Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures

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

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences, Aarhus University
Authors: van Beest, F. (Forskerdatabase), Kindt-Larsen, L. (Intern), Bastardie, F. (Intern), Bartolino, V. (Ekstern), Nielsen, J. N. (Ekstern)
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecosphere (Washington, D.C.)
Volume: 8
Issue number: 4
Article number: e01785
ISSN (Print): 2150-8925
Ratings:
Web of Science (2018): Indexed yes
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 2.61 SJR 1.333 SNIP 0.954
Explaining the catch efficiency of different cod pots using underwater video to observe cod entry and exit behaviour

Cod pots are considered seal-safe fishing gear and are proposed as a solution to mitigate the ongoing seal-fisheries conflict in the Baltic Sea. This study examined various factors which could affect the entry and exit behaviour of cod in relation to cod pots. Statistical modelling was used to determine which of these factors most affected the pots’ catch per unit effort (CPUE). Two fishing trials were conducted off the coast of Bornholm, Denmark, using six pot types with different design features, equipped with underwater camera systems to record the behaviour of the cod in relation to the pots. Four pot types were floating pots with one entrance and two were bottom standing with three entrances. Different pot types showed significantly different CPUEs and the pot type was an explanatory factor for entry and exit rates for both trials. In trial 1 artificial light was used for filming and results showed an increase in entry rates during the night time, suggesting that lights attract fish to the pot when the dark surroundings make the effect of the light more noticeable. Exit rates in trial 1 increased with an increasing number of fish in the pot while they decreased with soak time. In trial 2, when no artificial light was used, a saturation effect was found in that the probability of cod entering the pot lessened as the number of cod already in the pot increased. However, the exit rates in trial 2 also decreased with increasing number of fish in the pot. The study offers greater depth to the understanding of CPUE results by examining fish behaviour around the pots and not just the raw catch data. This in turn contributes to the ongoing search for the most favourable pot designs.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences
Authors: Hedgärde, M. (Ekstern), Berg, C. W. (Intern), Kindt-Larsen, L. (Intern), Lunneryd, S. G. (Ekstern), Königson, S. (Ekstern)
Pages: 67-90
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Ocean Technology
Volume: 11
Issue number: 4
ISSN (Print): 1718-3200
Ratings:
Scopus rating (2016): CiteScore 0.13 SNIP 0.445 SJR 0.121
Scopus rating (2015): CiteScore 0.22 SNIP 0.604 SJR 0.153
Scopus rating (2014): CiteScore 0.13 SNIP 0.479 SJR 0.126
Scopus rating (2013): CiteScore 0.11 SNIP 0.408 SJR 0.117
Scopus rating (2012): CiteScore 0.07 SNIP 0.076 SJR 0.112
Scopus rating (2011): CiteScore 0.09 SNIP 0.246 SJR 0.105
Scopus rating (2010): SNIP 0.278 SJR 0.108
Original language: English
Attraction, Behaviour, Cod, CPUE, Pot, Saturation
Electronic versions:
Publishers version
Links:
Source: PublicationPreSubmission
Source-ID: 131376727
Publication: Research - peer-review › Journal article – Annual report year: 2017
Identification of high-risk areas for harbour porpoise Phocoena phocoena bycatch using remote electronic monitoring and satellite telemetry data

The bycatch of harbour porpoise Phocoena phocoena is an issue of major concern for fisheries management and for porpoise conservation. We used high-resolution spatial and temporal data on porpoise abundance and fishing effort from the Danish Skagerrak Sea to identify areas with potentially higher and lower risk of porpoise bycatch. From May 2010 to April 2011, 4 commercial gillnet vessels were equipped with remote electronic monitoring (REM) systems. The REM system recorded time, GPS position and closed-circuit television (CCTV) footage of all gillnet hauls. REM data were used to identify fishing grounds, quantify fishing effort and document harbour porpoise bycatch. Movement data from 66 harbour porpoises equipped with satellite transmitters from 1997 to 2012 were used to model population density. A simple model was constructed to investigate the relationship between the response (number of individuals caught) and porpoise density and fishing effort described by net soak time, net string length and target species. Results showed that a model including both porpoise density and fishing effort data predicted bycatch better than models containing only one factor. We therefore conclude that porpoise telemetry or REM data allow for identification of areas of potential high and low bycatch risk, and better predictions are obtained when combining the 2 sources of data. The final model can thus be used as a tool to identify areas of bycatch risk.
Uncovering governance mechanisms surrounding harbour porpoise conservation in the Danish Skagerrak Sea

The harbour porpoise (Phocoena phocoena) is the focus of a range of conservation efforts and policies, including the Habitats Directive, aimed at reducing the bycatch of non-target species in gillnet fisheries. This paper describes the governance process and analyses the governance mechanisms and conflicts surrounding ongoing fisheries management planning with a focus on two Natura 2000 sites in the Danish part of the Skagerrak Sea designated to protect harbour porpoises. Responsibility for developing fisheries management for Natura 2000 sites is solely the remit of the fisheries agency, including mechanisms related to stakeholder involvement. This approach fuels the efficiency of the decision making process, while full transparency and/or co-decision becomes less of a given within a ministry for an economic sector compared with the environment ministry. In relation to porpoises, conflicts are driven mainly by the economy and the varying perceptions of the bycatch issue, with great differences between government, NGO’s and fishers. Interviews with fishers and fishing effort data reveal intra-sectoral conflicts pertaining to the incompatibility of active trawling and passive gillnetting in the areas. The paper questions the overall approach to managing the harbour porpoise bycatch issue in light of Natura 2000 and discusses the role of science and its high level of influence in this planning process.
What attracts Baltic sea grey seals to seal-safe cod pots and when do they attempt to attack fish in the pots?

Seals and fishermen share the role of top consumers in the Baltic Sea, leading to inevitable competition. One aspect of this is that fishermen use fishing gear to catch fish and seals raid these fishing gear. The fisheries lose out in terms of fish catches and also bear the significant costs of damage to the gear. Researchers have been active for some years in developing 'sealsafe' fishing gear, which will be unattractive to seals and resistant to attacks. This study investigated the presence of grey seals (Halichoerus grypus) around cod pots and their attempts to take fish from them. Baited and camera-equipped cod pots of three designs including three netting types were set out close to a seal haul-out site east of the island of Gotland in the Baltic Sea. The behaviour of visiting seals filmed with underwater cameras was observed and analysed using a generalized linear model (GLM). As well as the cod pot characteristics, the variables used for modelling included the time of day, whether bait fish were alive or dead, and the quantity of fish in each pot. It was found that the most important cod pot-characteristic for both seal presence and 'attack behaviour' was the design of the cod pot. The design which attracted the most seal presence and the most fish-attacking behaviour had loose netting around the upper chamber, in contrast to the other two designs which had tightly stretched mesh. Neither mesh size nor material showed any correlation with seal presence or attack behaviour. It was also found that the most important overall factor for predicting attack behaviour was the time of day. There was individual variation in seal behaviour. The behaviour was categorized into eleven groups, of which 'investigation' was the most commonly observed. Most attack behaviours were targeted towards moving fish and no attacks occurred on dead fish. These results could suggest that seals are visiting cod pots because of curiosity and not primarily because of hunger.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Swedish University of Agricultural Sciences
Authors: Stavenow, J. (Ekstern), Ljungberg, P. (Ekstern), Kindt-Larsen, L. (Intern), Lunneryd, S. G. (Ekstern), Königson, S. (Ekstern)
Pages: 91-107
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Ocean Technology
Volume: 11
Issue number: 4
ISSN (Print): 1718-3200
Ratings:
Scopus rating (2016): CiteScore 0.13 SNIP 0.445 SJR 0.121
Scopus rating (2015): CiteScore 0.22 SNIP 0.604 SJR 0.153
Scopus rating (2014): CiteScore 0.13 SNIP 0.479 SJR 0.126
Scopus rating (2013): CiteScore 0.11 SNIP 0.408 SJR 0.117
Scopus rating (2012): CiteScore 0.07 SNIP 0.076 SJR 0.112
Scopus rating (2011): CiteScore 0.09 SNIP 0.246 SJR 0.105
Scopus rating (2010): SNIP 0.278 SJR 0.108
Original language: English
Behaviour, Behavioural ecology, Halichoerus grypus, Seal depredation, Seal-fishery conflict mitigation
Electronic versions:
Publishers version
Links:
http://www.thejot.net/?page_id=837&show_article_preview=825
Links:
http://www.scopus.com/inward/record.url?scp=85030095561&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 85030095561
Publication: Research - peer-review › Journal article – Annual report year: 2017

Discarding of cod in the Danish Fully Documented Fisheries trials
Denmark was the first nation in Europe to promote the use of Fully Documented Fisheries (DFD) through Remote Electronic Monitoring (REM) and CCTV camera systems, with pilot schemes in place since 2008. In theory, such a scheme could supplement and even potentially replace expensive control and monitoring programmes; and when
associated with a catch quota management (CQM) system, incentivize positive changes in fishing patterns in a results-based management approach. Newdata flows are, however, required to ensure the practical implementation of such a scheme. This paper reviews the quality of the FDF data collected during 2008–2014 and their potential in strengthening information on cod discards. The analyses demonstrate the improved reporting of discards in logbooks and overall discard reductions, but they also show that some uncertainties around the absolute estimates of discard quantities have remained. Regular validation of weight estimation methods and close collaboration between scientific monitoring and control are important to support the use of reported discards as a reliable source of information. We discuss the potential of electronic monitoring in the context of the EU landing obligation.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Public Sector Consultancy, Ministry of Food, Agriculture and Fisheries
Pages: 1848-1860
Publication date: 2015
Main Research Area: Technical/natural sciences

**Publication information**

Journal: ICES Journal of Marine Science
Volume: 72
Issue number: 6
ISSN (Print): 1054-3139
Ratings:
  - BFI (2018): BFI-level 1
  - Web of Science (2018): Indexed yes
  - BFI (2017): BFI-level 1
  - Web of Science (2017): Indexed yes
  - BFI (2016): BFI-level 1
  - Scopus rating (2016): CiteScore 2.63
  - Web of Science (2016): Indexed yes
  - BFI (2015): BFI-level 1
  - Scopus rating (2015): CiteScore 2.18
  - Web of Science (2015): Indexed yes
  - BFI (2014): BFI-level 1
  - Scopus rating (2014): CiteScore 2.62
  - Web of Science (2014): Indexed yes
  - BFI (2013): BFI-level 1
  - Scopus rating (2013): CiteScore 2.46
  - ISI indexed (2013): ISI indexed yes
  - Web of Science (2013): Indexed yes
  - BFI (2012): BFI-level 1
  - Scopus rating (2012): CiteScore 2.35
  - ISI indexed (2012): ISI indexed yes
  - Web of Science (2012): Indexed yes
  - BFI (2011): BFI-level 1
  - Scopus rating (2011): CiteScore 2.32
  - ISI indexed (2011): ISI indexed yes
  - Web of Science (2011): Indexed yes
  - BFI (2010): BFI-level 1
  - Web of Science (2010): Indexed yes
  - BFI (2009): BFI-level 1
  - Web of Science (2009): Indexed yes
  - BFI (2008): BFI-level 2
  - Web of Science (2008): Indexed yes
  - Web of Science (2007): Indexed yes
  - Web of Science (2006): Indexed yes
Management of fisheries in harbour porpoise (Phocoena phocoena) marine protected areas
The harbour porpoise (Phocoena phocoena) is the focus of a range of conservation efforts and policies aiming at reducing bycatch of the species in gillnet fisheries. In European waters, the harbour porpoise is protected within the Habitats Directive (Annexes II and IV), implying that the population has to be maintained at a favourable conservation status and the deliberate actions of killing and disturbance and habitat deterioration shall be prohibited in accordance with the directive’s aims. A spatial network, Natura2000, will further protect all Annex II species. According to Natura2000, Member States are obliged to nominate candidate protected areas in their waters to the EU Commission and within six years establish legislation to implement them as special areas of conservation and prepare management plans. Up to this point in time, however, no such management plans exist. This Ph.D. thesis focuses on research methods and management tools, which can contribute to a better scientific understanding in the preparation of fisheries management plans for Natura2000 sites designated for harbour porpoises. Firstly, it investigates the potential use of CCTV cameras to document bycatch of marine mammals. Here it is shown that Remote Electronic Monitoring (REM) systems installed on commercial fishing vessels can provide video footage, time and position of all net hauls and record bycatches of marine mammals. Comparisons between the visual analysis of the REM data and fishers logbooks showed that the REM system gave more reliable results since fishers did not, in many instances, observe the bycatch while working on the deck because it dropped out of the net before coming on board. Furthermore, REM provided high percentage coverage at low cost, compared to on-board observers. Secondly, the suitability of using high-resolution spatial and temporal data on porpoise density and fishing effort data from the Danish Skagerrak Sea as a method to predict harbour porpoise bycatches was examined. The results showed that a simple relation between the two could predict bycatch and that the final model can thus be used as a tool to identify areas of porpoise bycatch risk and thereby support the management of both fisheries and harbour porpoises in accordance with the Habitats Directive. Thirdly, the behaviour of porpoises in relation to two different pinger types with different acoustic properties was studied at three different locations. The results showed that at one location, the AQUAmark100 pinger had a significant effect on porpoise echolocation behaviour at 0 and 200 m distances, whereas another trial showed a significant reduction in such behaviour for up to 400 m. In none of the studies of the AQUA100 did the behaviour reveal any signs of habituation. Studies of the AQUAmark300, however, revealed clear habituation effects. Fourthly and finally, the thesis describes the governance process and analyses its mechanisms and conflicts surrounding ongoing fisheries management planning with a focus on two Natura2000 sites in the Danish part of the Skagerrak Sea designated to protect harbour porpoises.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, University of St Andrews
Authors: Kindt-Larsen, L. (Intern), Larsen, F. (Intern), Stage, B. (Intern), Northridge, S. (Ekstern)
Number of pages: 115
Publication date: 2015

Publication information
Place of publication: Charlottenlund
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research › Ph.D. thesis – Annual report year: 2016

Pilot project for the preparation of MSC certification of the gillnet fishery in the Baltic Sea
Where have all the coast fish gone?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography, Centre for Ocean Life, Section for Monitoring and Data
Authors: Støttrup, J. (Intern), Lund, H. S. (Ekstern), Munk, P. (Intern), Dutz, J. (Intern), Kindt-Larsen, L. (Intern), Egekvist, J. (Intern), Stenberg, C. (Intern), Nielsen, T. G. (Intern)
Publication date: 2014
Event: Poster session presented at Fisheries Dependant Information Conference, Rome, Italy.
Main Research Area: Technical/natural sciences
Publication: Research › Poster – Annual report year: 2014

Acoustic activity of harbour porpoises (Phocoena phocoena) around gill nets: Short note

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Authors: Boström, M. K. (Ekstern), Krog, C. (Ekstern), Kindt-Larsen, L. (Intern), Lunneryd, S. (Ekstern), Wahlberg, M. (Ekstern)
Pages: 389-396
Publication date: 2013
Main Research Area: Technical/natural sciences
Publication information
Journal: Aquatic Mammals
Volume: 39
Issue number: 4
ISSN (Print): 0167-5427
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.378 SNIP 0.567 CiteScore 0.86
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.381 SNIP 0.368 CiteScore 0.77
BFI (2014): BFI-level 1
Critical report of current fisheries management measures implemented for the North Sea mixed demersal fisheries

The present report is an EU-FP7-SOCIOEC Report giving an overview and critical evaluation of the current management measures implemented for the North Sea mixed demersal fisheries and the fish stocks involved in this. Also, this involves review and critical evaluation of the scientific advice supporting the fisheries management for the North Sea mixed demersal fisheries and the stocks involved herein. Management of the demersal roundfish and flatfish fisheries in the North Sea is conducted mainly through the EU Common Fisheries Policy (CFP) and the yearly EU-Norway Bilateral Fishery Agreements. The prevailing management system and principle has been landing quotas (TAC, Total Allowable Catch) mainly based on the EU principle of relative stability in the international sharing of the TAC. Also, general effort limitations and technical measures are set for the EU and Norwegian fisheries on top of the TAC regulations. Technical measures have mainly aimed at reducing the retention and discard of the juveniles through gear measures and to protect the spawners and/or recruits in the fish populations through closures. Furthermore, the management is based on a set of national measures especially concerning control and enforcement measures, national distribution of the overall TAC, individual special technical measures, allocation (distribution) of national TACs to different fisheries and vessels including the share to e.g. Individual Transferable Quotas (ITQs) or Vessel Quota Shares (VQSs). The management of the North Sea demersal fisheries has changed quite a lot over the last decades following the need to rebuild the fish stocks, and in particular the North Sea cod stock in relation to the present case study. The CFP has increasing focus towards implementing multi-annual or long term management plans (MAMPs, LTMPs) partly to avoid the annual political battles over setting the TAC. There has furthermore been a trend during the last decade to move away from the Precautionary Approach and towards Maximum Sustainable Yield as the overarching management objective and Harvest Control Rules (HCRs) based on this. There have been introduced increasingly restrictive fisheries-based effort limitations with possibilities for exemption or for less drastic effort reductions provided that cod avoidance behavior can be demonstrated. Although the decision-makers under the CFP have had a reputation of consistently setting TACs way above the scientific advice, the development in recent years has been towards this gap being reduced.

Management of the fisheries has undergone a number of structural and behavioral changes, and these have already yielded some positive results as the state of the demersal stocks in the North Sea have globally improved. The status of main demersal stocks has considerably improved over the last decade. Fishing mortality has globally decreased and biomass has increased, and most of the assessed demersal stocks are now within sustainable limits. Some issues remain with North Sea cod, for which recovery is slower. At present, cod is the limiting species for all the North Sea demersal fisheries. Over a time span from the 1960s landings of demersal stocks have declined with an accelerating decrease since the mid-1990s in line with the falling stock sizes and regulated reductions in total allowable catches (TACs). A clear decrease in the mean fishing mortality (F) is observed in the 2000-2010 period with current F values between Fmsy and Fpa, and the spawning stock biomass (SSB) has on average been above Bpa for the period 1983-2010 for the assessed stocks. The effort in the central North Sea and along the Norwegian waters has decreased as well as the number of operating fishing vessels (capacity). Overall, the nominal effort (kW-days) by European fleets using demersal trawl, seine, beam trawl and gillnet in the North Sea, Skagerrak and the Eastern Channel have been substantially reduced (-20% between 2003 and 2011). Since 2000, the total fish biomass for exploited stocks in the North Sea is about 4-5 million tonnes with an increasing trend in the most recent years. Despite the decrease of landings and fishing mortality in the last recent decade, the overall recruitment has shown a clear decreasing trend from 1985-2010. The recent increase in SSB during the last decade, which is likely due to lower landings and fishing mortality levels in the last 15 years, indicate inclinations of the North Sea ecosystem to recover. However, this has not converted in higher recruitment levels in the
most recent years in which there may be a time delay. There is a clear trend that both the gross profit and the net profit has improved from 2008-2010 for the main fleets of the North Sea with the only exception of the Dutch beam trawlers 18-24m, for which the gross profit decreased by nearly 90%. The positive development in economic performance measures can be a result of the structural changes that have recently occurred in many fisheries. There are fewer vessels sharing the available resources (reduction in over-capacity). Especially, the movement towards right-based systems is expected to have had positive effects on reducing the over-capacity and improving the economic performance of many fleets. Historically, EU subsidies over the years have contributed to making the fleet more efficient, so the success of the CFP in the area of developing an efficient fleet has historically contributed to its failure in relation to conserve fish stocks, as overcapacity is consistently mentioned as one of the fundamental reasons for the conservation failure historically.

Employment in fishing as a social indicator is shrinking, not least for the North Sea, and has been so for many years. There are multiple explanations for this: i) individual vessels are getting more efficient, ii) consolidation of fleets whereby fewer vessels catch the available resources with noticeable decrease in number of operating fishing vessels, and iii) decreasing fishing opportunities in the shape of lower quotas. The raw number of fishers tells a story of a sector that in reality, at least in the prosperous countries around the North Sea, provides only few jobs. Despite the above trends indicating positive effects of the most recent fisheries management of the North Sea mixed demersal fisheries there are a row of general problems in the present management. Population dynamics with respect to recruitment variations, sub-populations and changes in distribution of several demersal North Sea stocks influenced by environmental factors besides fishery are not fully understood and taken into consideration in management (and management advice). Also, biological multi-species interactions between the stocks are not fully taken into account in the management of the stocks when setting the MSY management and exploitation limits for the stocks. Management is not based on broader ecosystem and multi-species objectives, but based mainly on single stock objectives. Also technical interactions between fisheries are not taken fully into account in management of the North Sea demersal fisheries. The fisheries targeting cod, whiting, haddock, saithe, flatchip and Nephrops in the North Sea and Kattegat-Skagerrak are mixed demersal fisheries for towed gears. Mixed fisheries considerations are of primary importance for the management of North Sea species. Single stock management is a cause of discarding in mixed fisheries, because individual stock management objectives may not be consistent with each other. As such, the TAC of one species may be exhausted before the TAC of another, leading to catches of valuable fish that cannot be landed resulting in over-quotas discard. Overall, present management and fisheries policy is characterized by the CFP having in many ways taken form of a classical intergovernmentalist, state-centric command-and-control, top-down management system, where member states’ ministers in the Council have exercised strong control over the fisheries management measures which have been developed and adopted on the background of proposals from the Commission and the Parliament, though since the ratification of the Lisbon Treaty the Parliament has assumed a role of co-legislator alongside the Council. EC has identified the lack of stakeholder involvement as one of the major weaknesses of the CFP, recognizing that this fact clearly undermine its legitimacy. Establishment of the Regional Advisory Councils (RACs) with the 2003 CFP can be seen as the first formal attempt to generate a network of multi-national, multi-interest advisory organizations with a strong regional focus among other involving resource users in the decision making. However, the RACs have at present only an advisory function on decisions and are not formally integrated directly in management on a regional basis, i.e. the RAC system is primarily intended to provide a regional stakeholder perspective to the Commission’s deliberations rather than providing stakeholders with real decision-making authority. RACs constitute, nevertheless, a move towards regionalization of the fisheries policy. Present management is, furthermore, characterized by a high degree of complexity, bureaucracy, and examples of micro-management where different management systems and measures are implemented in parallel making evaluation of impact of the individual measures and systems very complicated and the system suffers from lack of transparency. With respect to the complexity the different management measures are acting top of each other with impact on the same fisheries and stocks at the same time (and with time overlap in their implementation) creating a very complex management and associated advisory system, where it is difficult to distinguish specific effects and impacts of each individual measure implemented. Accordingly, it is also very difficult to make scientific management evaluation and advice associated to the individual measures.

**General information**

**State:** Published

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

**Authors:** Nielsen, J. R. (Intern), Ulrich, C. (Intern), Hegland, T. J. (Ekstern), Voss, B. D. (Ekstern), Thøgersen, T. T. (Ekstern), Bastardie, F. (Intern), Goti, L. (Ekstern), Eigaard, O. R. (Intern), Kindt-Larsen, L. (Intern)

**Number of pages:** 71

**Publication date:** 2013
Use of GIS for evaluation of spatially managed areas

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Ecosystem based Marine Management
Authors: Geitner, K. (Intern), Kindt-Larsen, L. (Intern)
Publication date: 2013
Event: Abstract from ESRI Europe, Middle East and Africa User Conference, Munich, Germany.
Main Research Area: Technical/natural sciences

Fully Documented Fishery onboard gillnet vessels >15 m

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Population Ecology and Genetics, Section for Public Sector Consultancy
Authors: Kindt-Larsen, L. (Intern), Larsen, F. (Intern), Stage, B. (Intern), Dalskov, J. (Intern)
Number of pages: 27
Publication date: 2012

Publication information
Place of publication: Charlottenlund
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Original language: English
Applicant: Ministeriet for Fœdevarer, Landbrug og Fiskeri
Main Research Area: Technical/natural sciences
Electronic versions:
REM_on_gillnet_vessels.pdf
Links:
http://www.fvm.dk/Admin/.../DWSDownload.aspx?
Publication: Commissioned › Report – Annual report year: 2012

Observing incidental harbour porpoise Phocoena phocoena bycatch by remote electronic monitoring

Quantification of marine mammal bycatch is important in relation to conservation and management of protected species. Hitherto, using onboard observers has been the most reliable and accurate method but observer programs can be prohibitively expensive. To investigate the potential of CCTV cameras to document bycatch of marine mammals, 6 Danish commercial gillnetters (10 to 15 m in length) operating under the Danish catch quota management system were equipped with Remote Electronic Monitoring (REM) systems. The REM systems provided video footage, time and position of all net hauls and bycatches of marine mammals. Comparisons between REM results and fishers logbooks showed that the REM system gave more reliable results, since fishers in many cases did not observe the bycatch while working on the deck because the bycatch dropped out of the net before coming on board. Furthermore, very high coverage percentages at low cost, compared to onboard observers, could be obtained with REM. Alternative means of conducting the video analysis were tested; they were however, found not to be very efficient.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Public Sector Consultancy , Section for Population Ecology and Genetics
Authors: Kindt-Larsen, L. (Intern), Dalskov, J. (Intern), Stage, B. (Intern), Larsen, F. (Intern)
Pages: 75-83
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Endangered Species Research
Evaluering af marsvins adfærd og habituering i forhold til redskabsselction med akustiske alarmer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology, Fjord & Bælt
Authors: Kindt-Larsen, L. (Intern), Wahlberg, M. (Ekstern), Larsen, F. (Intern)
Number of pages: 24
Publication date: 2011

Publication information
Place of publication: København
Publisher: Ministeriet for Fødevarer, Landbrug og Fiskeri
Original language: Danish
Main Research Area: Technical/natural sciences
Publication: Research - peer-review → Journal article – Annual report year: 2012

Fully documented fishery: a tool to support a catch quota management system

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Institute Management, Section for Public Sector Consultancy
Authors: Kindt-Larsen, L. (Intern), Kirkegaard, E. (Intern), Dalskov, J. (Intern)
Pages: 1606-1610
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: I C E S Journal of Marine Science
Volume: 68
Issue number: 8
Konsekvensvurdering af fiskeri på blåmuslinger i Lillebælt 2011

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems
Authors: Poulsen, L. K. (Intern), Christoffersen, M. O. (Intern), Kristensen, P. S. (Intern), Dolmer, P. (Intern), Aabrink, M. (Intern), Kindt-Larsen, L. (Intern), Dinesen, G. E. (Intern), Holm, N. (Intern)
Number of pages: 86
Pilot study of marine mammal bycatch by use of an Electronic Monitoring System

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Authors: Kindt-Larsen, L. (Intern), Dalskov, J. (Intern)
Number of pages: 6
Publication date: 2010

Publicaton information
Place of publication: Copenhagen
Publisher: Ministry of Food, Agriculture and Fisheries
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
Bycatch_of_marine_mammals_FINAL[1].pdf
Source: orbit
Source-ID: 279209
Publication: Research › Report – Annual report year: 2011

Final report of Fully Documented Fishery

General information
State: Published
Organisations: Section for Public Sector Consultancy, National Institute of Aquatic Resources, Section for Management Systems
Authors: Dalskov, J. (Intern), Kindt-Larsen, L. (Intern)
Number of pages: 49
Publication date: 2009

Publication information
Place of publication: Charlottenlund
Publisher: National Institute of Aquatic Resources, Technical University of Denmark
ISBN (Print): 978-87-7481-095-7
Original language: English
Series: DTU Aqua-rapport
Number: 204-09
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
23102009$204_09_samlet.pdf
Links:
Fully documented fishery - using electronic monitoring to improve industry self reported data

General information
State: Published
Organisations: Section for Public Sector Consultancy, National Institute of Aquatic Resources, Section for Management Systems, Institute Management
Authors: Dalskov, J. (Intern), Kindt-Larsen, L. (Intern), Kirkegaard, E. (Intern)
Pages: 1-10
Publication date: 2009

Host publication information
Title of host publication: ICES C.M. ASC
Volume: N:18
Place of publication: Copenhagen
Publisher: International Council for the Exploration of the Sea
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252483
Publication: Research › Article in proceedings – Annual report year: 2009

Use of electronic monitoring to improve and quality assure industry reported fisheries data

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Authors: Kindt-Larsen, L. (Intern), Dalskov, J. (Intern)
Publication date: 2009
Event: Poster session presented at 6th international fisheries observer & monitoring conference, Portland, Maine, USA, .
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252484
Publication: Research › Poster – Annual report year: 2009

Bifangst af hvaler i det danske pelagiske trawlfiskeri 2006-2008

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources, Section for Public Sector Consultancy
Authors: Kindt-Larsen, L. (Intern), Larsen, F. (Intern), Dalskov, J. (Intern)
Number of pages: 12
Publication date: 2008

Publication information
Publisher: Ministeriet for Fødevarer, Landbrug og Fiskeri
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions: 3704-3-06-0146_bifangstafhvaler.pdf

Bibliographical note
Projektet er finansieret af Ministeriet for Fødevarer, Landbrug og Fiskeri (EU-fiskeriudviklingsprogrammet FIUF)
Source: orbit
Source-ID: 252486
Udvikling og afprøvning af foranstaltninger til afværgning af bifangst af småhvaler i garnfiskeriet

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Kindt-Larsen, L. (Intern), Krog, C. (Ekstern), Wahlberg, M. (Ekstern), Beeholm, K. (Ekstern), Heikkilä, S. (Ekstern), Ottosen, K. (Ekstern), Nielsen, T. (Ekstern)
Number of pages: 74
Publication date: 2008

Can alerting sounds reduce bycatch of harbour porpoises (Phocoena phocoena)?

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Kindt-Larsen, L. (Intern), Larsen, F. (Intern), Amundin, M. (Ekstern)
Publication date: 2007
Main Research Area: Technical/natural sciences

Can alerting sounds reduce bycatch of harbour porpoises (Phocoena phocoena)?

General information
State: Published
Organisations: Section for Management Systems, National Institute of Aquatic Resources
Authors: Kindt-Larsen, L. (Intern), Larsen, F. (Intern), Amundin, M. (Ekstern)
Publication date: 2007
Main Research Area: Technical/natural sciences

Can alerting sounds reduce bycatch of harbour porpoises (Phocoena phocoena)?

General information
State: Published
Eastern Baltic cod - New knowledge of growth and mortality is the way to improved management advice (39386)
The aim of the project is to improve the knowledge and data basis for stock assessment and management for cod in the eastern Baltic Sea.

In later years, changes in growth and natural mortality of cod have presumably taken place and new knowledge on these parameters is essential for restoring analytical stock assessment for Eastern Baltic cod that is currently lacking. Improved knowledge on cod growth and mortality is therefore a prerequisite for being able to evaluate the stock status in relation to management targets and implement management plans that are built on quantitative stock assessment.

Ecological situation in the Baltic Sea has changed in later years, which requires updated biological information. This is done in the project using different approaches, bringing together expertise of different research areas. The approaches applied include molecular-genetic analyses of cod growth, bioenergetic modelling, and analyses of monitoring data on predation and condition/growth of cod. An important component of the project is cooperation with fishing industry to
support tagging experiments of Baltic cod, to obtain updated estimates of cod growth.

Finally, the project combines the new knowledge on cod that becomes available from this and other relevant projects to ensure that the assessment of stocks status and management advice is based on best available scientific information.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Danish Fishermen's Association

University of Copenhagen

Period: 15/08/2016 → 15/08/2018

Number of participants: 8

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

Project participant:

Storr-Paulsen, Marie (Intern)
Tomkiewicz, Jonna (Intern)
Hansen, Jakob Hemmer (Intern)
Neuenfeldt, Stefan (Intern)
Christensen, Asbjørn (Intern)
Kindt-Larsen, Lotte (Intern)
Berg, Casper Willestofte (Intern)

Project Coordinator:

Eero, Margit (Intern)

Bycatch of marine mammals and seabirds - Assessment and mitigation (39337)

The aim of the project is to develop innovative mitigation methods to reduce the unintended bycatch of marine mammals and seabirds in Danish gillnet fisheries.

The project includes the following components:
- determine the distribution in time and space of the bycatches;
- identify the factors that determine the occurrence of the bycatch and its distribution;
- identify behaviour that are correlated with bycatch;
- conduct pilot trials of mitigation methods;
- propose further mitigation methods to test in a continuation of the project.

The results of the project will contribute to a better management of protected species of marine mammals and seabirds, as well as placing Denmark in a better position with respect to its obligations in relation to the EU Habitats Directive, the EU Bird Directive, the EU Marine Strategy Framework Directive, the EU Council Resolution 812/2004 and the EU Action Plan for reduction of seabird bycatch.

This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).

National Institute of Aquatic Resources

Section for Ecosystem based Marine Management

Kolmården Wildlife Park

Period: 01/03/2016 → 28/02/2018

Number of participants: 5

Research areas: Ecosystem based Marine Management & Coastal Ecology

Project participant:

Sørensen, Thomas Kirk (Intern)
Rindorf, Anna (Intern)
Sustainable use of the invasive round goby in favour for the fishery and the environment (SORTMUND) (39336)
The overarching aim of SORTMUND is to establish a profitable and environmentally sustainable fishery after the invasive round goby in inner Danish waters. Round goby was first seen in south-eastern Danish waters in 2008 and have since then increased rapidly in abundance along the coastline where it has severe negative effects on local biodiversity and the traditional coastal fishery. We aim to launch the fish as a high-quality Nordic product for human consumption, in addition to fur animal feed. The project covers the entire value chain, and has broad participation, ranging from local fishermen and their trade organization, the processing industry, university institutes and a Michelin restaurant. Specific activities will be estimations of stock sizes, investigations of seasonal migrations of the fish, development of seal-safe of gear to avoid damages to the catch, test of methods to fillet the fish for human consumption, documentation of nutritional quality of the fish, development of a fermented fish sauce to add umami to the food, and optimization of logistics in relation to collection, cooling and transportation of fish from small harbors to processing. This project is coordinated by DTU Aqua.

The project is funded by the Ministry of Environment and Food of Denmark through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
Section for Marine Living Resources
National Food Institute
Danish Fishermen’s Association
Gilleleje Fillet Factory
Enspire
NF340 Lasse III
Gemba Seafood Consulting
Period: 01/03/2016 → 28/02/2019
Number of participants: 4
Research areas: Fish Biology & Marine Living Resources
Project participant:
Christoffersen, Mads (Intern)
Kindt-Larsen, Lotte (Intern)
van Deurs, Mikael (Intern)

Development of seal-safe fishing gear (Seal-Safe II) (39188)
Increasing numbers of seals in Danish waters have in recent years made it difficult to conduct a economically sustainable coastal fishery with gillnets and hooks/lines. The objective of Seal-Safe is to improve the viability of these fisheries by developing efficient, environmentally friendly and seal-safe pots for catching cod. The pots will make it possible for the coastal fishermen to conduct a sustainable fishery without damages inflicted by seals.

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

This project is coordinated by DTU Aqua.

The project is funded by the Danish Ministry of Food, Agriculture and Fisheries through the Green Development and Demonstration Program (GUDP).

National Institute of Aquatic Resources
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").
Seal-inflicted damages to Danish fisheries (39143)
In recent years, there has been an increasing conflict between commercial fisheries and the increasing seal populations. Direct damages in the form of reduced or damaged catch is frequently seen in fishing with set gillnets, poundnets and hooks/lines. Fishermen have proposed that the diminishing fish stocks are a result of increased predation from seals. The problems appear to be most widespread in the small-scale coastal fisheries, which there is a political will to preserve, but basic information about the scale of the problem is lacking.

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

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Copenhagen
Krog Consult ApS
BioApp
Period: 15/07/2013 → 01/05/2015
Number of participants: 2
Research areas: Ecosystem Based Marine Management & Fisheries Technology
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Manager, academic:
Larsen, Finn (Intern)
Project

Gillnet fishing in Natura 2000 areas – Porpoises and stone reefs (39125)
The aim of the project was to determine the effects of gillnet fishing in Danish Natura 2000 areas, specifically the effects on harbour porpoises and on the hard bottom’s flora and fauna.

The project included 3 sub-projects and 9 work packages aimed at:
- documenting the extent of gillnet fishing in selected Natura 2000 areas;
- evaluate the effects of gillnet fishing on porpoises in these Natura 2000 areas;
- evaluate the effects of management initiatives on the gillnet fishing in these areas;
- assess the effects of gillnet fishing on the stone reef's flora and fauna in these Natura 2000 areas.

The methods employed were a combination of literature reviews, documentation of fishing activities and conduction of field experiments. The results of the project will contribute to a better knowledge base on the effects of gillnet fishing and should lead to an improved management of gillnet fishing in Natura 2000 areas, based on facts instead of assumptions and anecdotal evidence.

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 15/04/2013 → 31/05/2015
Number of participants: 4
Research areas: Ecosystem based Marine Management & Coastal Ecology
Project participant:
Sørensen, Thomas Kirk (Intern)
Christoffersen, Mads (Intern)
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Manager, academic:
Larsen, Finn (Intern)
Reducing bycatch of harbour porpoises – Insight, mitigation and effects (39037)
The main objective of the project was to provide a better basis for management of harbour porpoise by-catch in Danish setnet fisheries by:
- Elucidating the circumstances that leads to by-catch
- Developing and testing by-catch mitigation methods
- Assess the side effects of such mitigation methods

The project included 6 sub-projects organized under three headings:
- Behaviour of harbour porpoises around gillnets
- Reducing by-catch of harbour porpoises
- Effects on harbour porpoises of wide spread use of pingers

The project was coordinated by DTU Aqua.

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
University of Southern Denmark
Aarhus University
Period: 01/12/2012 → 31/05/2014
Number of participants: 2
Research area: Ecosystem based Marine Management
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Coordinator:
Larsen, Finn (Intern)

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

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

The project is coordinated by DTU Aqua.

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Fishermen's Association
Period: 01/11/2012 → 01/10/2013
Number of participants: 7
Research areas: Coastal Ecology & Marine Populations and Ecosystem Dynamics
Project participant:
Munk, Peter (Intern)
Dutz, Jörg (Intern)
Stenberg, Claus (Intern)
Kindt-Larsen, Lotte (Intern)
Egekvist, Josefine (Intern)
Nielsen, Torkel Gissel (Intern)
Project Manager, academic:
Støttrup, Josianne Gatt (Intern)
Development of monitoring plans for incidental bycatch of harbour porpoises in inner Danish waters (38869)

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

The objective of the present project is thus to further develop and carry out plans for monitoring of incidental bycatch of harbour porpoises in inner Danish waters by use of CCTV camera systems. Further, to ensure full documentation of smaller gillnet vessels’ fishing operations by:
- monitoring all seasons of the major gillnet fisheries;
- providing information on bycatch of harbour porpoises and seabirds by fishery/season/area with a view to develop management plans for Natura2000 areas;
- providing information on discard of cod by gillnet vessels in inner Danish waters.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Period: 16/06/2011 → 28/02/2014
Number of participants: 4
Research area: Ecosystem Based Marine Management
Project participant:
Olesen, Hans Jakob (Intern)
Other:
Rasmussen, Mie Lundsfryd (Intern)
Phd Student:
Kindt-Larsen, Lotte (Intern)
Project Manager, academic:
Larsen, Finn (Intern)

Pilot project for the preparation of certification (MSC) of gillnet fishing in the Baltic Sea (38974)

Fishing for some important stocks has been assessed in accordance with Marine Stewardship Council (MSC) principles for sustainable fisheries. All these fisheries have now passed the assessment and are certified, with a single exception: Gillnet fishing in the Baltic. This is due to the lack of evidence for gillnet fishing East of Bornholm not having by-catches of the very small population of harbor porpoises which are found in the Baltic Sea in Ices Subdivision (SD) 24 and East.

There has not been registered by-catch of porpoises in the Danish gillnet fishing East of Bornholm, neither in biological studies nor by fishermen themselves. But as the Swedish and Polish studies have shown individual by-catches in some gillnet fisheries and the current estimates of stock size means that the by-catch of even a few individuals can prevent it from being restored, the MSC considered that it was not sufficiently proven that the Danish gillnet fisheries did not constitute a threat to the population.

There is therefore a need for documentation of the level of by-catch of harbor porpoises in the Danish gillnet fisheries.

This project is coordinated by Danish Fishermen's Association.

National Institute of Aquatic Resources
Section for Monitoring and Data
Danish Fishermen's Association
Period: 09/06/2011 → 01/05/2015
Number of participants: 6
Research area: Fisheries Management
Project participant:
Larsen, Finn (Intern)
Kindt-Larsen, Lotte (Intern)
Degel, Henrik (Intern)
Rasmussen, Mie Lundsfryd (Intern)
Lundgaard, Louise Scherffenberg (Intern)
Management of fisheries in harbour porpoise (Phocoena phocoena) marina protected areas

National Institute of Aquatic Resources
Period: 01/05/2010 → 02/09/2015
Number of participants: 7
PhD Student:
Kindt-Larsen, Lotte (Intern)
Supervisor:
Northridge, Simon (Ekstern)
Stage, Bjarne (Intern)
Main Supervisor:
Larsen, Finn (Intern)
Examiner:
Madsen, Niels (Intern)
Macleod, Kelly (Ekstern)
Read, Andrew Justin (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Electronic monitoring on smaller fishing vessels fishing with gillnets (38773)
The aim of the project is to examine whether electronic monitoring by the use of CCTV and sensor recordings can ensure full documentation of the fisheries carried out by smaller gillnetters, and whether the use of “pingers” (acoustic deterrent devises) can be more operational.

Furthermore, the project has the aim to prove that:
- A total recording of all catches of quota managed species and a reduction of “high-grading”
- Involvement of the fishing industry in collection of detailed data and thereby ensure industry involvement for joint responsibility for the collection of data to be used as the basis for the scientific advice
- An adequately documentation that can ensure that the fishery could be carried out sustainably in sensitive marine areas such as NATURA 2000 sites
- An improved economy for vessels that participate in fully documented fishery
- A documentation that can provide the basis for the marked to be able to evaluate sustainability of the fisheries.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Archipelago Marine Research Ltd
Period: 01/01/2010 → 31/12/2011
Number of participants: 5
Research areas: Fisheries Management & Observation Technology
Project participant:
Kindt-Larsen, Lotte (Intern)
Larsen, Finn (Intern)
Olesen, Hans Jakob (Intern)
Jensen, Reinhardt (Intern)

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 bio sonar against a
target by having the target emit artificial porpoise click trains (alerting signals). Alerting signals have a number of
advantages over traditional pinger signals, including that they will not lead to exclusion of porpoises from important
habitats, that the risk of habituation is smaller because the porpoises will be able to learn from their experience with the
alerting pingers, and that noise pollution will be considerably smaller because the sound level of alerting pingers is much
lower than for traditional pingers. The third sub-project tested if pingers emitting alerting-signals could reduce by-catch of
harbour porpoises in the commercial gillnet fishery. Alerting pingers were deployed on bottom-set gillnets in a fishery with
a high by-catch rates, in a double-blind experiment. The fourth sub-project investigated the behaviour of free ranging
harbour porpoises in relation to a gillnet. This included land-based tracking by theodolite of porpoises approaching a
bottom-set gillnet to determine detection distances and avoidance behaviour.

The project was coordinated by DTU Aqua.

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

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Fjord & Bælt
Period: 01/01/2009 → 31/12/2011
Number of participants: 3
Research area: Ecosystem based Marine Management & Observation Technology
Project participant:
Larsen, Finn (Intern)
Stage, Bjarne (Intern)
Project Manager, academic:
Kindt-Larsen, Lotte (Intern)

Activities:

**ICES - Working Group on Bycatch of Protected Species - WGBYC (External organisation)**
Period: 2012 → …
Lotte Kindt-Larsen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

**ICES - Working Group on Bycatch of Protected Species - WGBYC**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

**ICES - Working Group on Marine Mammal Ecology - WGMME (External organisation)**
Period: 2012 → …
Lotte Kindt-Larsen (Participant)
National Institute of Aquatic Resources
Section for Coastal Ecology
Degree of recognition: International

Related external organisation

**ICES - Working Group on Marine Mammal Ecology - WGMME**
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar