritime and Fisheries Fund (EMFF) and the Danish Fisheries Agency.
Christensen, A., Project Coordinator, National Institute of Aquatic Resources, Section for Marine Living Resources Dinesen, G. E., Project Participant, National Institute of Aquatic Resources Eero, M., Project Participant, National Institute of Aquatic Resources
17/09/2015 → 16/08/2018
Supporting the national monitoring of Marine Strategy Framework Indicators (39304)

In support of the national implementation of EU's Marine Framework Strategy Directive, the project assembles a one-off monitoring of indicators of the following aspects:

- Quality of sandeel habitat
- Proportion of large top predatory fish
- Biomass of planktonic secondary producers
- Pressure on the sea bed from towed fishing gear
- Marine macro-litter
- Marine micro-litter in the food chain

The quality of sandeel habitat is measured as the fraction of sampling sites in known sandeel habitat which are unsuitable for sandeel due to excessive silt content. The proportion of large top predatory fish describes the proportion of large cod and saithe in Danish waters, and biomass of secondary producers is measured as the annual average biomass of zooplankton of three size categories in Skagerrak/Kattegat in summer.

Pressure on the seabed is measured from VMS data and the minimum area which sustains 90% of all pressure estimated together with the effectively unfished area. Macro-litter is measured as the average catch of litter in fish trawl surveys, whereas micro-litter in the food chain is monitored as the amount and occurrence of microplastic particles in stomachs from pelagic and demersal fish.

This project was coordinated by DTU Aqua.

The project was funded by the Danish Nature Agency.

Rindorf, A., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Stedmon, C., Project Participant, National Institute of Aquatic Resources

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Egekvist, J., Project Participant, National Institute of Aquatic Resources

15/05/2015 → 31/12/2015

Keywords: Research areas: Ecosystem based Marine Management & Oceanography

Collaborators: Danish Fishermen’s Association

Project: Research

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.

Støttrup, J. G., Contact Person, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Dinesen, G. E., Project Participant, National Institute of Aquatic Resources

Wisz, M., Project Participant, National Institute of Aquatic Resources

Neuenfeld, S., Project Participant, National Institute of Aquatic Resources

Hüssy, K., Project Participant, National Institute of Aquatic Resources

Kristensen, K., Project Participant, National Institute of Aquatic Resources

Vinther, M., Project Participant, National Institute of Aquatic Resources

Sørensen, T. K., Project Participant, National Institute of Aquatic Resources

01/04/2015 → 31/03/2018

Keywords: Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics & Marine Living Resources & Ecosystem based Marine Management

Collaborators: Swedish University of Agricultural Sciences, Leibniz Institute for Baltic Sea Research, Klaipeda University, University of Latvia, Tallinn University, Polish Academy of Sciences

Project: Research
Strategies for the gradual elimination of discards in European fisheries (DiscardLess) (39238)

DiscardLess will help provide the knowledge, tools and technologies as well as the involvement of the stakeholders to achieve the gradual elimination of discarding. These will be integrated into Discard Mitigation Strategies (DMS) proposing cost-effective solutions at all stages of the seafood supply chain.

This project is coordinated by DTU Aqua.

The project is funded by EU, Horizon2020.

Ulrich, C., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Rindorf, A., Project Participant, National Institute of Aquatic Resources
Larsen, E., Project Participant, National Institute of Aquatic Resources
Feekings, J. P., Project Participant, National Institute of Aquatic Resources
Eg Nielsen, E., Project Participant, National Institute of Aquatic Resources
Mortensen, L. O., Project Participant, National Institute of Aquatic Resources
Bekkevold, D., Project Participant, National Institute of Aquatic Resources
O'Neill, B., Project Participant, National Institute of Aquatic Resources

01/03/2015 → 28/02/2019

Keywords: Research areas: Fisheries Management & Population Genetics & Fisheries Technology & Ecosystem based Marine Management

Collaborators: Instituto Español de Oceanografía, AlphaFilm, Marine Institute, Marine Scotland Science, UiT The Arctic University of Norway, Cefas Weymouth Laboratory, TRACE Wildlife Forensics Network Limited, L’Institut Français de Recherche pour l’Exploitation de la Mer, NAYS Ltd, Irish Department of Communications, Marine and Natural Resources, University of Bergen, Université de Bretagne Occidentale, Matis ltd., FishFix, Memorial University of Newfoundland, University of the Azores, University of Strathclyde, Pôle AQUIMER , Food and Agriculture Organization of the United Nations, Simrad Spain SLU, Barna Group, Agrocampus Ouest, Hamplðjan Group, University of Copenhagen, Nuscience Group, SafetyNet Technologies LTD, Marel hf, Sea Fish Industry Authority, ShipCon , AZTI-Tecnalia

Documents:
DiscardLess - An overview of the project
DiscardLess - What can science do to help with the landing obligation? Presentation from Sinaval, Bilbao, Spain 22 April 2015
DiscardLess - Poster from ICES Annual Science Conference 2015
DiscardLess - Newsletter no. 1 2015

Maping 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.

Sørensen, T. K., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Brown, E. J., PhD Student, National Institute of Aquatic Resources
Vinther, M., Project Participant, National Institute of Aquatic Resources
Dinesen, G. E., Project Participant, National Institute of Aquatic Resources

03/12/2014 → 31/08/2015

Keywords: Research area: Ecosystem based Marine Management & Coastal Ecology

Collaborators: University of Copenhagen

Project: Research

Development of seal-safe fishing gear (Seal-Safe II) (39188)

Increasing numbers of seals in Danish waters have in recent years made it difficult to conduct a economically sustainable coastal fishery with gillnets and hooks/lines. The objective of Seal-Safe is to improve the viability of these fisheries by developing efficient, environmentally friendly and seal-safe pots for catching cod. The pots will make it possible for the coastal fishermen to conduct a sustainable fishery without damages inflicted by seals.

The specific goal of Seal-Safe is to increase the catch rate to at least 4 kg cod per pot per day. Seal-Safe will attain this through a combination of fishing trials on board commercial fishing vessels and research into the behaviour of fish and seals around the pots.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).
The effect of bottom trawling on marine bottom fauna and eelgrass (ØB Bundfauna) (39192)
The project provided input to the analysis of the impact of fishing on the ecological quality of the Danish marine environment to the Danish Nature Agency in relation to the water plans needed in connection with the implementation of the Water Framework Directive.
It contained three subprojects:
- Quantifying the area of seabed swept by Danish bottom trawl fisheries.
- Quantifying the impact of bottom trawling on marine benthos.
- Quantifying the possible interaction between bottom trawling and the depth distribution of eelgrass (Zostera marina).
This project was coordinated by DTU Aqua.
The Project was funded by the Danish Nature Agency.

Biodiversity changes - causes, consequences and management implications (BIO-C3) (39117)
BIO-C3 will investigate the dynamics of biodiversity in the Baltic Sea, their causes and the consequences for the function of food webs, including implications for biodiversity management policies.
Baltic biodiversity is historically dynamic responding to various drivers operating at different time and space scales. Species diversity is generally low and contains many recent immigrants and glacial relict species because of low salinity and relatively young age. Nevertheless, Baltic food webs sustain many goods and services valued by society. We focus on functional consequences of ongoing and projected distributional and compositional changes of benthic and pelagic communities with a focus on invasive and resident key species. Using spatial and temporal projections of abiotic/biotic drivers including their interaction (climate change, eutrophication, species invasions, fisheries), we will assess how biodiversity (e.g., of species, traits, habitats) responds in time, space and along gradients of human impact and hydrography. We will investigate the potential and genetic basis for colonisation, acclimation and adaptation of species and populations to the Baltic Sea, and how compositional and adaptive changes of Baltic biodiversity affect ecosystem functions with an emphasis on trophic linkage and food web dynamics.
Results will feed into impact assessments that guide management policies including improved operationalization of status indicators, and guidelines for MPAs.
The project is coordinated by Helmholtz Centre for Ocean Research, Kiel (GEOMAR). DTU Aqua is co-coordinator. The project is funded equally by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.
Developing seal-safe fishing gear (Seal-Safe I) (39163)
Developing seal-safe fishing gear will primarily be focused on fish pots, which have the best potential for protection against seal attacks. Other advantages of pots includes being size selective, that the catch can swim freely inside the pot and is alive when the pot is emptied resulting in a higher quality and thus a higher price, high survival for discards, low bycatch of small cetaceans and seabirds, and that the pot does not have to be tended every day. Disadvantages include low catch rates compared to gillnets, and that they are not good at catching flatfish.
DTU Aqua will carry out a development project that includes the following components:
- Review of fishing gear as alternatives to gillnets.
- Optimizing existing pots to Danish conditions in collaboration with the fisheries.
- Fishing trials for cod with the optimized pots.
- Experiments with bait types.
- Studies of fish and seal behavior around pots.
- Dissemination of results to the Danish fishery.
DTU Aqua has established a collaboration with Swedish scientists, who have extensive experience with development of seal-safe fish pots.
The main challenge will be to increase the catch rates of the fish pots, so that seal-safe fish pots can be an economically viable alternative to set gillnets. If this is successful, changing from gillnets to fish pots can ensure the continued survival of the small-scale coastal fishery and at the same time reduce bycatch of e.g. marine mammals and seabirds.
The project is coordinated by DTU Aqua.
The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through a special governmental Funding for sustainable fisheries ("Bæredygtighedspuljen").
Larsen, F., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Kindt-Larsen, L., Project Participant, National Institute of Aquatic Resources
01/02/2014 → 01/07/2016
Keywords: Research area: Ecosystem based Marine Management
Collaborators: Swedish University of Agricultural Sciences, Aarhus University, Neksø Vodbinderi ApS
Project: Research

Integrating spatial processes into ecosystem models for sustainable utilization of fish resources (INSPIRE) (39118)
The BONUS INSPIRE Project conducts pilot ecosystem field surveys that help resolving the habitat requirements of different life-stages of the focal species by combined use of traditional methods and application of modern advanced analysis and modelling techniques.
The research is conducted in a matrix approach with four species specific case (cod, herring, sprat and flounder) and five research work-packages. The work packages deal with (i) habitat requirements and survival probability for different life stages, (ii) connectivity between habitat occupied in successive life stages, (iii) spatial scaling from local events to regional population dynamics, (iv) spatially explicit analytical stock assessments (including a comprehensive flatfish programme), and (v) ecosystem-based management and Marine Strategy Framework Directive indicators.
The overarching questions of the BONUS INSPIRE Project are:
- What habitat (both pelagic and benthic) conditions characterize the spatial distributions of cod, herring, sprat and flounder?
- To what extent do fishing and species interaction affect the local and basin-scale distribution of exploited stocks?
- What drives spatial connectivity and migrations of different fish species/populations?
- How does stock structure and separation of natural populations impact stock assessment outcomes?
This project is coordinated by University of Tartu, Estonia.
The project is funded by EU, BONUS (Science for a Better Future of the Baltic Sea Region), ERA-NET.
Neuenfeldt, S., Project Manager, National Institute of Aquatic Resources, Section for Oceans and Arctic
Hüssy, K., Project Participant, National Institute of Aquatic Resources
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Eero, M., Project Participant, National Institute of Aquatic Resources
01/02/2014 → 30/08/2017
Keywords: Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Ecosystem based Marine Management
Collaborators: Swedish University of Agricultural Sciences, Stockholm University, Thunen-Institut, Lund University, Uppsala University, National Marine Fisheries Research Institute, Helmholtz Centre for Ocean Research Kiel, Institute of Food Safety Animal Health and Environment, University of Tartu, University of Hamburg, National Resources Institute Finland
Project: Research

Starfish - power and management (Søstjerner) (39087)
The overall objective of the project was to provide the scientific basis for management that can lead to the establishment of a commercial fishery of starfish (Asterias rubens) in primarily the Limfjorden, including Natura 2000 areas. The project background was the increasing prevalence of starfish that is both a threat to the mussel fishing and a potential source of income for fishing. In the project, the population of starfish and production was determined and analyzed and based on
population stock estimates and stock modeling a total allowable quota of 10,000 tonnes annually was estimated as a conservative annual catch, which is considered sufficient to maintain a potential starfish meal industry. Effect of fishing was determined both for the population of starfish, the stock of mussels and benthic components like infauna and macroalgae. It was shown that using the starfish purse seine will have no or negligible effects on infauna and blue mussels. In terms of biodiversity and biomass of macro algae, no significant effects of the purse seine, including a load of 300 tonnes of starfish in the net, could be detected. Torn of macro algae leafs were however detected in the purse seine after fishery over macro algae habitats and this was included in management advise on effects of starfish fisheries. A guide for management including recommendations on environmental impact and starfish populations were developed. This project was coordinated by DTU Aqua.

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

Petersen, J. K., Project Coordinator, National Institute of Aquatic Resources, Danish Shellfish Centre
Nielsen, C. F., Project Participant, National Institute of Aquatic Resources
Fitridge, I., Project Participant, National Institute of Aquatic Resources
Saurel, C., Project Participant, National Institute of Aquatic Resources
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01/01/2014 → 30/06/2015

Keywords: Research areas: Shellfish and seaweed & Coastal Ecology & Marine Living Resources & Ecosystem based Marine Management

Collaborators: Foreningen Muslingeerhvervet, Centralforeningen for Limfjorden

Project: Research

Optimal sustainable use of cod stocks accessible for Danish fisheries (DEL-TORSK) (39147)

Optimal sustainable utilization of cod stocks that contain several biological sub-populations requires taking population structure into account in stock assessment and management. The aim of this project was to develop scientific basis for cod management decisions in the North Sea and the Baltic that takes biological units of cod and their dynamics into account. Methodological challenges concerning advising on stocks that contain sub-populations with differences in dynamics and biological parameters are common for North Sea and the Baltic. Therefore, the project considered both seas, in terms of developing methodological basis for addressing population structure in management advice. The results were presented at ICES benchmarks for North Sea and Baltic Sea cod in 2015, and used to developing further the management basis for optimal use of cod stocks.

The project included mapping of distribution of sub-populations using genetic analyses and modelling of transport of early life stages. These results were combined with existing knowledge on cod population structure both in the Baltic and North Sea, to identify distribution areas of sub populations. This information was then incorporated in area-specific stock assessment analyses.

This project was coordinated by DTU Aqua.

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

Eero, M., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Hüssy, K., Project Participant, National Institute of Aquatic Resources
Huwer, B., Project Participant, National Institute of Aquatic Resources
Nielsen, A., Project Participant, National Institute of Aquatic Resources
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17/07/2013 → 30/04/2015

Keywords: Research areas: Ecosystem based Marine Management & Marine Populations and Ecosystem Dynamics & Population Genetics & Fish Biology & Marine Living Resources & Fisheries Management

Project: Research

Seal-inflicted damages to Danish fisheries (39143)

In recent years, there has been an increasing conflict between commercial fisheries and the increasing seal populations. Direct damages in the form of reduced or damaged catch is frequently seen in fishing with set gillnets, poundnets and hooks/lines. Fishermen have proposed that the diminishing fish stocks are a result of increased predation from seals. The problems appear to be most widespread in the small-scale coastal fisheries, which there is a political will to preserve, but basic information about the scale of the problems is lacking.

The present project aimed to remedy this situation by collecting information on the scale of the seal-inflicted damages to Danish commercial fisheries and assessing the economic consequences of the damages. The project focused on the following areas:
- Seal populations in Danish waters – distribution, size, behaviour and feeding preferences (WP 1)
- Damage to catch and fishing gears inflicted by seals (WP 2, 3 and 4)
- Potential mitigation measures (WP 5)

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

Larsen, F., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Kindt-Larsen, L., PhD Student, National Institute of Aquatic Resources
15/07/2013 → 01/05/2015

**Keywords:** Research area: Ecosystem based Marine Management

**Collaborators:** BioApp, University of Copenhagen, Krog Consult ApS

**Project:** Research

**Gillnet fishing in Natura 2000 areas – Porpoises and stone reefs (39125)**
The aim of the project was to determine the effects of gillnet fishing in Danish Natura 2000 areas, specifically the effects on harbour porpoises and on the hard bottom's flora and fauna.
The project included 3 sub-projects and 9 work packages aimed at:
- documenting the extent of gillnet fishing in selected Natura 2000 areas;
- evaluate the effects of gillnet fishing on porpoises in these Natura 2000 areas;
- evaluate the effects of management initiatives on the gillnet fishing in these areas;
- assess the effects of gillnet fishing on the stone reef's flora and fauna in these Natura 2000 areas.
The methods employed were a combination of literature reviews, documentation of fishing activities and conduction of field experiments. The results of the project will contribute to a better knowledge base on the effects of gillnet fishing and should lead to an improved management of gillnet fishing in Natura 2000 areas, based on facts instead of assumptions and anecdotal evidence.
This project was coordinated by DTU Aqua.

Larsen, F., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Kindt-Larsen, L., PhD Student, National Institute of Aquatic Resources
15/07/2013 → 01/05/2015

**Keywords:** Research area: Ecosystem based Marine Management

**Collaborators:** BioApp, University of Copenhagen, Krog Consult ApS

**Project:** Research

**Marine litter in Nordic waters (MANOFA) (39104)**
"Marine litter in the Nordic waters" was a project funded by The Marine Group (HAV) under The Nordic Council of Ministers in 2013-2014. The main aim of the project was to establish a Nordic forum for collaboration and exchange of knowledge on status for methodologies and available data for marine litter between Nordic experts, environmental managers and stakeholders, due to the common environmental concerns in our shared seas. Among other activities, the project compiled information that can be used as a contribution to facilitate the framing of this environmental problem in a Nordic perspective. Two workshops were held about I) Common knowledge status on marine litter in the Nordic countries, and indicators relevant for EU Marine Strategy Framework Directive (14 November 2013 in Gothenburg, Sweden) and II) Status for monitoring and Future actions (6-7 November 2014 in Oslo, Norway).
The project was coordinated by Aarhus University.

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01/01/2013 → 31/12/2014

**Keywords:** Research areas: Ecosystem based Marine Management & Oceanography & Marine Populations and Ecosystem Dynamics

**Collaborators:** N-Research, Aarhus University, Institute of Marine Research, Faroe Marine Research Institute

**Project:** Research

**Reducing bycatch of harbour porpoises – Insight, mitigation and effects (39037)**
The main objective of the project was to provide a better basis for management of harbour porpoise by-catch in Danish setnet fisheries by:
- Elucidating the circumstances that leads to by-catch
- Developing and testing by-catch mitigation methods
- Assess the side effects of such mitigation methods
The project included 6 sub-projects organized under three headings:
- Behaviour of harbour porpoises around gillnets
- Reducing by-catch of harbour porpoises
- Effects on harbour porpoises of wide spread use of pingers
The project was coordinated by DTU Aqua.
The project was funded by the Danish Ministry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

Larsen, F., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
**Benthic ecosystem fisheries impact study (BENTHIS) (39021)**

There is general concern about the adverse impact of fisheries on benthic ecosystem which may negatively affect the fisheries yield and integrity of the sea bed. In an integrated approach to marine management, there is a need to develop quantitative tools to assess the impact of fisheries on the benthic ecosystem and at the same time collaborate with the fishing industry to develop innovative technologies and new management approaches to reduce the impact on benthic ecosystems. BENTHIS will provide the knowledge to further develop the ecosystem approach to fisheries management as required in the Common Fisheries Policy and the Marine Strategy Framework Directive. It will study the diversity of benthic ecosystem in European waters and the role of benthic species in the ecosystem functioning. Fisheries impacts will be studied on benthic organisms and on the geo-chemistry. The newly acquired knowledge will be synthesized in a number of generic tools that will be combined into a fishing/seabed habitat risk assessment method that will be applied to fisheries in the Baltic, North Sea, Western waters, Mediterranean and Black Sea. Fisheries will be selected with the fishing industry based on the impact on the benthic ecosystem. BENTHIS will integrate fishing industry partners to collaborate in testing the performance of innovative technologies to reduce fishing impact. Finally, in collaboration with the fishing industry and other stakeholders, new management approaches will be developed and tested on their effects on the ecosystem and their socio-economic consequences. As such BENTHIS will substantially improve the scientific basis to integrate the role of marine benthic ecosystems in fisheries management.

The project has 33 partners from 12 countries.

The project is coordinated by Institute for Marine Resources & Ecosystem Studies (IMARES), Wageningen University, The Netherlands.

The project is funded by EU, Framework Programme 7.

**BALTFIMPA generic tool (39001)**

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

The project was lead by DTU Aqua.

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

**Analysis of measures for increased stability in the industrial fisheries (39027)**

The objective of the project “Analysis of measures for increased stability in the industrial fisheries” has been to improve fisheries advice to ensure more stable quotas for the three main industrial species in the North Sea; sandeel, sprat and Norway pout. The means to get there was to improve data, calculation procedure and management plans by taking into account the special conditions that exist for each species.

Through an industry-scientist-manager collaboration platform initiatives were taken to a theoretically and practical
cooperation, where collection and analysis of biological and fishery-based data and knowledge sharing between fisheries, bio-economy, management and research has supported development of robust management strategies that may increase economic stability in the industry if implemented in the future.

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

Mosegaard, H., Project Coordinator, National Institute of Aquatic Resources, Section for Marine Living Resources
Pedersen, E. M., Project Manager, National Institute of Aquatic Resources
van Deurs, M., Project Participant, National Institute of Aquatic Resources
Worsøe Clausen, L., Project Participant, National Institute of Aquatic Resources
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10/07/2012 → 22/05/2014

Keywords: Research areas: Marine Living Resources & Ecosystem based Marine Management
Collaborators: Danmarks Pelagiske Producentorganisation, Danish Fishermen's Association, Cefas Weymouth Laboratory, Association of Danish Fish Meal and Fish Oil Manufacturers
Project: Research

A coast to coast network of protected areas: From the shore to the deep sea (CoCoNet) (38863)
The project targeted design and implementation of marine protected areas, as well as advancement of the scientific basis for optimal design and implementation. The project focused on two pilot studies in the Mediterranean and Black Sea for establishing a network of MPAs.

DTU Aqua participated in developing the scientific basis for optimal design of MPA networks by developing spatial size-based models to describe biodiversity as appropriate scales, as well as habitat connectivity from trait-based modelling, and procedures for analyzing habitat connectivity. DTU Aqua also contributed to governance issues relating to establishment of MPA networks.

The project had 39 partners from the EU and Eastern Europe and Near Asia.

The project was coordinated by Universita del Salento, Italy.
The project was funded by EU, Framework Programme 7.

Christensen, A., Project Manager, National Institute of Aquatic Resources, Section for Marine Living Resources
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Kiørboe, T., Project Participant, National Institute of Aquatic Resources

01/01/2012 → 31/01/2016

Keywords: Research areas: Marine Living Resources & Oceanography & Ecosystem based Marine Management
Project: Research

Center for Ocean Life (COOL) - a Villum-Kahn Rasmussen Centre of excellence for the study of life in a changing ocean (38960)
Our goal is to develop a fundamental understanding and predictive capability of marine ecosystems through the use of novel trait-based approaches and models.
The Centre is organized around three main research activities:
- Identification and mechanistic description of the traits and trade-offs required to characterize the main Darwinian missions (feed, survive, reproduce) of the various life forms in the ocean through experimental and theoretical work, as well as analysis of literature data.
- Models: scaling of individual behavior to population and ecosystem dynamics through the development of trait-based models.
- Testing model prediction by comparing to observed trait patterns in the ocean.
The Centre involves biologists, physicist, chemists, and mathematicians and has a very strong training component through the supervision of master students, and about 30 PhD and postdoctoral fellows as well as by offering PhD summer schools and organizing international workshops. The Centre in addition host many visiting students and scientists.
The Centre is lead by DTU Aqua.
The project is funded by the Villum Kahn-Rasmussen Foundation (Velux Foundations) as well as through various national and European fellowship programs (Research Council, H.C. Ørsted Fellowship programme, Marie Curie, Carlsberg Foundation, etc).

Kiørboe, T., Project Manager, National Institute of Aquatic Resources, Centre for Ocean Life
Andersen, K. H., Project Participant, National Institute of Aquatic Resources
Visser, A., Project Participant, National Institute of Aquatic Resources
Stedmon, C., Project Participant, National Institute of Aquatic Resources
Gislason, H., Project Participant, National Institute of Aquatic Resources
Payne, M., Project Participant, National Institute of Aquatic Resources
Thygesen, U. H., Project Participant, National Institute of Aquatic Resources
MacKenzie, B., Project Participant, National Institute of Aquatic Resources
Mariani, P., Project Participant, National Institute of Aquatic Resources
Nielsen, T. G., Project Participant, National Institute of Aquatic Resources

01/01/2012 → 31/12/2017
Operational ecology: Ecosystem forecast products to enhance marine GMES applications (OPEC) (38864)
The primary goal of OPEC was to improve the quality of operational services for biogeochemical and ecological parameters and hence, improve our ability to project the future status of European marine ecosystems, by delivering a suite of error quantified indicators which describe changes in ecosystem function suitable for implementation in operational centers. In order to advance our understanding and predictive capacities for the response of marine ecosystems to global change, OPEC employed a combination of numerical simulations, data assimilation of satellite and in situ data, observational strategy evaluation and cross-disciplinary synthesis. The MSFD takes a regional approach to the development of strategies for environmental status, identifying four main regions: NE Atlantic, Baltic, Mediterranean and Black Seas. The MSFD also identifies a number of high level descriptors of environmental status (e.g., biodiversity, commercial fish, eutrophication, food webs, and invasive species) each of which has a defined set of indicators. Using the regional approach as framework we implemented and tested a suite of indicators in each region. These descriptors along with the ECVs provided a framework for the definition of new environmental applications (e.g., habitat for biodiversity, oxygen depletion/eutrophication, fisheries and marine climate change research).
A common set of descriptors with associated GES indicators and ECVs were defined across the four regions, to ensure a commonality of approach and the development of a consistent capacity across Europe. Auditable quality is essential for GMES environmental applications, and OPEC emphasized the assessment of predictability of key indicators. The R&D of the project included development of coupled end to end ecosystem models, where DTU Aqua implemented the coupling between the SMS model for higher trophic levels and HBM-ERGOM for physics and biogeochemistry. The project had nine partners from the EU and was coordinated by Plymouth Marine Laboratory, UK.
The project was funded by EU. Framework Programme 7.

Christensen, A., Project Manager, National Institute of Aquatic Resources, Section for Marine Living Resources
Vinthner, M., Project Participant, National Institute of Aquatic Resources
Neuenfeldt, S., Project Participant, National Institute of Aquatic Resources
St. John, M., Project Participant, National Institute of Aquatic Resources
01/01/2012 → 31/12/2014
Development of monitoring plans for incidental bycatch of harbour porpoises in inner Danish waters (38869)

Incidental bycatch of harbour porpoises in Danish fisheries has till now primarily been documented by on-board observers or voluntary reporting by fishermen. An observer program in 1992-98 showed bycatch in Danish North Sea fisheries to occur primarily in bottom-set gillnets for turbot, cod, hake and plaice, but a similar program has not been conducted in inner Danish waters and the Baltic Sea.

The objective of the present project is thus to further develop and carry out plans for monitoring of incidental bycatch of harbour porpoises in inner Danish waters by use of CCTV camera systems. Further, to ensure full documentation of smaller gillnet vessels’ fishing operations by:

- monitoring all seasons of the major gillnet fisheries;
- providing information on bycatch of harbour porpoises and seabirds by fishery/season/area with a view to develop management plans for Natura2000 areas;
- providing information on discard of cod by gillnet vessels in inner Danish waters.

The project is coordinated by DTU Aqua.

Larsen, F., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Kindt-Larsen, L., PhD Student, National Institute of Aquatic Resources
Rasmussen, M. L., Other, National Institute of Aquatic Resources
16/06/2011 → 28/02/2014

Key fishers project II (38172)

The aim of this project is to collate data on recreational catches of fish around Denmark’s 7,300 km coastline. The objectives are to collate data on species caught in coastal areas and fjords around Denmark. The project is carried out in close collaboration with the Danish Organization for Amateur Fishermen and the Danish Union of Recreational Fishermen, who facilitate and support contact with up to 95 recreational fishers. This project is an extension of a previous project (2005-2007) and an earlier project “Catch Registration” initiated in 2002. Whereas the first project allowed the fishers to fish as they normally did with whatever gear they normally used and register all their catch, including undersized fish or non-edible fish, the Key Fishers projects had a different approach. In the Key Fishers projects, the fishers use standardized gear unanimously agreed upon and supplied by DTU Aqua. They fish at fixed positions during a particular time period each month. Catch data is sent to DTU Aqua for analysis. Information on temperature is provided by each fisher through a temperature data logger placed at the fishing position. General site information is provided by the fishermen through interviews conducted with each fisher. Further environmental data is obtained from other sources for the multivariate analyses to explore potential causes of change or spatial and temporal variations in CPUE.

Several reports have been produced from the project (Pedersen et al., 2005; Sparrevohn et al., 2009, Støttrup et al. 2012; Kristensen et al. 2014). With ten years of data it is now possible, in collaboration with other Baltic Sea countries, to contribute with data to development of fish indicators for the entire Baltic Sea (Helcom 2015). A first peer-reviewed publication on the method for crowd sourcing and citizen science used here is being developed and data analyses looking at spatio-temporal changes have been initiated.

The project is coordinated by DTU Aqua.

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

Støttrup, J. G., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
01/01/2011 → 31/12/2016

Vectors of change (VECTORS) (38907)

Marine life makes a substantial contribution to the economy and society of Europe. VECTORS aimed at elucidating the drivers, pressures and vectors that cause change in marine life, the mechanisms by which they do so, the impacts that they have on ecosystem structures and functioning, and on the economics of associated marine sectors and society.
Throughout, VECTORS particularly focused on causes and consequences of invasive alien species, outbreak forming species, and changes in fish distribution and productivity. New and existing knowledge and insight was synthesized and integrated to project changes in marine life, ecosystems and economies under future scenarios for adaptation and mitigation in the light of new technologies, fishing strategies and policy needs. VECTORS also evaluated current forms and mechanisms of marine governance in relation to the vectors of change. Based on its findings, VECTORS outlined solutions and tools for relevant stakeholders and policymakers during the lifetime of the project. The VECTORS consortium included a mixture of natural scientists with knowledge of socio-economic aspects, and social scientists (environmental economists, policy and governance analysts and environmental law specialists) with interests in natural system functioning.

DTU Aqua contributed to VECTORS by developing new statistical models of fish species distributions, by further developing spatially resolved bio-economic models of fishing, and by analyzing fish species richness and distribution in the north Atlantic and the general relationship between changes in fish stock abundance and distribution area. We coordinated the Baltic WP where we implemented the ATLANTIS end-to-end model and performed initial scenario testing. We also analyzed the most important drivers of fish population dynamics in the Baltic, and contributed to the study of invasive species.

VECTORS comprised a total of 37 European Universities, research institutions and professional associations dealing with applied maritime and marine research. The project included marine environmental scientists, fisheries scientists, conservation biologists, sociologists and economists from across the European scientific community providing expertise in marine ecosystems, management, fisheries, maritime transport, tourism and coastal development.

The project was coordinated by Plymouth Marine Laboratory, UK. The project was funded by EU, Framework Programme 7.

Gislason, H., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Eero, M., Project Manager, National Institute of Aquatic Resources
Nielsen, J. R., Project Participant, National Institute of Aquatic Resources
Köster, F., Contact Person, National Institute of Aquatic Resources
Lewy, P., Project Participant, National Institute of Aquatic Resources
Rindorf, A., Project Participant, National Institute of Aquatic Resources
Bastardie, F., Project Participant, National Institute of Aquatic Resources
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01/01/2011 – 31/01/2015

Keywords: Research areas: Ecosystem based Marine Management & Fisheries Management & Marine Living Resources
Project: Research

Development and demonstration of Marine Strategy Framework Directive (MSFD) tools for harmonization of the initial assessment in the eastern parts of the Greater North Sea sub-region (HARMONY) (38894)

The HARMONY project has developed and made available a toolbox supporting national MSFD implementation with special focus on issues of a transnational relevance and importance. It builds on cooperation among member states sharing the Greater North Sea sub-region through active involvement in several OSPAR groups. The tools are based on respecting the needs for national flexibility, while ensuring the necessary regional harmonization of key elements under the marine strategies.

The project partnership met these challenges through four development/harmonization activities and a coordination and information activity:

1) To develop and demonstrate a tool supporting an analysis of essential features and characteristics leading towards an integrated assessment building upon the criteria identified in the Commission Decision, while ensuring the necessary linkage to existing work under the Regional Sea Conventions as well as existing EU legislation (WFD, Natura 2000).

2) To develop and demonstrate a tool (a pressure and an impact index) supporting an analysis of the predominant pressures and impacts on the ecosystems, including those impacts of human activities for the Greater North Sea Marine sub-region.

3) Provide examples on the linkage of effects and human pressures to informed ecosystem-based marine strategies (based on activities 1 and 2).

4) To establish and support the active cooperation among member states sharing the Greater North Sea sub-region enabling comparisons and harmonization, where relevant and possible, between national efforts in preparing the initial assessment, elaborate the criteria including identification of indicators and target setting, and further on, the preparation of the monitoring program and the program of measures within the Greater North Sea sub-region.

DTU Aqua has focused on biodiversity of fish and fish populations, mapping fishing pressures and ecosystem components of the project working area (North Sea).

The project was coordinated by Department of Bioscience, Aarhus University, Denmark.
The project was funded by the Danish Ministry of Environment.

Serensen, T. K., Contact Person, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Vinther, M., Project Manager, National Institute of Aquatic Resources
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01/01/2010 – 01/01/2012

Keywords: Research area: Ecosystem based Marine Management
Eco-certification of Danish fisheries (38885)
Danish Fishers PO had decided that all commercial fisheries in Denmark should, where possible, operate at the standard necessary to obtain MSC certification by 2012. This project was the third of a suite of EFF-financed projects supporting this challenge.
Of particular focus was the absence of management plan for plaice and sole in Kattegat-Skagerrak area, which is one of the prerequisites for certification. Sole stock is regularly assessed by ICES, implying that a management plan could potentially be established on a standard basis. But the situation was more problematic for plaice, which assessment suffered from a number of uncertainties and issues which could not be solved through a standard benchmark process. DTU Aqua was thus involved in order to clarify the biological knowledge base for this stock and contributed to suggestions for a more tailored approach to the assessment and management of plaice in Skagerrak.
The project resulted in significant changes in the perception of plaice population dynamics in the Skagerrak-Kattegat. An ICES workshop was convened in 2012 (WKPESTO) on the basis of the project, and a new basis for scientific advice was agreed. The scientific and advice outcomes of the project have been disseminated in a scientific publication by Ulrich et al. (2013), DOI: 10.1016/j.seares.2013.04.007
The research underlying this project was continued in project 39025 in 2013-2014. The project was coordinated by Danish Fishermen's Producers' Organisation, Denmark. The project was funded by the Danish Ministry of Food, Agriculture and the Fisheries and the European Fisheries Fund (EFF).
Ulrich, C., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Boje, J., Project Participant, National Institute of Aquatic Resources
01/01/2010 → 01/02/2013
Keywords: Research areas: Fisheries Management & Ecosystem based Marine Management
Collaborators: Danish Fishermens Producers Organization
Project: Research

EU preparatory action on maritime spatial planning in the North Sea (MASPNOSE) (38895)
Several EU member states had been working on spatial plans for their part of the North Sea. However, most marine spatial planning was carried out on a national level and largely ignored the possible benefits of cross-border cooperation.
Joining forces with neighboring countries could have been an efficient way forward. A first step in this direction was the EU MASPNOSE project that brought together spatial planning practitioners, stakeholders and researchers in order to deal with these bottlenecks. MASPNOSE was an EU project on ecosystem based Maritime Spatial Planning (MSP) in the North Sea, focusing on cross-border areas. The project focused on the southern North Sea with Belgium, Denmark, Germany and the Netherlands as target countries.
To achieve this aim, MASPNOSE explored possibilities for cooperation among North Sea countries; established elements for a common agenda for cooperation of countries around the North Sea; tested the 10 key principles on Maritime Spatial Planning set up by the European Commission; and identified potential barriers and opportunities for cross border Maritime Spatial Planning.
The MASPNOSE project acknowledged the overarching importance of national authorities and other stakeholders (e.g. industries, NGO's) in Maritime Spatial Planning. National governments had an advisory role in the project. Stakeholder participation was one of the focus points of the project and took place in the different case studies on a local scale. MASPNOSE could be seen as an experiment on how cross-border Maritime Spatial Planning could be carried out. This was based on two cross-border case studies in the North Sea: the Dutch-Belgian border and the Dogger Bank.
The project was coordinated by Wageningen University, The Netherlands.
The project was funded by EU, Call for tender (Preparatory Action for Maritime Spatial Planning).
Sørensen, T. K., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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01/01/2010 → 31/05/2012
Keywords: Research areas: Ecosystem based Marine Management & Marine Living Resources & Coastal Ecology
Collaborators: Wageningen IMARES, Wageningen University & Research, Thunen-Institut, Deltares, Ghent University
Project: Research

Fisheries management in NATURE 2000 areas (38797)
Approximately 17% of the Danish sea territory is appointed as Nature 2000 areas. Many of these areas are also very important for fishery. To allow fishery to continue in Nature 2000 sites, it must be demonstrated that the fishery does not negatively impact the basis for appointment for the site. The project aims to establish the science base for development of a concept for Environmental Impact Assessments (EIA) for fishery and aquaculture in Nature 2000 areas, as well as establish interactions between the mussel fishery and the basis for appointment of Nature 2000 areas. The results generated will provide input to the EIA conducted by DTU Aqua and to other advisory issues related to mussel fishery, and
The approach is a combination of field experiments, model development and theoretical work. Through the project, knowledge will be generated on eelgrass, macrophyte and blue mussel ecology and abundance and interactions with mussel fishery. Development of the oyster fishery in the Wadden Sea will be developed with focus on the Nature 2000 site N89. Seabed mapping of the stone reefs in the Little Belt Sea will include an analysis of the impact of blue mussel fishery on these habitats. Finally the project will establish knowledge base for interactions between aquaculture and Nature 2000 areas.

The project is coordinated by DTU Aqua.

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01/01/2010 → 30/09/2012

Keywords: Research areas: Ecosystem Based Marine Management & Observation Technology
Collaborators: Danish Shellfish Centre
Project: Research

Forage fish interactions (FACTS) (38781)

Removal of a forage fish has consequences for both predators and prey of forage fish. As everything is connected, every management action has a price which goes beyond the apparent, direct effect on the target species. The fishery on forage fish can therefore not be seen in isolation, as the immediate gain in profit from the fishery has to be discounted by the lowered potential for production of large piscivorous fish. Management actions on other species also influences forage fish, i.e. conservation efforts on marine mammals or sea birds have direct consequences for the predation pressure on forage fish.

The objective of the project was to provide insight and quantitative advice on the ecosystem wide consequences of management actions directly or indirectly related to forage fish.

The two overarching questions were:
- What are the consequences of forage fish fisheries on (a) predator growth and abundance, (b) economic output of fisheries on piscivorous species, and (c) ecosystem stability and the risk for regime shifts?
- What are the consequences of changes in predator populations on forage fish populations and fisheries?

The method was a combination of ecosystem models, of process studies aimed at feeding into the models, of economic models, and of data-analysis of existing data sources.

The project covered four ecosystems in detail: Norwegian-Barents Sea, Baltic Sea, North Sea and Bay of Biscay.

FACTS brought together leading European fisheries and university institutes working on creating the tools for ecosystem based management. The active involvement of the institutes in the current management has provided a means for the results of the project to feed into management. The project furthermore included a network component which has ensured a wider dissemination of methods and results within the marine scientific community.

The project was coordinated by DTU Aqua.

The project was funded by EU, Framework Programme 7.

Haslun, O. H., Project Manager, National Institute of Aquatic Resources
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01/01/2010 → 31/12/2012

Keywords: Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology & Ecosystem based Marine Management
Collaborators: Christian Albrechts University of Kiel, Centre National de la Recherche Scientifique, Wageningen IMARES, Marine and Food Technological Centre, University of Copenhagen, Spanish Institute of Oceanography, Cefas Weymouth Laboratory, L'Institut Français de Recherche pour l'Exploitation de la Mer, University of St Andrews, Leibniz Institute for Baltic Sea Research, University of Southern Denmark, Institute of Marine Research, Finnish Game and Fisheries Research Institute, University of Hamburg
Project: Research

Integrated management of agriculture, fishery, environment and economy – a strategic research alliance (IMAGE/MAFIA) (38772)

Background and Objectives

Management of terrestrial and aquatic ecosystems is legally defined in several European directives. The scientific basis for implementing the directives has been limited by insufficient models, deficiencies in terms of uncertainties, local and regional aspects and lack of knowledge on the interplay between agriculture, fishery, environmental qualities in all surface
waters, and economy. The project aimed to establish an interdisciplinary and international approach designed to establish a body of knowledge to develop tools, models, scenarios and predictions in order to integrate science and management from agriculture, fishery, aquatic environments and economy into a common platform. The main aims were to link the complex interplay between land use in the drainage basins, the transport of nutrients to water bodies, biogeochemistry of freshwater and marine water, marine ecosystem dynamics and the removal of biomass and nutrients in marine fisheries all integrated into a management strategy evaluation (MSE) framework consisting of linked catchment area and river-run-off models, marine bio-geo-chemical models, end-to-end marine ecosystem models, fishery models, economic and cost-minimization models, and ecosystem services assessments models. Such a complex model and MSE framework could be used to assess effects of changing market conditions, changed agricultural and fishery support policies, as well as fulfillments of water related directives.

Tasks and Deliverables

The Danish Strategic Research Council financed project IMAGE was a strategic research alliance between central Danish and international fisheries and marine environment based university institutes. The project integrated, educated, and trained new researchers and private and public end-users to develop and work with a number of empirical and dynamic models and management tools, further developed into cross traditional media and science-based decision support systems, to strengthen national and international environmental management. The results published in a high number of scientific peer reviewed articles have provided major scientific progress. The results and research quality included analyses of novel processes and development of new and improved models, integrated prognoses and scenarios for the interplay between changes in the drainage basins and the ecological and economic consequences, and a number of science-based decision support tools. The work involved (i) identification of key elements and reduction of uncertainties in using complex models, (ii) designing, developing and integrating important new concepts in the models, (iii) linking models and evaluating their ability to detect and follow changes in terrestrial environments into ecological and economic consequences, and (iv) strengthened Danish research in linking science, modeling and management of the environment and economics and thereby consolidating a strong international position. The DTU Aqua has focused on further development, implementation and validation of advanced models and fisheries and ecosystem management evaluation tools: Development, calibration and implementation of the Baltic ATLANTIS end-to-end ecosystem and tropho-dynamic model linked to the HBM-ERGOM physical and bio-geo-chemical models and the FISHRENT fishery economic model; Further development and implementation of the bio-economic and individual vessel based multi-stock-multi-fleet DISPLACE simulation model; Dynamic coupling of the Baltic FLR multi-stock-multi-fleet bio-economic model to the SMS-Multi-Species model. The focus has been on biological interactions and integrated fisheries interactions.

Partners

The project had 12 project partners mainly from Danish universities (AU, DTU, KU, SDU) and national fisheries economics and fisheries research institutes (SMHI Sweden), but also from American, Swedish and Finnish universities as well as SMEs (e.g. DHI). The project was coordinated by Aarhus University. DTU Aqua was main project developer, WP4 leader and member of the Project Steering Group.

This project was funded by the Danish Council for Strategic Research.

Nielsen, J. R., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

Bastardie, F., Project Participant, National Institute of Aquatic Resources
Ross, S. D., Project Participant, National Institute of Aquatic Resources
Eigaard, O. R., Project Participant, National Institute of Aquatic Resources
Christensen, A., Project Participant, National Institute of Aquatic Resources
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01/01/2010 → 31/12/2015

Keywords: Research areas: Fisheries Management & Ecosystem based Marine Management
Project: Research

Towards an integrated marine and maritime science community (MARCOM+) (38881)

The Aberdeen plus interest group joined forces with the Venice Platform group to take further steps in integrating the marine, maritime and coastal research sectors in Europe. The goal is to establish a sustainable and long-lasting partnership forum (European Marine and Maritime Science and Technology Forum), based on shared interests and shared leadership, and to test it on regional seas and pan-European basis. The process will contribute to developing interactions between partners (the research community, industry, regional authorities, civil society and other stakeholders) starting from regional scales to broader issues shared with EU-neighboring countries.

In the project DTU Aqua is representing the European Fisheries and Aquaculture Organization (EFARO).

The project is coordinated by International Council for the Exploration of the Sea (ICES).
Köster, F., Project Participant, National Institute of Aquatic Resources
Lisbjerg, D., Project Participant, National Institute of Aquatic Resources, Research Secretariat

01/01/2010 → 15/04/2012
Advanced modelling tool for scenarios of the Baltic Sea ecosystem to support decision making (ECOSUPPORT) (38733)

The Baltic Sea is subject to several major human impacts, and three of the most important are fishing, eutrophication and climate change. Understanding and projecting how these impacts will affect the food web and its fish populations in future is therefore challenging, and requires modelling approaches which include climatic-hydrographic forcing, nutrient loading scenarios and likely fishing intensities.

ECOSUPPORT was a project whose objective was to develop an advanced modelling tool for conducting scenario simulations of how these human impacts affect the marine ecosystem and fish populations. The project coupled several different types of models so that end-to-end ecosystem models were developed which to understand how human impacts could influence the Baltic food web and fish populations. The models to be linked included regional climate models, oceanographic-lower trophic level ecosystem models (Nutrient-Phytoplankton-Zooplankton-Detritus) and fish population models. Key project results included new scenario simulations how regionally downscaled global climate model outputs would affect the development of Baltic cod populations under scenarios of climate change and seal (predator) population growth, and under different combinations of eutrophication, exploitation and climate change. These simulations included all key elements of the foodweb via an Ecopath model which included competitive and predatory interactions between the major fish species in the Baltic. The results demonstrated the vulnerability of the cod population to successful implementation of key ecosystem management policies for the Baltic Sea, including those related to exploitation and nutrient loading. Additional model scenarios focused on the sprat population which is a key intermediary link in the Baltic foodweb as prey and predator for cod and of zooplankton. These scenarios illustrated the range of future biomass and yields under assumed ranges of climate change and natural mortality.

One of the major novelties of the project was the availability of 3 different NPZD models, which enable estimation of output uncertainties to different model parameterizations and assumptions in the lower trophic levels and physical oceanographic processes, and to compare these with uncertainties due to fish population dynamics (e.g., recruitment variability). These comparisons suggest that the biological uncertainty associated with fish population dynamics was larger than that associated with the choice of the oceanographic NPZD model.

Partners in the project are the above mentioned and five other marine research institutes around the Baltic Sea. The project is coordinated by Swedish Meteorological and Hydrographic Institute, Sweden.

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

MacKenzie, B., Contact Person, National Institute of Aquatic Resources
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01/01/2009 → 31/12/2011

Keywords: Research areas: Oceanography & Marine Populations and Ecosystem Dynamics & Ecosystem based Marine Management

Collaborators: Leibniz Institute for Baltic Sea Research, Stockholm University, Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research, University of Gothenburg, Swedish Meteorological and Hydrological Institute

Project: Research

Developing fisheries management indicators and targets (DEFINEIT) (38763)

DEFINEIT constructed operational models of fish stock dynamics explicitly taking into account exploitation and climatic conditions and combine these models with basic economic models. To ensure an outstanding scientific level in each of these areas, the project brought together key competences in operational multispecies modelling, stock recruitment relationships, population dynamics of non-target fish species and economic modelling of fisheries from a wide geographic area ranging from the Barents Sea to the North Sea. The project used multispecies models to investigate changes in predation induced by differences in the distribution and the amount of alternative food. Effects of technical interactions in the fishing process were considered to avoid delivering management advice for different stocks which is mutually inconsistent. Integrating the knowledge gained, the project suggested methods for estimating reference points. The project identified the main causes of variation in recruitment patterns between stocks as well as the key processes from spawning to recruitment of selected stocks. The consequences of using proxies to describe stock reproductive potential were determined and survival during early life stages was investigated in order to identify the role of the physical and biological environment. The improved understanding of recruitment variability was used in individual stock assessment and included in multispecies models to provide reliable predictions. The maximum level of fishing effort consistent with sustainment of susceptible species was estimated along with the effect of discard of by-catch on economic yield. The project developed resource indicators that combine economic, social and biological indicators and relate directly to the benefit for the society. Future stock dynamics limits to sustainable ecosystem exploitation and the fishing levels delivering maximum sustainable economic yield under selected climatic scenarios were analyzed in unison to ensure the delivery of mutually consistent management advice. General properties of the ecosystems were used to suggest rules of thumb for management in areas where the amount of data available is insufficient to construct similar models.

The project was coordinated by DTU Aqua.
Evaluation of harbour porpoise behaviour in relation to acoustic alarms (pingers) (38670)
The project included four sub-projects that were all related to development of methods for mitigation of harbour porpoise
by-catch. The first sub-project investigated the effective deterrent range for a commercial pinger and whether the range
changed over time (habituation). This is important to know in order to be able to evaluate the effects if pingers are to be
used in marine protected areas like the Natura 2000 areas. By deploying automated porpoise click loggers (C-PODs) in a
grid around an active pinger, the effective range of the pinger was assessed. The set-up was deployed both in Denmark
and in Scotland to also investigate possible regional differences in porpoise reactions to pingers. The second sub-project
tested the alerting-hypothesis, i.e. whether it was possible to induce porpoises in the wild to use their biosonar against a
target by having the target emit artificial porpoise click trains (alerting signals). Alerting signals have a number of
advantages over traditional pinger signals, including that they will not lead to exclusion of porpoises from important
habitats, that the risk of habituation is smaller because the porpoises will be able to learn from their experience with the
alerting pingers, and that noise pollution will be considerably smaller because the sound level of alerting pingers is much
lower than for traditional pingers. The third sub-project tested if pingers emitting alerting-signals could reduce by-catch of
harbour porpoises in the commercial gillnet fishery. Alerting pingers were deployed on bottom-set gillnets in a fishery with
a high by-catch rates, in a double-blind experiment. The fourth sub-project investigated the behaviour of free ranging
harbour porpoises in relation to a gillnet. This included land-based tracking by theodolite of porpoises approaching a
bottom-set gillnet to determine detection distances and avoidance behaviour.

The project was coordinated by DTU Aqua.

Marine invasive species impact on ecosystem structure and function (MARINVA) (38716)
The project aims to investigate the structural and environmental impacts of invasive benthic fauna and algae in Danish
waters. Focus is on three species: a macrophyte from Asia, a group of polychaete species from North America/Arctic and
an oyster species from Japan. All three species are more or less well established in Danish waters and co-existing in the
western Limfjord. Knowledge on these species is sparse, including their physiological and habitat requirements. We will
study how and to what extent these species influence the community they have become a part of with particular focus on
ecosystem nutrient and energy turnover. The approach is a combination of field and laboratory experiments at different
scales (individual to population). DTU Aqua focuses on coexistence of Pacific oyster and blue mussels in relation to
competition for food and space, and research include lab and field experiments, and observation of small and large scale
distribution.

The project is coordinated by University of Copenhagen.
### Monitoring and evaluation of spatially managed areas (MESMA) (38871)

The MESMA project focused on marine spatial planning and aimed to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluating and implementing Spatially Managed Areas (SMAs). The main tasks in the project were information analysis, the development of a generic framework, the testing and evaluation of this framework through case-studies and the development of a toolbox. A significant proportion of the effort was centered on the case studies within five geographical regions: the North Sea, Baltic, Mediterranean, Atlantic, and Black Sea. This approach made it possible to compare pressures on an inter-regional level (e.g. offshore wind farms in the North Sea, Black Sea and Baltic), or a multi-pressure level for a specific region (e.g. SMA in fishing, wind-energy, geo-hazards and tourism in the Black Sea).

The project was coordinated by IMARES, Wageningen UR, The Netherlands.

The project was funded by EU, Framework Programme 7.

Sørensen, T. K., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

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FP7 Contract ID: 226661

01/01/2009 → 31/12/2013

Keywords: Research areas: Ecosystem based Marine Management & Marine Living Resources & Coastal Ecology

Collaborators: Bulgarian Academy of Sciences, Wageningen IMARES, Management Unit of the North Sea Mathematical Models and the Scheldt Estuary, Marine and Food Technological Centre, Hellenic Centre for Marine Research, Ministry for Resources and Rural Affairs, Cefas Weymouth Laboratory, Heriot-Watt University, Norwegian Institute for Water Research, Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Institute for Agricultural and Fisheries Research, University College London, University College Cork, Institute of Marine Research, Italian National Research Council, Thunen-Institut, Senckenberg Gesellschaft für Naturforschung, Polish Academy of Sciences, Deltares, Ghent University

### The shore crab and its parasites in Limfjorden. A model study of a marine invasive species in its home range (38870)

The purpose of the DTU Aqua part of the project is to collect and analyze data for a quantitative description of the population and parasite structure of the shore crab (Carcinus maenas) in Limfjord in Denmark. This includes quantitative information on the species’ geographical distribution in the Limfjord as well as estimates of abundance. The abundance estimates will be based on mark-recapture experiments and trawl survey data. Geographical distribution and year to year fluctuation in abundance of the shore crab will be related to key parameters such as salinity, depth and temperature.

The project is coordinated by University of Copenhagen, Denmark.

Hoffmann, E., Project Participant, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management

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01/01/2009 → 31/12/2011

Keywords: Research areas: Ecosystem Based Marine Management & Marine Living Resources

Collaborators: University of Bergen, University of Copenhagen, Danish Shellfish Centre

### Sustainable fisheries, climate change and the North Sea ecosystem (SUNFISH) (38135)

Global climate changes will seriously challenge the governance of fisheries in the North Sea and elsewhere. Changes in temperature, wind conditions, river runoff and currents will affect primary and secondary production, the distribution, feeding, growth and survival of commercially exploited fish at all stages of life. Without improved knowledge about the effect of climate on the basic biological processes involved in fish production, it will be increasingly difficult to separate the effects of fishing from those of environmental fluctuations and change, identify biological reference points, and to develop management strategies for sustainable fisheries. By combining models of the effects of climate on the hydrographical and biological processes important for fish production with models of fish stock dynamics and fishing, the project provided a basis for improved predictions of the effects of climate change on the sustainable exploitation and maximum yield of North Sea fish stocks. The dynamics of cod (a top predator), herring and sandeel (two important prey for fish), seabirds and marine mammals were studied in detail. Their spawning, egg and larval drift, juvenile and adult distribution, growth and survival were investigated through experiments, statistical analyses of collected data and advanced bio-oceanographic models. The sustainability of exploitation under changing climate conditions were examined by modifying an existing stochastic multispecies fisheries model to make it account for climate effects on fish ecology. The project provided an integrated modelling framework for developing sustainable fisheries management strategies superior to using simple extrapolations of observed historical trends to predict the likely outcome of climate change on the North Sea ecosystem.
The project was coordinated by DTU Aqua. The project was funded by the Danish Council for Strategic Research.

Rindorf, A., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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Munk, P., Project Participant, National Institute of Aquatic Resources
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Mosegaard, H., Project Participant, National Institute of Aquatic Resources

01/01/2008 → 01/09/2012

Keywords: Research areas: Ecosystem Based Marine Management & Marine Living Resources

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.

Støttrup, J. G., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
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01/01/2007 → 31/12/2011

Keywords: Research areas: Coastal Ecology & Ecosystem based Marine Management

Incorporating extrinsic drivers into fisheries management (IN EX FISH) (38188)
The overall aim of the IN EX FISH project is to increase the responsiveness of fisheries management to a range of anthropogenic and non-anthropogenic forcing factors. This will be achieved through a systematic review of the factors influencing fish stock dynamics in European Seas and by developing a suite of management tools. These management tools will use robust metrics of ecosystem state, and will provide varied management responses depending on the ecosystem state compared to a historic reference condition. The framework will be developed specifically to be integrated into European fishery management processes and will be based on the geographical areas defined by the regional advisory councils (RACs).

A holistic ecosystem approach will be used to assess the effects of anthropogenic and non-anthropogenic factors on the main functions of the biological cycle of exploited fish species and the ecosystem that supports them. The IN EX FISH project recognizes that humans are part of the marine ecosystem and that some are dependent upon it for their livelihoods. The project will validate its management recommendations through consultation with stakeholder groups and incorporate their feedback into the project outputs.

The IN EX FISH project has four specific and verifiable scientific and technical objectives. These are (i) To provide a state of the art review of the impact of anthropogenic and non-anthropogenic factors on the dynamics of fish stocks; (ii) To develop a framework for the systematic evaluation of the impact of anthropogenic and non-anthropogenic factors on the dynamics of exploited fish species; (iii) To develop criteria for the selection of appropriate metrics, to review available
metrics of ecosystem status, to select those that match the criteria and establish reference levels in four geographic regions for these metrics and (iv) To incorporate IN EX FISH knowledge of anthropogenic and non-anthropogenic effects into fisheries management.

The project is coordinated by School of Biological Science, University of Liverpool, UK. Dolmer, P., Project Manager, National Institute of Aquatic Resources van Deurs, M., Project Participant, National Institute of Aquatic Resources MacKenzie, B., Project Participant, National Institute of Aquatic Resources Jensen, H., Project Participant 01/01/2006 → 31/12/2008

The project was coordinated by Institute for Marine Resources and Ecosystem Studies (IMARES), The Netherlands. Eero, M., Project Manager, National Institute of Aquatic Resources Section for Ecosystem based Marine Management Nielsen, J. R., Contact Person, National Institute of Aquatic Resources Köster, F., Contact Person, National Institute of Aquatic Resources Jarre, A., Project Participant, National Institute of Aquatic Resources Bastardie, F., Project Participant, National Institute of Aquatic Resources Andersen, K. H., Project Participant, National Institute of Aquatic Resources Sørensen, T. K., Project Participant, National Institute of Aquatic Resources Mosegaard, H., Project Participant, National Institute of Aquatic Resources Thomsen, K., Project Participant, National Institute of Aquatic Resources Tomczak, M., Project Participant Jacobsen, J. B., Project Participant 01/01/2006 → 31/12/2009

Indicators for fisheries management in Europe (IMAGE) (38225)
The Common Fisheries Policy (CFP) requires the progressive implementation of an ecosystem-based approach to fisheries management (EBFM). To implement effective management, it is essential to develop a framework that allows for the evaluation of different management strategies based on indicators. Indicators can support the decision making process by (i) describing the pressures affecting the ecosystem, the state of the ecosystem and the response of managers, (ii) tracking progress towards meeting management objectives and (iii) communicating trends in complex impacts and management processes to a non-specialist audience. The aim of this project was to develop an indicator-based operational framework that can support ecosystem-based management, and also show how this can be applied to test and evaluate different management strategies or sampling programs.

The principal objectives of IMAGE were:-To develop an operational framework of candidate indicators (ecological, economic, social) that can support ecosystem-based fisheries management at the regional and pan-European scale-To elaborate these indicators in comprehensive dashboards (e.g. current values, trends, reference levels)-To develop methodology to integrate this information into tools supporting the decision-making process-To develop a framework that can evaluate management strategies based on indicators-To advise on how indicators can be used to support EBFM in selected regional case studies based on the RAC areas.

The project consisted of a conceptual phase where the operational framework was designed. This was followed by a phase of methodology development, an implementation phase consisting of regional case studies linked to the RACs and finally a pan-European evaluation and synthesis of the projects results. The results of this project contribute to the development of an effective EBFM in the context of the CFP, while also contributing to the applied science needed to support the emerging European Marine Strategy and Maritime Policy.
Baltic Sea management: Nature conservation and sustainable development of the ecosystem through spatial planning (BALANCE) (38432)

BALANCE aimed to develop transnational marine spatial planning tools and an agreed template for marine management planning and decision-making. It was based on four transnational pilot areas demonstrating the economical and environmental value of habitat maps and marine spatial planning (exemplified through two zoning plans). The tools and zoning plans integrated biological, geological and oceanographic data with local knowledge from stakeholders. A "blue corridor" concept was developed and promoted, i.e. between protected sites adding spatial development dimensions to the implementation of EU Directives. As a part of this work it was assessed if the Baltic marine Natura 2000 network is ecologically coherent and adequately represents and protects a continuum of habitats. A communication strategy was developed for stakeholder involvement to ensure that objectives and decisions address local stakeholders’ needs.

Spatial planning tools included Baltic Sea marine landscapes presented in GIS maps, a holistic approach to marine habitat mapping integrating data on benthic, pelagic and fish habitats in four transnational pilot areas, development of habitat models for areas with little biological information, templates for zoning plans in two pilot areas, including planning guidelines and criteria to evaluate management success, meta-database for Baltic Sea marine data, outlining data formats, techniques and data availability for use by stakeholders in future planning, development of agreed protocols for habitat mapping based on intercalibration of existing national protocols, ensuring compatible data for future transnational mapping.

DTU Aqua was mainly involved in habitat modelling (coastal and pelagic fish habitats) and in development of marine spatial planning and management frameworks.

In addition to DTU Aqua, 23 partners were involved in the BALANCE project, i.e. representing governmental and non-governmental organizations and research institutes from the entire Baltic region in the fields of biology/ecology, fisheries and geology.

The project was coordinated by DTU Aqua.
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01/01/2005 → 31/12/2007
Keywords: Research area: Ecosystem Based Marine Management
Project: Research

Marine protected areas as a tool for ecosystem conservation and fisheries management (PROTECT) (38095)

1) To evaluate the potential of MPAs as a tool to protect sensitive species, habitats and ecosystems from the effect of fishing.

2) To outline and develop monitoring, assessment and management tools for MPAs that can assess: a) the impact of fisheries on marine ecosystems, b) the effect of different levels of protection and c) the impact and socio-economic effects of MPAs on fishing communities.

3) To facilitate linkages between science and management in the areas of: a) MPA design and implementation, b) timing and level of stakeholder involvement and c) management effectiveness and adaptability.
The project was coordinated by DTU Aqua.
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Keywords: Research area: Ecosystem Based Marine Management
Collaborators: National University of Ireland, Wageningen IMARES, University of Copenhagen, Swedish National Board of Fisheries, Marine Scotland, Centre for Ecology and Hydrology, UiT The Arctic University of Norway, Cefas Weymouth Laboratory, University of Portsmouth, L'Institut Français de Recherche pour l'Exploitation de la Mer, Sea Fisheries Institute, Institute of Marine Research, University of Gothenburg, Finnish Game and Fisheries Research Institute, University of Hamburg, Institute for Marine Sciences
Project: Research