Sustainable development of the Nephrops fishery in the Kattegat-Skagerrak region

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The use of at-sea-sampling data to dissociate environmental variability in Norway lobster (Nephrops norvegicus) catches to improve resource exploitation efficiency within the Skagerrak/Kattegat trawl fishery

Research into the influence of environmental variables on the behaviour of Norway lobster (Nephrops norvegicus), and hence catch rates, dates back to the 1960s (e.g., Höglund and Dybern, Diurnal and seasonal variations in the catch-composition of Nephrops norvegicus (L.) at the Swedish west coast. ICES CM 1965/I46; Simpson, Variations in the catches of Nephrops norvegicus at different times of day and night. Rapport et Proès-verbaux des Réunions Conseil permanent international pour 1’Exploration de la Mer 156:186). However, the use of fishery-dependent data in identifying influential factors is relatively limited and only includes a number of papers on a limited dataset (e.g., Redant and De Clark, Diurnal variations in CPUE and length composition of the catches in a Nephrops directed fishery in the Central North Sea. ICES CM 1984/K:3; Maynou and Sardà, Influence of environmental factors on commercial trawl catches of Nephrops norvegicus (L.). ICES J. Mar. Sci. 58:1318). Here, we aimed to dissociate environmental variability in Norway lobster catches to improve resource exploitation efficiency within the Skagerrak and Kattegat trawl fisheries by utilising data collected as part of an extensive at-sea-sampling programme spanning 16 years. Catch rates were modelled using Generalized Additive Mixed Models (GAMMs) and considered a range of response variables, including depth, temperature, current speed, season, moon phase and time of day. The results obtained herein showed that time of day, season, depth, temperature, year, trawl type and location all significantly affect catch rates of Nephrops.
Integrating individual trip planning in energy efficiency – Building decision tree models for Danish fisheries

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

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The Danish quota for Norway lobster is fished by use of trawl. In the past 5 years, between 10 and 70 % of the quota has not been exploited. This is partly on account of restricted quotas on some of the other species that are targeted in this mixed species fishery. Furthermore, in order to protect cod, trawling is banned in some areas including areas known as Norway lobster grounds. Creels are highly selective gears both with regards to sizes and species and they lead to high quality landings. Compared to trawling, stationary gears such as creels also have much less impact on the benthic habitat and reduce fuel consumption. Commercial creeling for Norway lobster is for example found in Sweden, Norway, Scotland, and the Faroe Islands. However, all available literature report low catch rates and the viability of the fishery therefore depends upon fuel savings and the opportunity to achieve a premium price reflecting the high quality of the landings. The fleet consists of vessels up to 12 m with a crew of one to two man. Working with creels requires a spacious deck and an advantageous arrangement in order to set and haul a large number of creels. Creeling for Norway lobster is seasonal and off season either other species are targeted (e.g. common lobster and edible crab) or the vessel is rigged for trawling or set netting.

The design of creels varies but generally they have two entrances and entice Norway lobster to the creel by use of bait e.g. salted herring. The low catch rates are primarily due to:

- Norway lobster have difficulty locating the entrance.
- Norway lobster are aggressive and the first ones being caught displays aggressive behavior towards newcomers.
- The creel is an alien element on the seabed and in itself might scare Norway lobster from entering.

The design of the creels and the type of bait contribute to the high selectivity and low by-catch rates of the fishery. It has thus been estimated that approximately 24 % of the catch by weight is discarded in the Swedish fishery and of this 56 % is Norway lobster below minimum landing size and 16 % is juvenile cod. The catch as well as the by-catch is generally undamaged and in a good condition and due to short handling time on deck, survival of the discard is expected to be high. As the creels are very species selective, the risk of lost creels continuing to fish (ghost – fishing) is regarded to be low. Creeling for Norway lobster is considered to have potential as a commercial fishery in Danish waters if the catch rates are optimized and a market for the high quality live Norway lobsters is ensured.

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**Organisations:** National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
**Authors:** Frandsen, R. (Intern), Krag, L. A. (Intern), Andersen, B. S. (Intern), Madsen, N. (Intern)
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A review of EU bio-economic models for fisheries: The value of a diversity of models

The lessons learned from a review of thirteen existing European bio-economic models used in the evaluation of EU policies are presented. How these models compare and differ in terms of their biological and economic components, the integration between the components, which indicators are selected and how they are used, are described and analysed. The article concludes that the multitude of construction differences reflects the necessity of adapting the modelling approach to answer different questions. Since real life questions in fisheries are so diverse, answering them requires a diversity of models

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Scopus rating (2010): SJR 1.289 SNIP 1.483
Challenges and opportunities for fleet- and métier-based approaches for fisheries management under the European Common Fishery Policy

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

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

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Organisations: National Institute of Aquatic Resources, Section for Management Systems
Authors: Ulrich, C. (Intern), Wilson, D. C. (Ekstern), Nielsen, J. R. (Intern), Bastardie, F. (Intern), Reeves, S. A. (Ekstern), Andersen, B. S. (Intern), Eigaard, O. R. (Intern)
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Optimization of fisheries resource exploitation in the Skagerrak (Oskar)

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Short-term choice behaviour in a mixed fishery: investigating métier selection in the Danish gillnet fishery

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Scopus rating (2012): CiteScore 2.35
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Transforming knowledge into quantitative modelling: Danish fishers respond to a web-based survey on dynamics in fuel consumption and fishing patterns

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Authors: Bastardie, F. (Intern), Nielsen, J. R. (Intern), Andersen, B. S. (Intern), Eigaard, O. R. (Intern)
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Challenges in integrating short-term behaviour in a mixed-fishery Management Strategies Evaluation frame: a case study of the North Sea flatfish fishery
This study presents a fleet-based bioeconomic simulation model to the international mixed flatfish fishery in the North Sea. The model uses a Management Strategies Evaluation framework including a discrete choice model accounting for short-term temporal changes in effort allocation across fisheries. A simplified random utility model was used based on the expected revenue (or economic attractiveness) and two tradition parameters related to short and long term historical fishing patterns. All three parameters were significant. Even though reactions and adaptations vary between fleets, the estimated conservative behaviour of the main fleets led to only marginal effect at the stock level. The importance of accounting for fleet behaviour was then evaluated using an elasticity analysis to explore how increased weight of economic attractiveness contributes to changes in the biological output and positive increase in the economic performance of the individual fleets. This showed the existence of a window of sensitivity of the model to the behaviour assumptions. The study highlights the challenge of implementing an effort allocation model in a general framework of Management Strategies Evaluation for mixed-fisheries, and illustrates the necessary trade-offs between very detailed numerical relationships and the representation of aggregated processes. (C) 2009 Elsevier B.V. All rights reserved.
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BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
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Scopus rating (2010): SJR 1.041 SNIP 1.1
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Scopus rating (2009): SJR 0.985 SNIP 1.065
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Scopus rating (2001): SJR 0.934 SNIP 0.891
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Effect of fishing effort allocation scenarios on energy efficiency and profitability: An individual based model applied to Danish fisheries

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Effects of fishing effort allocation scenarios on energy efficiency and profitability: an individual-based model applied to Danish fisheries

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

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Studies and pilot projects for carrying out the common fisheries policy. Topic: LOT 3, Scientific advice concerning the impact of the gears used to catch plaice and sole - Open call for tenders FISH/2007/7 - Final report: Section G: Overview of possible alternative fishing methods in the North Sea

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Do North Sea cod (Gadus morhua) fisheries maintain high catch rates at low stock size?
This study presents all investigation of the relationship between stock size of North Sea cod (Gadus morhua) and catch rates in seven commercial fishing fleets. The shape of the relationship was estimated using a model allowing both density-dependent changes in catchability and bias in the assessment biomass estimates. Catchability in fisheries targeting a mixed species composition either remained constant or decreased with decreasing stock size, whereas catchability in targeted cod fisheries increased with decreasing stock size. However, even in all the cases where catchability increased, the change was insufficient to compensate for the decrease in stock size, and catch rates of all fleets decreased. Two factors that could lead to nonconstant catchability were investigated: (i) the presence of decoupling between stock size and density in high-density areas and (ii) the presence of concurrent shifts in the spatial distribution of the cod stock and the cod fishery. No evidence of the former was found but there was a northern shift in the spatial distribution of both effort and the cod stock.

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State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Management Systems
Authors: Rindorf, A. (Intern), Andersen, B. S. (Intern)
Pages: 1800-1813
Publication date: 2008
Main Research Area: Technical/natural sciences
Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 65
Issue number: 9
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Impact of technological creep on fishing effort and fishing mortality, for a selection of European fleets

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries Advice
Authors: Marchal, P. (Ekstern), Andersen, B. S. (Intern), Caillart, B. (Ekstern), Eigaard, O. R. (Intern), Guyader, O. (Ekstern), Hovgård, H. (Intern), Iriondo, A. (Ekstern), Le Fur, F. (Ekstern), Sacchi, J. (Ekstern), Santurtun, M. (Ekstern)
Slutrapport TEMAS (Technical measures - development of evaluation model and application in danish fisheries)
TEMAS: fleet-based bio-economic simulation software to evaluate management strategies accounting for fleet behaviour

TEMAS (technical management measures) is a fleet-based bio-economic software for evaluating management strategies accounting for technical measures and fleet behaviour. It focuses on mixed fisheries in which several fleets can choose among several fishing activities to target different stocks in one or several areas. The software combines a management strategy evaluation framework, using a forward-running operating model and a management procedure with a fleet behaviour module simulating both short-term (effort allocation) and long-term (entry/exit) fleet dynamics. The suite of models behind TEMAS can be thought of as an extension of the traditional ICES forecast model. Alternative management scenarios can be compared and evaluated for their bio-economic consequences and robustness to parameter uncertainty. The software is generic and user-friendly, and can be run at several space and time scales.
The Danish fishery for anglerfish: From by-catch to target fishery?

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Munch-Petersen, S. (Intern), Andersen, B. S. (Intern)
Pages: 1-18
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Council Meeting
Volume: K:13
ISSN (Print): 1015-4744
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2003): Indexed yes
Original language: English
Links:
Source: orbit
Source-ID: 226713
Publication: Research › Conference article – Annual report year: 2007
Improving the definition of fishing effort for important European fleets by accounting for the skipper effect

The scope of this paper is to quantify, for a wide selection of European fisheries, fishing tactics and strategies and to evaluate the benefits of adjusting the definition of fishing effort using these elements. Fishing tactics and strategies were identified by metiers choices and a series of indices. These indices have been derived to reflect shifts in tactics (within a fishing trip) and in strategies (within a year). The Shannon-Wiener spatial diversity indices of fishing tactics (FT_SW) and strategies (YE_SW) had the greatest impact on catch rates. In particular, FT_SW was always negatively correlated to catch rates. One may anticipate that during a fishing trip, vessels with high FT_SW have been searching fish aggregations for a long time, while vessels with low FT_SW have been more efficient in finding these aggregations. The linkage between YE_SW and catch rates was of a more complex nature. Adjusting fishing effort by means of (i) the metier effect and (ii) the indices of tactics and strategies generally led to a substantial gain in the precision of the relationship between fishing mortality and fishing effort.

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries Advice
Authors: Marchal, P. (Ekstern), Andersen, B. S. (Intern), Bromley, D. (Ekstern), Iriondo, A. (Ekstern), Mahevas, S. (Ekstern), Quirijns, F. (Ekstern), Rackham, B. (Ekstern), Santurtun, M. (Ekstern), Tien, N. (Ekstern), Ulrich, C. (Intern)
Pages: 510-533
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Canadian Journal of Fisheries and Aquatic Sciences
Volume: 63
Issue number: 3
ISSN (Print): 0706-652X
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.56 SJR 1.322 SNIP 1.163
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.256 SNIP 1.051 CiteScore 2.22
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.443 SNIP 1.379 CiteScore 2.6
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.421 SNIP 1.081 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.324 SNIP 1.196 CiteScore 2.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.423 SNIP 1.09 CiteScore 2.13
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.425 SNIP 1.118
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.451 SNIP 1.196
Modelling short-term choice behaviour of danish fishermen in a mixed fishery

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Andersen, B. S. (Intern), Christensen, A. (Ekstern), Sumaila, U. (Ekstern), Marsden, A. (Ekstern)
Pages: 13-26
Publication date: 2006

Host publication information
Title of host publication: Fisheries Centre Research Report
Publisher: University of British Columbia, Fisheries Centre
Main Research Area: Technical/natural sciences
Conference: North American Association of Fisheries Economists Forum, 01/01/2005
Source: orbit
Source-ID: 226591
Publication: Research - peer-review › Journal article – Annual report year: 2006

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

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

Publication information
Journal: Journal of Fish Biology
Volume: 66
Issue number: 2
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.945 SNIP 1.148
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.937 SNIP 1.096
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176
Dynamics of fisheries, and the flexibility of vessel activity in Denmark between 1989 and 2001

Danish fishing vessels can be characterized by their diversity of fishing practice in terms of fishing gear and target species, and by their operational flexibility in respect of these fishing practices throughout the year. We describe the temporal fluctuations in this flexibility by following the activity of individual fishing vessels between 1989 and 2001. Initially, a typology of fisheries (classification of fishing trips) and vessel groups (classification of fishing vessels) was established through multivariate analyses of catch and effort data for 1999. In all, 54 fisheries and 25 vessel groups were identified. These typologies were then applied to all data for the whole time period, and the dynamics of fisheries and vessel groups investigated. The dynamics of vessels groups are studied both within groups (main and secondary fisheries, changes in activity patterns) and between groups (tracking of vessels shifting between groups). Results show average stability of vessel activity in terms of the main fishery, along with a great diversity of secondary fisheries and some possibilities for shifting between gears and areas. We conclude that the level of technical interactions is high, and that separation into distinct management units is difficult. (C) 2004 International Council for the Exploration of the Sea. Published by Elsevier Ltd. All rights reserved.

General information
State: Published
Organisations: Section for Fisheries Advice, National Institute of Aquatic Resources, Section for Management Systems
Authors: Ulrich, C. (Intern), Andersen, B. S. (Intern)
Pages: 308-322
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Journal of Marine Science
Volume: 61
Issue number: 3
ISSN (Print): 1054-3139
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.46
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.35
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.32
ISI indexed (2011): ISI indexed yes
Linking fishing effort and fishing mortality in a mixed-fisheries context

**General information**
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Fisheries Advice
Authors: Marchal, P. (Ekstern), Andersen, B. S. (Intern), Bromley, D. (Ekstern), Iriondo, A. (Ekstern), Mahévas, S. (Ekstern), Quirijns, F. (Ekstern), Rackham, B. (Ekstern), Santurtun, M. (Ekstern), Tien, N. (Ekstern), Ulrich, C. (Intern)
Pages: 1-33
Publication date: 2004
Main Research Area: Technical/natural sciences

**Publication information**
Journal: ICES C.M. 2004/
Volume: FF:27
Original language: English
Source: orbit
Source-ID: 227712
Publication: Research - peer-review › Journal article – Annual report year: 2004

Suggestion for an "Evaluation Frame" for comparison of alternative management regimes

**General information**
State: Published
Organisations: National Institute of Aquatic Resources, Section for Fisheries Advice, Section for Management Systems
Authors: Sparre, P. J. (Intern), Ulrich, C. (Intern), Vermard, Y. (Ekstern), Andersen, B. S. (Intern), Hovgård, H. (Intern), Munch-Petersen, S. (Intern), Nielsen, J. R. (Intern)
Pages: 1-83
Publication date: 2004

**Host publication information**
Title of host publication: EFIMAS
Publisher: EU
Main Research Area: Technical/natural sciences
Conference: EFIMAS, Ijmuiden, 01/01/2004
Source: orbit
Source-ID: 237645
Publication: Research › Article in proceedings – Annual report year: 2004
Projects:

Geographical distribution of fish resources and optimizing of fishery practice in the north-eastern North Sea (RESOURCE) (38878)

RESOURCE is a collaborative fishermen-scientist project in direct continuation of the REX projects in the north-eastern North Sea conducting small-scale scientific surveys, but only with one commercial trawler, encompassing also geographical distributional aspects as in OSKAR.

The REX project showed that changes in the biomass densities of cod differ between bottom types (and may depend on stock size) and the proportion of the cod population found on smooth bottoms is not constant. However, due to scaling problems and too short a time series the achieved results have so far had no impact on the assessment procedure or any (measurable) effect on the TAC’s (but the RAC discussions may have affected decisions by the European Commission). Continuation of the field work with the trawler in 2010-12 in the RESOURCE project should produce a sufficient time series for supplementing the abundance indices for the older ages in the assessment, which at present are based only on the catch rates in the international scientific surveys (IBTS). This total REX-RESOURCE time series will be used in the state space assessment of North Sea cod (SAM) and various other approaches applied to document how commercial CPUE may be used in the tuning procedure. Particular attention will be given to evaluate the size of the spawning stock of cod.

Mechanistic knowledge on vital rates together with REX, RESOURCE, OSKAR and IBTS (and possibly also UK) survey data will be used as input to the geostatistical tool GeoPop to estimate the temporal and spatial dynamics of the size distribution of the cod stock. This part of the project will represent a direct continuation of OSKAR principles including considerations to how to design an operational fishery-forecast system for North Sea cod.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources

Section for Marine Ecology and Oceanography

Danish Fishermen's Association
Period: 01/01/2010 → 30/09/2012
Number of participants: 13
Research area: Marine Populations and Ecosystem Dynamics
Project participant:
Andersen, Niels Gerner (Intern)
Pedersen, Eva Maria (Intern)
Andersen, Bo Sølgaard (Intern)
Hüssy, Karin (Intern)
Kristensen, Kasper (Intern)
Nielsen, Anders (Intern)
Stage, Bjarne (Intern)
Mosegaard, Henrik (Intern)
Christensen, Asbjørn (Intern)
Mariani, Patrizio (Intern)
Madsen, Niels (Intern)

Project Manager, academic:
Beyer, Jan (Intern)
Wieland, Kai (Intern)

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

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

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

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

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 01/01/2010 → 31/12/2015
Number of participants: 7
Research areas: Fisheries Management & Ecosystem based Marine Management
Project participant:
Bastardie, Francois (Intern)
Ross, Stine Dalmann (Intern)
Eigaard, Ole Ritzau (Intern)
Christensen, Asbjørn (Intern)
Palacz, Artur (Intern)
Andersen, Bo Sølgaard (Intern)
Project Manager, academic:
Nielsen, J. Rasmus (Intern)

**Sustainable shrimp fishery in Skagerrak (38994)**
The main objective of the Norwegian-Swedish-Danish research project “Sustainable shrimp fishery in the Skagerrak” was to clarify whether there are one or more shrimp stocks in the Skagerrak. The management of shrimp fishing in the Skagerrak and Norwegian Deep is based on the perception of the shrimp resource as one large population. However, biological differences between shrimps (e.g. the size at sex change) indicate that there may be several stocks in the area. The question of one or more stocks was answered by collecting and genetically analyzing several thousand shrimp from Skagerrak and northern Kattegat, Norwegian Channel and the Norwegian fjords. The analyzed shrimps came both from research cruises and commercial fisheries. The kinship of the collected shrimp was examined with modern DNA technique and the results compared with existing knowledge of the biology of the species. This knowledge was obtained from scientific sources as well as from the fishing industry in terms of skipper interviews. The genetic analyses revealed that
shrimps in Skagerrak and Norwegian Deep all belong to the same stock, but also that some of the fjord-populations are genetically distinct (can be considered separate stocks). These results are published in ICES Journal of Marine Science in 2015.

The fisher information collected in the project was not only focused on shrimp biology but also addressed economical and technical aspects of the shrimp fishery. In this way, scientists have gained an understanding of both how shrimp populations are structured and distributed in the Skagerrak and of the economic importance. The exchange of knowledge between researchers and fishers was an important aspect of the project and was facilitated by regular meetings and interview schemes in all three countries.

Another primary objective of the project was to improve the current assessment of the Skagerrak shrimp stock by developing a new length-based analytical model. DTU Aqua was in charge of this part of the project and in an assessment benchmark in 2012 the developed model was accepted.

The project was coordinated by Institute for Marine Research, Norway.

The project was funded by EU, InterReg (regional collaboration).

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Institute of Marine Research
University of Gothenburg
Lund University
Directorate of Fisheries
Ministry of Food, Agriculture and Fisheries
Danish Fishermen's Association
Norwegian Fishermen’s Association
Period: 01/01/2010 → 31/12/2013
Number of participants: 6
Research areas: Fisheries Management & Marine Living Resources
Project participant:
Munch-Petersen, Sten (Intern)
Nielsen, Anders (Intern)
Andersen, Bo Sølgaard (Intern)
Egekvist, Josefine (Intern)
Holm, Nina (Intern)
Project Manager, academic:
Eigaard, Ole Ritzau (Intern)

Development of fisheries with minimized emission of greenhouse gases (38688)
Identification of methods and prioritization of areas for actions of minimizing greenhouse gas emissions, optimizing fuel consumption and, thus, improve the economy and reducing the environmental effects of fishing on marine habitats. The focus is on fishing with trawls. Two different strategies (work packages) are considered in the project:

1) Development of new and more energy efficient trawls: This work package targets the development of trawl design with improved relationship between capture efficiency and/or catch value in relation to energy use for towing the gear. In this work package we apply an internationally developed computational model based on fluid mechanics and finite element methods and models to predict the capture efficiency of trawl. Through computer simulations we investigate the predicted ratio between catch value and fuel consumption for different trawl designs. These simulations are accordingly applied to identify the most favorable trawl design with optimized value of the catch in relation to the fuel consumption to tow the trawl. Through international cooperation, we also experimentally examine the consequences on catch efficiency of applying high strength thin twine netting with low drag in sections of trawls.

2) Fisheries tactics and management in relation to energy efficiency in fisheries effort allocation for different fisheries: This work package analyze management options for different types of fisheries, to investigate opportunities and incentives to achieve the same value (and catch) in fisheries with less effort or re-allocation of effort and consequently less fuel consumption. Advanced computer based bio-economic fisheries simulation models are developed and used in fleet and stock-based scenario analyses for energy efficiency in fishery by integrated evaluation of fishing effort, catch, catch composition and utilization, economics, and fuel consumption under given effort allocation schemes. This involves
development and implementation of a generic bio-economic Individual Based Model (IBM) that works on individual vessel basis and which can simulate multi-stock-multi-fleet (mixed) fisheries and evaluate on a scale of very high resolution in time and space. This computer based management evaluation tool and simulation model can evaluate economic cost-benefits, biological impacts according to fish stock sustainability, as well energy efficiency according to catch in weight and value per fuel volume consumed and/or in relation to total fuel costs for different management scenarios. The implementation of the IBM model involves additionally development of advanced statistical and computer based models and methods for coupling information from logbook databases with information from VMS tracking (satellite monitoring) databases on vessel and fishing trip basis. Furthermore, it involves development of a web-based questionnaire and platform to obtain information from the Danish fishery on cost dynamics with focus on fuel costs and effort allocation.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
IFREMER
Johann Heinrich von Thünen-Institute
Technical University of Denmark
Period: 01/01/2008 → 31/12/2012
Number of participants: 7
Research area: Fisheries Technology & Fisheries Management
Project participant:
Krag, Ludvig Ahm (Intern)
Bastardie, Francois (Intern)
Andersen, Bo Selgaard (Intern)
Eigaard, Ole Ritzau (Intern)
Madsen, Niels (Intern)
Project Manager, academic:
Herrmann, Bent (Intern)
Nielsen, J. Rasmus (Intern)

Survey of existing bio-economic models (38569)
The project “Survey of existing Bio-Economic Models (S12.507729)” is an EU Lot-5 project under studies for carrying out the common fisheries policy (No MARE/200707 Lot5) which reviews and evaluates a long row of the most important European bio-economic fisheries evaluation models. In particular the models reviewed are: EIAA, TEMAS, MOSES, BEMMFISH, BIRDMOD (Including Aladym), MEFISTO, AHF, EMMFID, SRRMCF, COBAS, ECOCORP, ECONMULT and FLR under EFIMAS. The review is done in two parts. Firstly a revision framework based on some specific and general tables is created in order to facilitate the comparison as well as the selection of the model for completing a specific task. Secondly a report of each model including model generalities, specific issues and implementation details, is produced. The structure of the review as well as the revision framework is based on the existing literature (reports and scientific papers including EFIMAS ECOKNOWS work and platforms), and after a feedback process among the group.

BEMs are used to understand the feedback between human activity and natural resources. When a model is built initial attention must be given to the fishery management problem. The simulation of fisherman behavior is not extensively included in the models. A trade-off between simplicity and usefulness emerges when integrated models are used. New research questions will stimulate the development of new models. The lessons learned from a review of thirteen existing European bio-economic models used in the evaluation of EU policies are produced. How these models compare and differ in terms of their biological and economic components, the integration between the components, which indicators are selected and how they are used, are described and analyzed. The publications from the project conclude that the multitude of construction differences reflects the necessity of adapting the modelling approach to answer different questions. Since real life questions in fisheries are so diverse, answering them requires a diversity of models.

The project has built further on the networks and platforms produced under EU FP6 EFIMAS Project coordinated by DTU Aqua, including the EFIMAS ECOKNOWS (Economist Knowledge System). The DTU Aqua team associated to the project has produced 1 peer reviewed journal paper, 1 conference proceeding and a consolidated report under the Lot5 project.

The project is coordinated by Marine and Food Technological Centre (AZTI), Spain.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
A framework for fleet and area based fisheries management (AFRAME) (38110)

Basing advice on fleets or fisheries requires switching focus from a biological unit (a fish stock) to a social one (a fleet or fishery). This is a major shift away from the current TAC-dominated, stock-based approach. The general objective of the AFRAME project was to develop an operational area- and fleet-based framework that integrates single-species assessment and advice. The framework must be robust to uncertainty caused by, for instance, lack of discard data. Work also included development of indicators as a basis for setting management targets, as well as the analysis of stakeholder perspective in relation to these developments.

Three case studies of mixed demersal fisheries were included focusing on areas where the need for a fleet-based management is particularly urgent: (i) The North Sea, (ii) The Western Waters in ICES areas VII & VIII (Celtic Sea to the Bay of Biscay), and (iii) the Eastern Mediterranean.

The AFRAME project has been particularly successful in developing a simple and operational approach for mixed-fisheries advice. This approach is now integrated as part of the ICES Advice for the North Sea, through the setup of a dedicated working group applying this approach on a routine basis.

The project was coordinated by Marine and Food Technological Centre (AZTI), Spain.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Marine and Food Technological Centre
Wageningen IMARES
Cefas
IFREMER
Institute of Marine Research
University of Copenhagen
Aalborg University
Marine Scotland Science
Hellenic Centre for Marine Research

Eigaard, Ole Ritzau (Intern)
Andersen, Bo Sølgaard (Intern)
Nielsen, J. Rasmus (Intern)
Ulrich, Clara (Intern)
Project

**Capacity, F and Effort (CAFE) (38100)**
The CAFE project was designed to investigate the links between the fleet capacity, the fishing effort of those fleets and the fishing mortality that results from that effort, so as to facilitate the development of a fishing management strategy.

The fishing effort was considered as the amount of time a given fishing capacity was deployed in a fishery. Therefore, engine power could be seen as a capacity measure and kilowatt hours as the expression of the effort from that capacity. This estimate allowed for capacity and effort to be directly linked within the project.

CAFE proved that relating higher capacity and/or effort to higher fish mortality was a common misinterpretation. Thus, the project aimed to test the hypothesis that there was a quantifiable relationship between the capacity and effort by particular fleets and the fishing mortality imposed on the various commercial stocks.

The project covered six different case studies (the North Sea, the Bay of Biscay and the Mediterranean) accounting, both pelagic and demersal fisheries and single and multi-species fisheries.

A combination of models and metrics was subsequently employed to quantify the links between capacity, effort and fishing mortality. External factors which affected the fishers’ choices were also identified. The modelling approach used both statistical and mathematical modelling techniques.

The models and the understanding gained through them were subsequently used to examine the response of the system to a range of management measures for controlling capacity and effort. A series of simulations were performed to examine the fisheries’ response to limitations of capacity, effort or other measures. Several of the models were run using data of different case studies to test the general applicability of the approaches and observe existing differences between individual countries.

The project was coordinated by IMARES, Wageningen UR, The Netherlands.
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Wageningen IMARES
Cefas
University of Portsmouth
University of Copenhagen
Institute for Research in Economics and Business Administration
IFREMER
Marine Scotland
Spanish Institute of Oceanography
Marine and Food Technological Centre
IRD
Hellenic Centre for Marine Research
European Commission - Joint Research Center
Period: 01/01/2006 → 31/12/2009
Number of participants: 2
Research area: Fisheries Management
Project participant:
Andersen, Bo Sølgaard (Intern)
Eigaard, Ole Ritzau (Intern)

**Management plans and Danish fishery (2245)**
The objectives of the project were with reference to the EU Commissions proposals on multi-annual management plans, to deliver high quality advice on management of the fishing effort in Danish fisheries in the Baltic Sea, the North Sea, the Skagerrak and the Kattegat.
To be able to deliver the advice the project addressed the need for detailed and accurate data on catches, effort and
economical performance in the main demersal Danish fisheries in the concerned areas and the need for accurate stock
assessment of the economically most important fish and shellfish stocks. The project also developed a systematic method
to give a qualified prediction of the selectivity of a trawl based on information on the trawl design.

The project included seven work packages: (i) Description of development in catches, fishing effort and economical
performance of the main demersal Danish fisheries including creation of a single database; (ii) Develop a reference fleet
system to collect detailed information on catches and fishing effort; (iii) Development of a software to be used to simulate
trawl selectivity; (iv) Establish a fisheries independent monitoring survey on Norway lobster in the Skagerrak and the
Kattegat; (v) Provide advice on a fishing effort management system for the demersal fisheries in Kattegat including
proposal for enhancement of the cod selectivity in trawl fisheries; (vi) Provide advice on fishing effort in form of days at sea
by métier; and (vii) Evaluate the impact of the effort management system in the Baltic Sea on the Danish fishery and the
stocks.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
Period: 01/01/2006 → 31/12/2008
Number of participants: 13
Research areas: Fisheries Management & Fisheries Technology
Project participant:
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Madsen, Niels (Intern)
Bastardie, Francois (Intern)
Pedersen, Eva Maria (Intern)
Christensen, Steen (Ekstern)
Project Manager, academic:
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Andersen, Bo Selgaard (Intern)
Jørgensen, Ole A. (Intern)
Herrmann, Bent (Intern)
Storr-Paulsen, Marie (Intern)
Dalskov, Jørgen (Intern)
Nielsen, J. Rasmus (Intern)
Krag, Ludvig Ahm (Intern)

Improved advice for the mixed herring stocks in the Skagerrak and Kattegat (ICES area Illa) (2011)
The ICES working group on Herring Assessment for the Area South of 62°N (HAWG) has not been able to provide an
advice applicable for the stock components in area Illa due to limited resources to explore on the matter intersessionally.
In previous years, the TAC for the fleets fishing herring in area Illa have been decided by managers according to
recommendations for the North Sea Autumn Spawners (NSAS), raised according to the historical fraction of NSAS in the
catches by these fleets. The recommendation for the NSAS was guided by the need to rebuild that stock. By now, the
NSAS stock has recovered and the main concern is for the Western Baltic Spring Spawners (WBSS) stock. The HAWG
used a simple procedure in 2004 to find the highest total catch by fleet in area Illa that would be compatible with a
precautionary exploitation of WBSS. This procedure used two kinds of information about the fishery, the fraction of WBSS
that is caught in area Illa, and the fraction of the catches by the area Illa fleets that consist of WBSS based on recent
historic data. This very crude procedure can be refined with more detailed information on how the stocks on one hand and
the fisheries on the other hand are distributed geographically and seasonally. Furthermore, the differences in both
distribution and fishing pattern both in terms of season and stock components suggest a scope for a fishery management
that is more fishery and stock oriented, allowing for more directed stock-wise exploitation. The primary goal of the project
is to improve the assessment and advice of the mixed stock in area Illa by elaborating fleet- and stock-based
disaggregation on the existing projection method. The advice would so take into account both stocks and all fleet
components in area Illa. Temporal and spatial distribution of the different stock components and fleet exploitation patterns
will form the basis for the elaboration.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Operational evaluation tools for fisheries management options (EFIMAS) (38094)
Existing models in fisheries management advice (FMA) only consider effects of overall fishing on single fish stocks, while not taking broader ecosystem, social and economic impacts of management decisions into account. Mixed fisheries aspects where several fishing fleets fish on several stocks in the same fishery, spatial planning, and long-term management strategy evaluation are also not considered adequately.

In response to this situation, managers launched EFIMAS aiming to develop alternative management evaluation tools and management strategies that have broader, multi-disciplinary and long-term perspectives. These include social and economic impacts and ecosystem impacts (e.g. by-catch and discards), besides biological consequences on single stocks.

This is a new way of thinking international fisheries research and FMA, by developing conceptual and comprehensive multi-fleet and multi-stock bio-economic simulation tools and management evaluation frameworks (MEF), being spatial and seasonal explicit. A successful implementation of ecosystem, social and economic dynamics and factors on a spatial scale in the advisory process is a major leap towards more holistic and sustainable management within EU waters and fisheries. MEFs enable higher degree of participatory management evaluation by involving various stakeholders in FMA.

EFIMAS, and sister projects, develop and integrates a set of new and existing software tools and simulation models (especially FLR – Fisheries Library in R), generating a more robust Management Strategy Evaluation (MSE) framework, that allows testing plausible hypotheses about dynamics of fish stocks, fisheries and fleets.

The MEF contributes to a conceptual change and paradigm shift in generating advice and management with entire fleets and fisheries as the central units. Here the basic management instrument is the input, i.e. the capacity of fishing fleets, the vessel efficiency, and the effort (activity). This differs from the traditional output based ICES approach, providing advice on single fish stock catch limit from rather uncertain terminal year stock assessments and under strong assumptions on future total stock fishing mortality (F) without much consideration on factors, creating and controlling F and partial Fs by fleet.

The developed frameworks allow simulating and evaluating, respectively, the biological, social and economical consequences of a range of proposed management options and objectives within different management regimes. They can evaluate fleet and mixed fisheries interactions and fisheries behavior, uncertainties in stock and fisheries dynamics, data collection, assessment, modelling, as well as the advisory management and implementation processes. Being capable of evaluating the relative performance of multiple alternative options the MEFs possess strong capacity in performing sensitivity and risk analyses of consequences.

Managing fisheries in a virtual environment provides more reliable scientific advice to stakeholders: In the same way that a pilot might fly in a simulator before flying for real, the simulation tools evaluates the robustness of alternative strategies and virtual regimes to give more holistic FMA in broader context before implementation. This provides managers and stakeholders a better idea of the consequence of a given strategy or intervention before opting for a particular management approach.

The overall evaluation comprises process evaluation (PE) and technical evaluation (TE). PE focuses on participatory management. Here participatory and iterative scenario-based MEF modelling is used to obtain input and cyclic feedback from multiple stakeholders for different options, and to test the general utility of the operational MEF.

Participants: 30 European universities and national fisheries research institutes with biological and economic expertise as listed under www.efimas.org.

The project was coordinated by DTU Aqua.
National Institute of Aquatic Resources

Section for Ecosystem based Marine Management
Period: 01/01/2004 → 31/12/2009
Number of participants: 11
Research area: Fisheries Management
Project participant:
Bastardie, Francois (Intern)
Munch-Petersen, Sten (Intern)
Eigaard, Ole Ritzau (Intern)
Andersen, Bo Sølgaard (Intern)
Nielsen, Jacob (Ekstern)
Blæsbjerg, Mette (Intern)
Vestergaard, Ole (Intern)
Project Manager, academic:
Ulrich, Clara (Intern)
Degnbol, Poul (Ekstern)
Sparre, Per Johan (Intern)
Project Coordinator:
Nielsen, J. Rasmus (Intern)

Activities:

ICES - Study Group on Nephrops Surveys - SGNEPS (External organisation)
Period: 2012 → ...
Bo Sølgaard Andersen (Participant)

National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Study Group on Nephrops Surveys - SGNEPS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK (External organisation)
Period: 2012 → ...
Bo Sølgaard Andersen (Participant)

National Institute of Aquatic Resources
Section for Management Systems
Degree of recognition: International

Related external organisation
ICES - Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak - WGNSSK
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar