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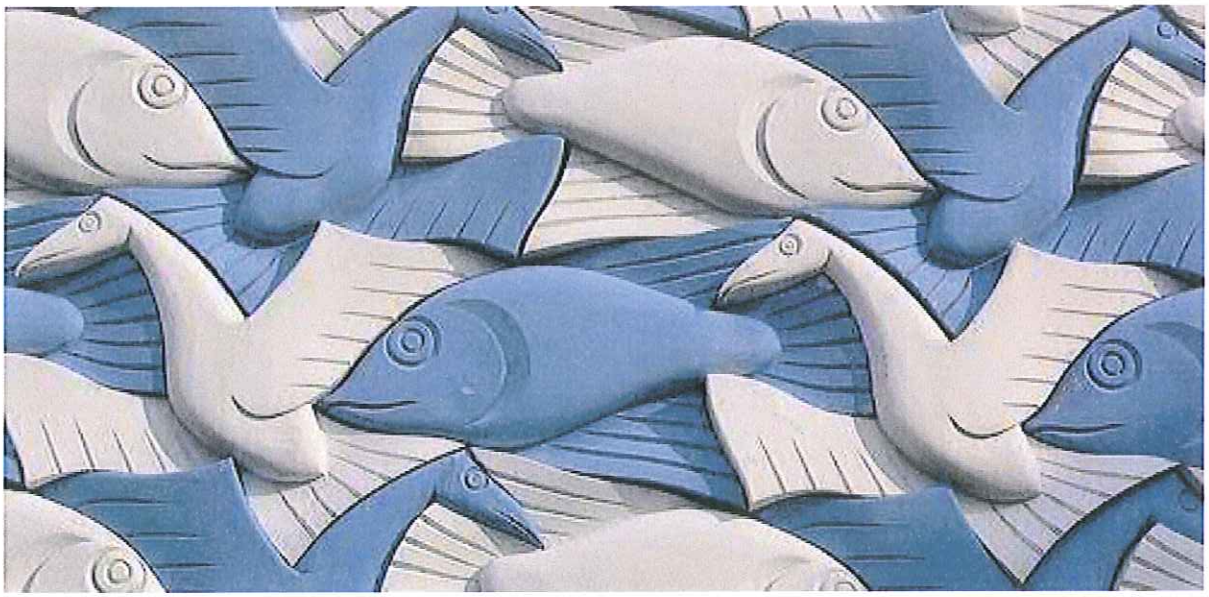
# Stichting DLO
# Centre for Fishery Research (CVO)

## The KB WOT Fisheries Programme carried out in 2012

Cindy van Damme and Frans van Beek

CVO report: 13.005



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CVO rapport UK V4

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## Summary

The KB WOT Fisheries programme is essential to the maintenance and development of the expertise that underpins the statutory obligations of fisheries monitoring and advice for the Netherlands. As the WOT obligations of the Netherlands change over time, the KB WOT programme remains flexible and responsive to developments and innovations in methods and policy needs. The core principles of the programme are maintaining expertise whilst being forward looking, ensuring value for money and strong collaboration with client ministries. The KB WOT fisheries programme must operate within the context of the reform of the Common Fisheries Policy (CFP), the development of the EU Marine Strategy Framework Directive (MSFD) and the EU Maritime Policy.

The KB WOT fisheries programme is established annually and positioned around a number of themes. In 2012 the KB WOT fisheries programme consisted of 14 projects. The programme centred on the research into the changes in marine ecosystems, the impact of fisheries on ecosystems and changing fisheries management. It also focused on maintaining and developing key expertise for the fisheries WOT programme and international exchange of scientists and technology to bring added value to the Dutch WOT fisheries programme.

The programme managed to combine operational research, aimed at some immediate challenges to EZ, with more broad strategic research aimed at future policy development and research needs of EZ. One example is the project aimed at MSY (Maximum Sustainable Yield) approach in the management of flatfish in the North Sea. This was a multi-year project which was aimed to study the knowledge required to carry out the MSY based management and the results of this management on fisheries and fish stocks (see sample project KB-14-012-013). Other projects targeted distribution and ecology of fish species, modelling the life cycle of individual fish and the North Sea ecosystem and the effect on this of changes in abiotic factors, such as temperature and salinity.

KB WOT fisheries also provided resources to maintain the expertise that is required to carry out the WOT fisheries programme. Thus resources were given to projects that standardise fish ageing, maturity estimation techniques and identification of fish eggs and larvae (maintaining standards in these topics is crucial to the maintenance of the quality of fish stock assessments). Likewise, the fisheries acoustic expertise and shellfish surveying techniques within WUR were underpinned through the programme.

Of the 14 projects funded in 2012, ten were carried out in collaboration with European partners. This provided a large amount of added value to the programme, as resources and expertise from other countries contribute to the WUR research strategy. There is a component of the programme devoted specifically to international collaboration. This ensures that IMARES stays at the cutting edge of scientific developments and at the centre of fisheries research in Europe.

The programme was also very productive in terms of publications, presentations and developing new methods or tools for fisheries research. 21 international presentations were given at working groups and symposia. 7 new methods or models were developed and 12 scientific publications prepared.

# Samenvatting

Het KB programma voor WOT Visserij onderhoudt en ontwikkelt de expertise die nodig is om de wettelijke verplichtingen van Nederland op gebied van visserij monitoring en advies uit te voeren. Hierbij wordt tevens naar de toekomst gekeken, een kosteneffectieve programmering van het onderzoek nagestreefd en goede contacten met de ministeries onderhouden. Het is noodzakelijk dat het KB WOT programma flexibel blijft, om te kunnen inspelen op veranderingen in Nederlands en EU visserij beleid en ontwikkelingen en veranderingen in visserijmethoden.

Het KB WOT Visserij programma wordt jaarlijks vastgesteld en gepositioneerd rond een aantal thema's. In 2012 waren deze thema's: ecosysteem benadering van visserijbeheer en vis descriptoren in de KRM, MSY beheers doelstellingen voor Noordzee platvis, onderhoud van expertise en ontwikkeling en uitwisseling van kennis in internationaal verband. Er zijn 14 projecten uitgevoerd in 2012.

Op gebied van visserijbeheer zijn er projecten uitgevoerd gericht op veranderingen in het huidige beheer en toekomstige kennisbehoeften. Een voorbeeld is het project gericht op de MSY benadering (maximaal duurzame oogst) in het beheer van platvis in de Noordzee. Dit was een meerjarig project dat gericht onderzoek heeft uitgevoerd naar de kennis die nodig is om het MSY beheer te kunnen uitvoeren en wat het effect van dit beheer op de visserij en visbestanden is (zie voorbeeldproject KB-14-012-013). Andere projecten waren gericht op verspreiding en ecologie van vissoorten, het modelleren van de levenscyclus van individuele vis en de voedselketen in de Noordzee en het effect hierop van veranderingen in abiotische factoren, zoals temperatuur en zoutgehalte.

Een deel het KB WOT visserij budget is gebruikt voor het onderhouden en ontwikkelen van expertise die cruciaal is voor het uitvoeren van bemonsteringen en van invloed zijn op de kwaliteit van de beheers adviezen. Het gaat hierbij om standaardisatie, onderhoudt en ontwikkeling voor het bepalen van leeftijd, geslachtsrijp en identificatie van viseieren en -larven. Ook is ondersteuning gegeven aan de verdere ontwikkeling van akoestische methoden voor het monitoren van vis- en schelpdierbestanden (zie voorbeeldproject KB-14-012-020).

Van de 14 gefinancierde projecten werden er 10 uitgevoerd in samenwerking met Europese collega's. Dit leverde een grote hoeveelheid toegevoegde waarde aan het programma omdat op deze wijze middelen en expertise uit andere landen bijdroegen aan het strategische KB WOT Visserij onderzoek. Het programma heeft ook weer geresulteerd in een aantal publicaties, presentaties en het ontwikkelen van nieuwe methoden en hulpmiddelen voor visserijonderzoek. In 2012 zijn 21 internationale presentaties gegevens, 12 wetenschappelijke manuscripten zijn opgezet en er zijn 7 nieuwe methoden en/of modellen ontwikkelt.


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# 1 Introduction to the KB WOT Fisheries Programme

The KennisBasis Wettelijke Onderzoeks Taken (KB WOT) Fisheries programme is an annually reviewed multiannual programme with clear objectives and deliverables. The programme ensures the maintenance and development of expertise to support the statutory obligations of the Netherlands in fisheries monitoring and advice. It. As the WOT obligations of the Netherlands change over time, the KB WOT fisheries programme is responsive to developments and innovations in methods and policy needs. Although the main principles of the programme are maintaining expertise, it is at the same time forward looking, ensuring value for money and strong collaboration with client ministries. The KB WOT fisheries programme is part of the overall WUR KB programmes. Within WUR, KB is classified in seven themes. The KB for the WOT related to fisheries is in theme IV: "Duurzame ontwikkeling van de groen-blauwe ruimte" which translates to "Sustainable development of the green and blue space".

The statutory obligations (or fishery WOT tasks) cover the advice and actions required to support the national and European fishery policies. They cover commitments to the CFP (Common Fisheries Policy), national freshwater policy, the Habitats Directive, the Water Quality Directive and the Marine Strategy Framework Directive (MSFD) where relevant to fisheries. The tasks include the collection of information and data, the development of understanding and the provision of evidence based advice. When developing the structure of the KB WOT programme it is necessary to anticipate the developments and future needs of EZ and the EU. Importantly for the KB programme, the EU is attempting to move towards a gradual integration of fishery management into an Integrated Marine Policy in the next reform of the CFP.

One of the major objectives of the KB WOT Fisheries programme is to support the maintenance of the key-expertise required to carry out the statutory tasks, and encouraging the further development of the expertise needed. The development and maintenance of this knowledge and expertise base is also an integral part of the IMARES plan. The programme covers issues such as the fisheries data collection framework (DCF) but also considers the reform of the CFP and the fisheries component of the MSFD. The programme aims to combine operational research, aimed at some immediate challenges to EZ, with more strategic research, aimed at future policy development and research needs of EZ. In practice, many of these future needs in the fields of fisheries come from current or upcoming EU directives.

KB WOT supports the maintenance and underpinning of key expertise to carry out the WOT programme and improve the efficiency of carrying out the WOT tasks. The resources are also used to innovate, develop and expand the knowledge in the research areas covering fishery dynamics, fish biology, sampling strategies, populations, ecology and management systems (simulations and advice). In addition the programme strives to strengthen the scientific output of the research organisation carrying out the statutory tasks, build international links and to add research value via co-finance initiatives.

# 2 The Programme in 2012

In 2012 the research priorities were based on the perceived needs of the WOT programme. The maintenance of key expertise, necessary to carry out the WOT tasks, takes priority, followed by the development and innovation required for future WOT work. The remaining part of the available resources can be used for strategic purposes.

A proportion of the KB WOT budget was reserved for a specific project to investigate MSY management of mixed flatfish fisheries. A project that EZ and IMARES viewed as important to the long term strategic needs in the management of the North Sea fisheries.

In order to provide robust science it is important that the research with KB WOT is excellent and innovative. EZ requires advice and services that can stand international scrutiny and is also forward looking. For the maintenance of the scientific reputation of IMARES and for quality control of the research; international scientific, peer reviewed, publications are essential. A small part of the budget is used for stimulating publishing of research which supported the WOT programme. Another part of the budget is reserved for exchange of scientists with scientific institutes abroad.

## 2.1 Research Areas

The following areas were considered high priority to KB WOT Fisheries in 2012:

1. Ecosystem approach and fish descriptors in the MSFD
2. MSY targets for North Sea flatfish
3. Maintaining Quality
4. International Exchange

## 2.2 Rationale for the choice of research areas

The productivity of the sea is subject to changes over a range of temporal scales. The interaction of these natural changes with human pressures makes the fisheries system dynamic and sometimes unpredictable. Recently changes in the aquatic ecosystems have been well-documented. The importance of parts of an ecosystem can over time become stronger or weaker (e.g. a move from demersal to pelagic production of fish in the North Sea). While some of these changes are caused by regular cycles (e.g. salt waters flows into the Baltic, or the Atlantic Multidecadal Oscillation), others are trends associated with longer term change. Climate change has been identified as a cause of some of these changes. For proper management of the marine ecosystems and its resources it is important to understand the causes and variability and magnitude of these changes. This understanding will allow assessment of risks, analysis of the probability of stock recovery or over exploitation, and to distinguish between natural and human impact on the ecosystem.

Although a significant amount of knowledge on the impact of fisheries on the ecosystem is currently available. There still remains a further need for knowledge to assist the management. EU Member States are obliged to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Also EU legislation is developed to reduce the amount of discarding. As well as a request that mechanisms be found for the management of "data poor" stocks. KB WOT resources are used to aid these international obligations. Projects are be carefully selected to address these specific needs of the WOT programme. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications.

Fisheries management needs to and is constantly developing. The international advisory framework for fisheries is looking at new possibilities for managers. The EU has recently progressed from the management of fish stocks to fisheries management, and this includes the management of fishing effort as well as catch. With the constant developments in management, the EU and national governments are expecting flexibility in the provision of advice. The obligations for biological and economic data of fish and fisheries data collected by the Member States has been adjusted accordingly. To develop new approaches to management and management models KB WOT resources are used. With the changes in management resources are also required for the development and adjustment of data collection, data storage and data access.

Further, KB resources will be put aside for the maintenance and quality control of the present expertise base and routine techniques and skills needed for WOT tasks. This covers age reading, maturity assessment, stock assessments, acoustic techniques and data collection. Courses, workshops and exchanges, usually coordinated by ICES, are an important part of maintaining and developing core skills. The sharing of experience and techniques is a major part of the development of fisheries science within the EU. The workshops and study groups also produce new innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.

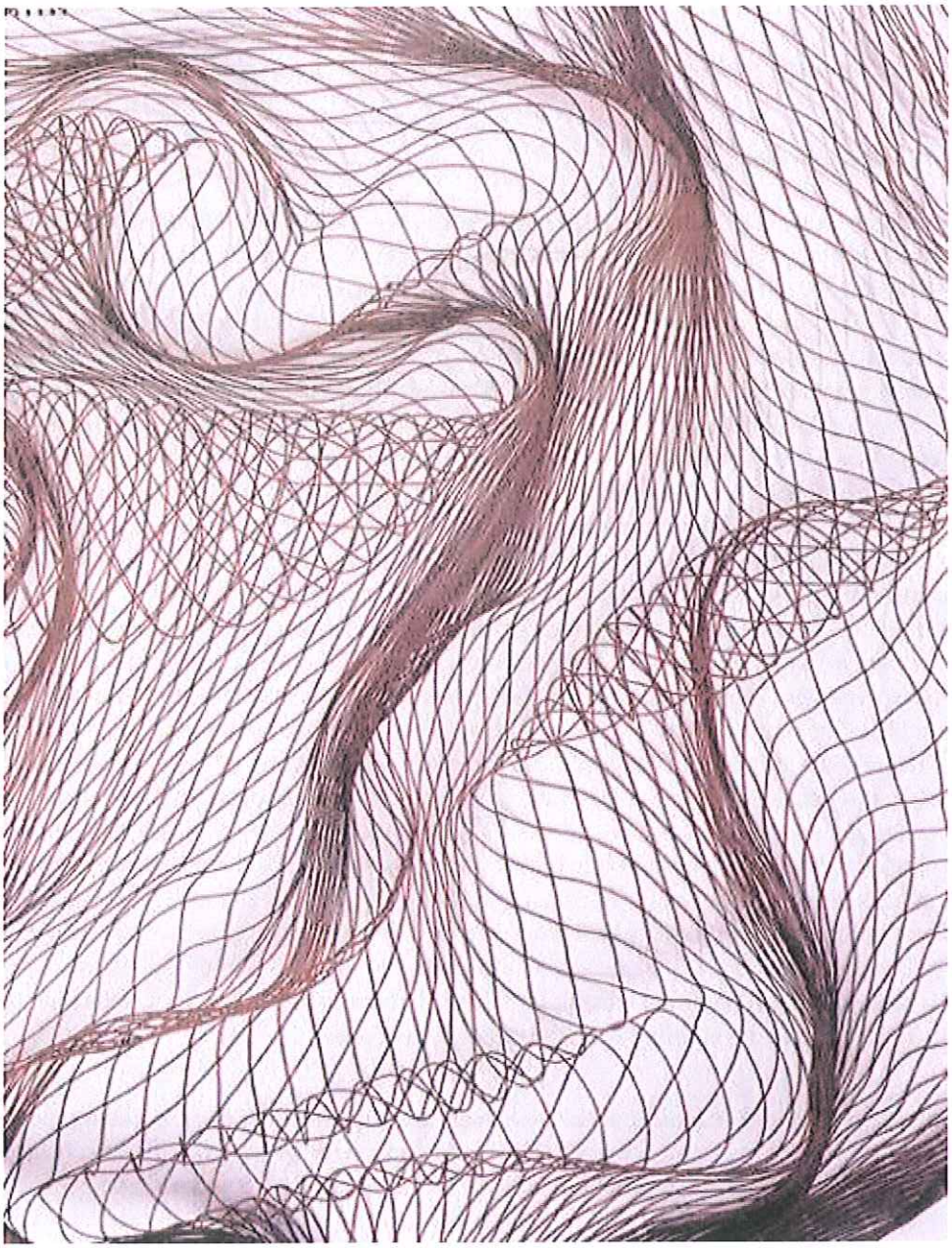
## 2.3 Projects funded through KB WOT Fisheries in 2012.

The following projects were funded in 2012 by KB WOT Fisheries. The annual reports are attached to the end of this report.

| BAS No | Title | Project leader | Research Theme |
|---|---|---|---|
| KB-14-012-007 | Fish ageing | Bolle | 3. Maintaining Quality |
| KB-14-012-009 | Underpinning acoustics | Fässler | 3. Maintaining Quality |
| KB-14-012-010 | International Exchange | Damme, van | 4. Int. exchange |
| KB-14-012-012 | Programme Management and communication | Damme, van | NA |
| KB-14-012-013 | FMSY targets for North Sea demersal fisheries | Poos | 2. MSY flatfish targets |
| KB-14-012-015 | Atlas of the fishes of the northern European shelf | Heessen | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-016 | Habitat quality of forage fish from acoustic multifrequency information (HAQUAFAMI) | Fässler | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-017 | Phytoplankton abundance and productivity impacts the distribution of pelagic fish and has consequences for fisheries | Gastauer | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-018 | Analysing AIS data to inform the usage of the sea | Hintzen | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-019 | Quality control of maturity staging and egg identification of marine fish | Damme, van | 3. Maintaining Quality |
| KB-14-012-020 | Acoustic Shellfish Mapping: Application of Acoustic Techniques for the WOT Shellfish Surveys | Troost | 3. Maintaining Quality |

| | | | |
|---|---|---|---|
| KB-14-012-021 | (Re)moving The Goalposts | Miller | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-022 | DEB reproduction mackerel and horse mackerel | Damme, van | 1. Ecosystem Approach and fish descriptors |
| KB-14-012-023 | Comparing DIDSON and SEAGIS video images from the acoustic blind zone | Gastauer | 1. Ecosystem Approach and fish descriptors |

The total budget €621000 was expended in 2012.



# 3 Highlights of the Programme in 2012

The KB WOT programme in 2012 was diverse and had many important findings and benefits to WOT, WUR and EZ.

## 3.1 Science for Fisheries Management

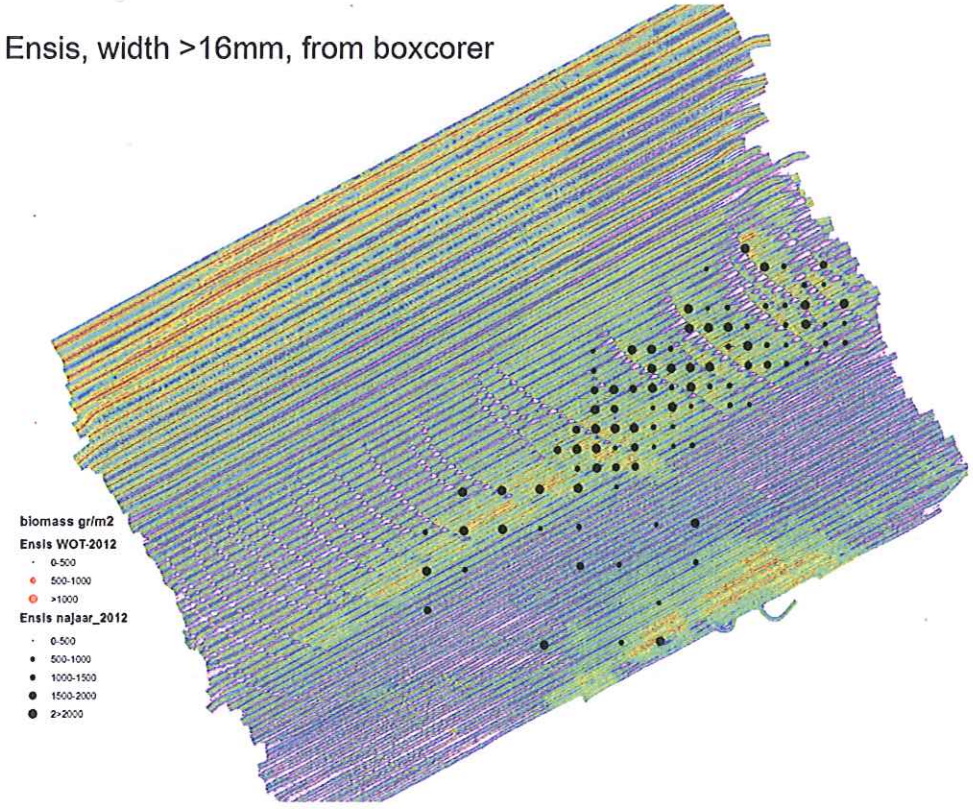
Following commitments by the EU and EU member states made at the World Summit on Sustainable Development at Johannesburg in 2002, the new EU Common Fishing Policy is centred around the objective of achieving MSY in the exploitation of marine biological resources stocks. The KB WOT project researching mixed flatfish MSY targets in the North Sea contributes directly to the ecosystem approach to fisheries management and the development of mixed fisheries management plans. In 2012, this project was supplemented by the EU FP7 project JAKFISH which explores MSY beyond the boundaries of single species advice. The project resulted in 3 publications in Marine Ecology Progress Series, ICES Journal of Marine Science and Marine Policy. One describes the effects of MSY management plans for flatfish fisheries in the North Sea. It was explored how spawning closures for plaice and sole contribute to sustainable management of 4 target species (sole, plaice, turbot and brill). Seasonal patterns in fishing effort and catchability by age group and area were estimated to quantify the effect of different spawning closure scenarios on the selection pattern. The performance of the different scenarios was evaluated using indicators of stock status (spawning stock biomass), economic performance of the fishery (yield, revenue) and ecosystem impact (discards, bycatch of cod and rays, seabed integrity, fisheries-induced evolution). The results indicated that in a single-species context, spawning closures may have positive effects for the stocks of the target species, while in a mixed fisheries and ecosystem context, negative effects may occur. Another study focussed on the effects of fuel costs on trawling speeds and navigating speeds within the Dutch beam trawl fleet. This study indicates that both trawling speeds and navigating speeds have decreased as fuel costs increased. The study also aimed to develop a mechanistic understanding of the observed reduction in fishing speeds. This was only partially successful because the models predicted a stronger decrease than was observed. The findings are important for the use of catch and effort data for sole on which stock assessments and MSY estimates are based. A third study detailed the use of stakeholder participation in developing models. One of the lessons learnt from studying such stakeholder participation was that it allowed integrating different objectives and analyse trade-offs among those objectives when devising management plans.

The programme also funded (via International exchange) participation in various working group which develop techniques for fisheries management; The working group for an integrated assessment of the North Sea (ICES WGINOSE), which is cross disciplinary and is looking at how to advise on a regional level about the status of the ecosystem and associated anthropogenic impacts. The working group on multispecies assessment methods (WGSAM) is looking at combining assessment of predator stocks and their prey stocks and if balanced fishing on the predator stock can result in higher yields of the prey stocks.


Floor Quirijns

## 3.2 Novel insights

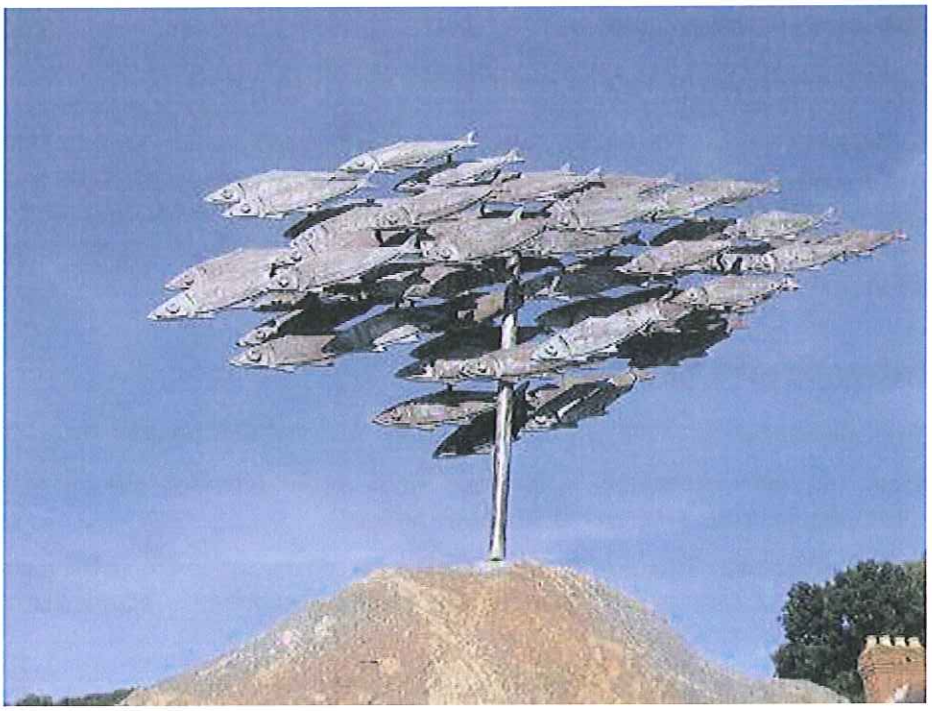
Acoustic techniques are increasingly applied for seafloor mapping and optimum allocation techniques for stock assessments. Within KB WOT 2012 the possibility to apply multibeam technology in the annual WOT monitoring and assessment of the American or Atlantic jack knife clam (*Ensis directus*) was studied. This is an invasive bivalve species and its present biomass in Dutch coastal waters has been estimated between 400 and 600 thousand tonnes. The project was carried out in cooperation with the Royal Belgian Institute of Natural Sciences – Management Unit North Sea Mathematical Models (RBINS-MUMM). The acoustic signal of Ensis could be detected, but because of a high variation in the correlation of the acoustic signal with Ensis abundance, the predictive power and therefore generic applicability was still low. This may be improved using more advanced techniques for pre-processing of the backscatter data, and post-processing of both depth and backscatter data.




*Map of the backscatter data after noise reduction, combined with large (>16mm width) Ensis biomass at all sampling stations (black circles).*

Most acoustic surveys commonly collect usable data using several frequencies. This is done primarily to facilitate "target fish" species identification and distinction from other fish based on different sound scattering properties at different frequencies. Indeed, acoustic data contain qualitative and quantitative information on various trophic levels within an ecosystem, ranging from plankton to larger predators. Generally, however, backscatter information coming from plankton or other non-target fish species is currently discarded. In this project a bi-frequency algorithm was applied to multi-frequency data collected in the northern North Sea during acoustic surveys for herring from 2003 to 2010. This algorithm can be used to identify acoustic backscatter coming from macrozooplankton. The method

allowed production of high-resolution maps of distributions, abundances and biomass of macrozooplankton in the northern North Sea. Forage fish species like herring feed directly on macrozooplankton, which are mainly composed of copepods or euphausids. Knowledge about the location and abundance of food (macrozooplankton) and environmental conditions (temperature) can then for example be used to identify preferable habitat for herring. A Dynamic Energy Budget (DEB) model was used to estimate food intake requirements of herring, given prey abundance and temperature, and consequently map the quality of the habitat in the survey area.



### 3.3 Tools and method development

Methods have been developed to cover the blind zone in acoustic surveys. Fish targets in the upper water layers are usually missed with traditional acoustics. A DIDSON acoustic camera and a SEAGIS stereo video camera system were used to survey the 'acoustic blind zone'. Both systems cannot be used as standard equipment during acoustic surveys, as the ship's speed is too high. But a survey executed with both systems in the North Sea during the herring acoustic survey showed that only few herring were found in the upper water layers. Thus the amount of fish missed by traditional acoustic methodology is negligible.

Acoustic survey data can be linked with auxiliary data sources, information about temperature, salinity, chlorophyll and zooplankton data. Models were developed to reveal the relation between these factors and herring distribution. No direct relation was found between phytoplankton and the distribution of herring in the entire North Sea, but a strong negative relationship could be found between zooplankton and phytoplankton concentration in the Northern North Sea. Similarly herring abundance was shown to be closely linked with zooplankton concentrations. This might be an indication that at the time when herring are feeding on zooplankton in the northern North Sea, most of the chlorophyll has already been taken up by the zooplankton. The models of herring distribution of the acoustic survey and herring fishing from the VMS data showed a good overlap of both datasets, indicating that no major parts of the herring stock were missed out by the survey.

The Dynamic Energy Budget (DEB) model of mackerel and horse mackerel gives the possibility to model the energy investment of a fish in growth and reproduction. However, the reproduction was up till now modelled as a certain amount of energy going in and a definite number of eggs produced. We know from reproductive studies that the amount of energy used for reproduction and the numbers of eggs produced during a spawning season is variable. The reproductive part of the DEB model was further improved to cope with the variability. New data on reproduction and fecundity as well as other life history parameters of mackerel and horse mackerel from various sources was collected. The DEB parameters were estimated using this data. The reproductive part of the DEB model was developed and the data was used for validating the model. The DEB model now allows for one spawning season to investigate effects of changes in temperature on the reproduction.

### 3.4 Standardisation of techniques and quality control

Advances were continued in a pan European approach to fish ageing and maturity staging of flatfish (sole, plaice, dab, flounder, turbot and brill), pelagic fish (sprat, mackerel, horse mackerel and blue whiting) and haddock. Egg identification, staging and fecundity estimations of mackerel and horse mackerel were further standardised. IMARES is at the centre of drives to standardise monitoring of these variables, which form the most important input data in stock assessments.

### 3.5 Recent Publications resulting from KB WOT Fisheries

The following peer reviewed publications resulted from the KB WOT Fisheries programme in 2012:

Poos JJ, Turenhout MNJ, van Oostenbrugge H, Rijnsdorp AD (accepted) Adaptive response of beam trawl fishers to rising fuel cost. ICES Journal of Marine Science.

Rijnsdorp AD, Van Overzee HMJ, Poos JJ (2012) Ecological and economic trade-offs in the management of mixed fisheries: A case study of spawning closures in flatfish fisheries. Marine Ecology Progress Series 447, 179-194

Röckmann C, Ulrich C, Dreyer M, Bell E, Borodzicz E, Haapasaari P, Hauge KH, et al. (2012) The added value of participatory modelling in fisheries management - what has been learnt? Marine Policy 36 (5), 1072-1085

Saunders RA, O'Donnell C, Korneliussen RJ, Fässler SMM, Clarke MW, Egan A, and Reid D (2012) Utility of 18-kHz acoustic data for abundance estimation of Atlantic herring (*Clupea harengus*). ICES Journal of Marine Science

In addition a further nine manuscripts for submission are in preparation.

Fässler et al. (in prep) Determining herring habitat quality from acoustically derived zooplankton abundance in the northern North Sea.

Fässler et al. (in prep) Depth-dependent finite element models of herring (*Clupea harengus*) target strength using magnetic resonance imaging (MRI) of swimbladders.

Fässler et al. (in prep) Target strength and vertical distribution of smelt (*Osmerus eperlanus*) in the IJsselmeer based on stationary echosounder recordings.

Fässler et al. (in prep) Mackerel in the North Sea during the feeding stage.

Fässler et al. (in prep) Constraints on the Kirchhoff-approximation and Kirchhoff-ray-mode fish swimbladder scattering models.

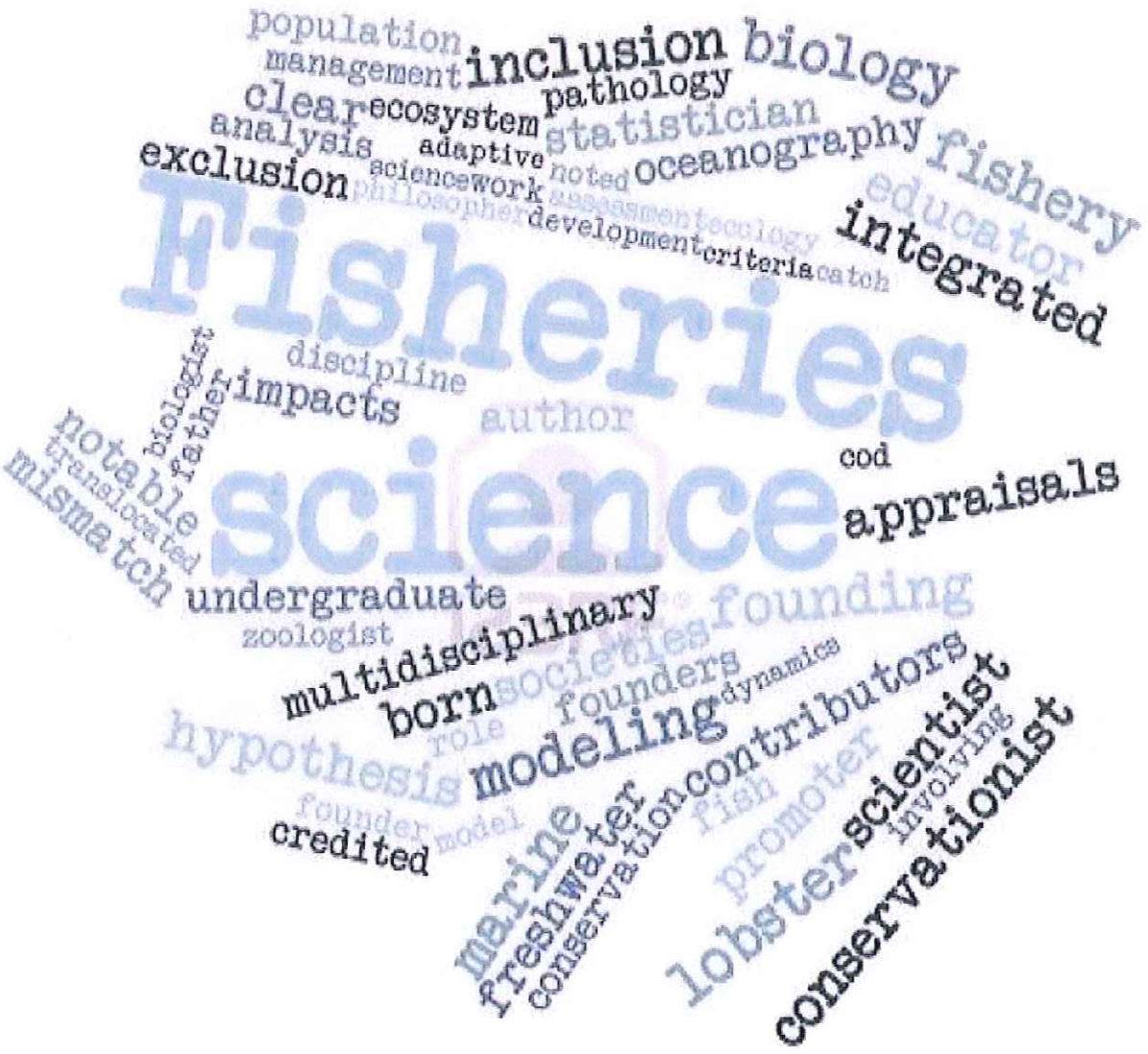
Fässler et al. (in prep) Year class strength and subpolar gyre affect blue whiting length distribution on the spawning grounds: mechanisms of population regulation.

Fässler et al. (in prep) Boarfish (*Capros aper*) target strength modelled from magnetic resonance imaging (MRI) scans of its swimbladder.

Gastauer et al. (in prep) Phytoplankton distribution and production influences the distribution of North Sea herring.

Miller D et al. (in prep) Hindcasting management of flatfish in the North Sea: is a stable management regime necessary?

There are also over 30 internal and international reports from projects, workshops and expert group meetings which were partially financed through KB WOT Fisheries and contribute directly to the development of WOT fisheries monitoring and advice.



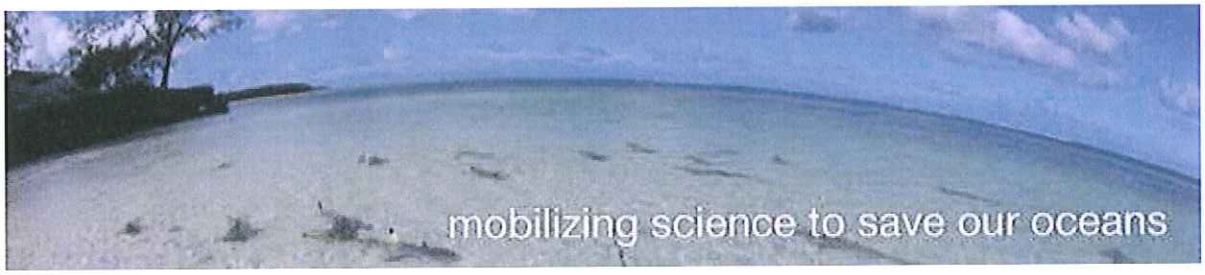
# 4 International partnership and collaboration.

By its very nature, and due to its embedding in the European Fisheries Policy, fisheries research is highly international. Fish do not observe virtual man-made boundaries. Thus many of the WOT is carried out in collaboration with research organisations from abroad. In particular the research at sea, the sampling of the catches, the development of methods and models and also the international advisory process itself. Thus it is evident that international cooperation is often required to develop the skills base to complete the WOT and maintain quality. All collaboration must conform to the aims and priorities of the WOT programme.

Of the 14 projects funded in 2012, ten were carried out in collaboration with European partners. This provided a large amount of added value to the programme, as resources and expertise from other countries contribute to the WUR research strategy. Added value was also increased by combining KB funds with those from EU FP7. There is a component of the programme devoted specifically to international collaboration. This ensures that IMARES stays at the cutting edge of scientific developments and at the centre of fisheries research in Europe. This project, called international exchange, enabled IMARES colleagues to participate in studies of larval fish mortality, predator-prey interactions, ecosystem modelling, regime shifts in the North Sea, fisheries induced evolution, developing new methods for fish stock assessments, improving survey and fishing technologies, evaluating management measures for various fish stocks, marine biodiversity and surveying fish plankton. Over 20 international presentations were given at working groups and symposia.

The strength of this cooperation is that knowledge and technology transfers are carried out in a more cost effective manner with efficiencies of scale. It also reduces the risk of IMARES "reinventing the wheel" when dealing with novel requests and new situations.

Through the KB WOT Fisheries programme IMARES scientists collaborated with scientists from over 35 institutes from a wide range of countries including: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Norway, Poland, Portugal, Russia, Spain, Sweden, United Kingdom, United States of America, Austria, Switzerland, Italy, Greece, Georgia, South Africa, Australia, Greenland and the Faroe Islands.



# 5 Conclusions

The KB WOT Fisheries programme was very productive in 2012. Almost all research targets and objectives were met. There was large amount of added value to the programme through either co-financing or international/inter-institute collaboration.

This programme is performed within KB Onderzoek (KB) / Beleidsondersteunend onderzoek (BO) / Wettelijke onderzoekstaken (WOT) of EZ-programmes.

## Signature

Report CVO 013.005
Projectnumber: KB WOT Visserij programme BAS KB-14-012

Approved by: Drs. F.A. van Beek
Head WOT, Centre for Fishery Research

Signature: 

Date: March 2013

# Annex 1. Annual Reports of KB WOT Projects 2012

| Title | 1. FISH AGEING |
|---|---|
| Number | KB-14-012-007 |
| Project leader | Loes Bolle |
| Other researchers in WUR | Ineke Pennock, André Dijkman, Jan Beintema, Marcel de Vries, Peter Groot, Thomas Pasterkamp, Betty van Os-Koomen, Gerrit Rink |
| Researchers outside WUR | Age coordinators and age readers at various European institutes (see section international) |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 40000 |
| Goals of project | Maintenance of the key expertise fish ageing, by means of international calibration, training and QA procedures. |
| Target group for research | ICES reports of international exchanges and workshops are disseminated through the ICES Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS) |

**PROGRESS 2012**

| | |
|---|---|
| Results | Main results :<br>International calibration: Preparation of the turbot, brill, sprat and dab exchanges. Contribution of (validated) otolith sets to horse mackerel workshop.<br>Education: Training of new age readers for turbot, brill & mackerel completed. Training of new age readers dab, blue whiting and haddock has progressed well.<br>Other: Reorganisation of IMARES otolith collections |
| | Products :<br>Results of international calibration exercises are documented in reports and summarised in the annual ICES PGCCDBS report (see general publications below). |
| Did the work follow plans (science or financial)? | Update IMARES ageing manual postponed to 2013, hence part of budget (6000) was reallocated to other KBWOT projects in October 2012 |
| Developed expertise | Maintenance of key expertise fish ageing |
| Science publications | - |
| General publications | Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS). ICES CM 2012/ACOM:50 |
| Other outputs | - |
| Any links to Wageningen University projects? | No |
| What is relevant for EZ fisheries or ecosystem management? | IMARES needs to maintain its expertise in fish ageing to deliver an internationally approved WOT programme. |

| | |
|---|---|
| Describe collaboration with any partners outside WUR (national) | N.A. |

**SAMENVATTING VOOR KENNIS ONLINE**

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|---|---|
| Non-scientific partners | None |
| Summary and Conclusions of Project | Key expertise fish ageing is crucial for all age structured population dynamic research, including stock assessments and hence fisheries management advice. Maintenance of this key expertise is achieved by international calibration, training and QA procedures. |
| Dutch summary and conclusions | De kernexpertise leeftijdsbepalingen van vissen is van essentieel belang voor alle leeftijds-gestructureerde populatie dynamisch onderzoek, zoals de toestandsbeoordelingen van visbestanden en daarmee de visserijadviezen. Onderhoud van deze kernexpertise wordt bewerkstelligd door internationale kalibratie, training en kwaliteitsborging. |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | Yes. An international fish ageing network is established through the ICES Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS) |
| Who were the international partners? | Research institutes throughout Europe, who are involved in fish ageing of fish species and stocks that are relevant for Dutch research and advice (e.g. ILVO in Belgium, IFREMER in France, DTU Aqua in Denmark, vTI in Germany, IMR in Norway, CEFAS and AFBI in the UK, The Marine Institute in Ireland). |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | N.A. |
| How did the project position IMARES internationally? | Fish ageing performance contributes to the standing of IMARES within international (ICES) network. International coordination and calibration of fish ageing contributes to the quality of ICES work (e.g. stock assessments). |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 40.000,- | 379 | 34.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 2. UNDERPINNING ACOUSTICS |
|---|---|
| Number | KB-14-012-009 |
| Project leader | Sascha Fassler |
| Other researchers in WUR | |
| Researchers outside WUR | |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 35.000 |
| Goals of project | maintaining/expanding acoustic expertise at IMARES |
| Target group for research | within IMARES and with collaborative institutes |

**PROGRESS 2012**

| | |
|---|---|
| Results | Main results : Maintenance of acoustic survey methods in WOT surveys for blue whiting, North Sea and Atlanto-Scandic herring. Collaboration with international partners. Enhancing scientific output. |
| | Products : Presentations and paper drafts to be published in international peer-reviewed Journals (see below); further development and maintenance of R programme library "acousa" to make it more applicable for partners of ICES coordinated surveys; organisation of first IMARES Acoustics Symposium on Texel in September 2012. Initial development of acoustic test system hardware to be used in WOT surveys and other projects. |
| Did the work follow plans (science or financial)? | yes |
| Developed expertise | Enhanced understanding of differences between different sound scattering models through work conducted with colleagues at IMR<br>Investigation into smelt backscatter and diurnal behaviour from acoustic in Lake IJssel |
| Science publications | Draft papers:<br>• "Depth-dependent finite element models of herring (*Clupea harengus*) target strength using magnetic resonance imaging (MRI) of swimbladders"<br>• "Target strength and vertical distribution of smelt *(Osmerus eperlanus*) in the IJsselmeer based on stationary echosounder recordings"<br>• "Mackerel in the North Sea during the feeding stage"<br>Submitted papers:<br>• "Constraints on the Kirchhoff-approximation and Kirchhoff-ray-mode fish swimbladder scattering models"<br>• "Year class strength and subpolar gyre affect blue whiting length distribution on the spawning grounds: mechanisms of population regulation"<br>• "Boarfish (*Capros aper*) target strength modelled from magnetic resonance imaging (MRI) scans of its swimbladder"<br>Published papers:<br>• "Utility of 18 kHz acoustic data for abundance estimation of Atlantic herring (*Clupea harengus*)" |
| General publications | - |
| Other outputs | - |
| Any links to Wageningen University projects? | - |

| | |
|---|---|
| What is relevant for EZ fisheries or ecosystem management? | The developed expertise assists project acquisition (EU FP7 calls) and current work conducted with the fishing industry. |
| Describe collaboration with any partners outside WUR (national) | Through the organised Acoustics Symposium links were strengthened and built up with people working on bio-hydroacoustics at TNO, NIOZ and Leiden University. |

**SAMENVATTING VOOR KENNIS ONLINE**

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|---|---|
| Non-scientific partners | |
| Summary and Conclusions of Project | The project is part of a continuous project aiming to maintain and expanding the expertise in active underwater acoustics research and development at IMARES. It is a fundamental part that helps building links to international partners and therefore keeping the standard up to date. This allows IMARES to retain its position at the forefront of current research in the area. It assures the proficiency of IMARES to fulfil the current and future acoustic monitoring requirements in light of an ecosystem approach to fisheries management. |
| Dutch summary and conclusions | Het project is onderdeel van een continu project voor het onderhouden en ontwikkelen van de expertise actieve onderwater akoestiek bij IMARES. Het is een fundamenteel onderwerp met links naar internationale partners en op die manier de standaard up-to-date te houden. Dit project zorgt ervoor dat IMARES zijn positie in de voorhoede van het huidige akoestische onderzoek behoudt. Het zorgt ervoor dat de bekwaamheid van IMARES blijft voldoen aan de huidige en toekomstige akoestische survey vereisten in het licht van een ecosysteembenadering van het visserijbeheer. |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | Yes |
| Who were the international partners? | Marine Institute (Ireland), IMR & CMR (Norway), NOAA (USA), Ifremer (France), DTU-Aqua (Denmark), Cefas (UK) |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | - |
| How did the project position IMARES internationally? | The project helped to maintain international links by actively participating in on-going research. Without this contribution, IMARES would quickly lose its position and international network. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 35.000,- | 357 | 35.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 3. INTERNATIONAL EXCHANGE |
|---|---|
| Number | KB-14-012-010 |
| Project leader | Cindy van Damme |
| Other researchers in WUR | Ingeborg de Boois, Mark Dickey-Collas, Loes Bolle, Ralf van Hal, Adriaan Rijnsdorp, Ingrid Tulp, David Miller, Niels Hintzen, Christine Röckmann, Bob van Marlen, Sascha Fässler, Sander Florius, Lorna Teal, Thomas Brunel and Ineke Pennock |
| Researchers outside WUR | None directly funded, but this project links IMARES directly into the ICES network. |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 135530 |
| Goals of project | To fund participation in international science networks and ICES meetings. Workshop on Sexual Maturity Staging of Herring and Sprat, Working Group on Data and Information Management, Study Group on Biodiversity, Working Group on Fish Ecology, Working Group on Methods of Fish Stock Assessment, Working Group on Multispecies Assessment Methods, Working Group on operational oceanographic products for fisheries and environment, Study Group on the History of Fish and Fisheries, Working Group on Fishery Systems, Strategic initiative on Stock assessment methods, Working Group on Fisheries-Induced Evolution, Working Group on the Implications of Stock Structure, ICES-FAO Working Group on Fishing Technology and Fish Behaviour, Working Group on Fisheries Acoustic Science and Technology, Study Group on Electrical Trawling, Working Group on Integrating Surveys for the Ecosystem Approach, Workshop on the Identification of clupeoid, flatfish, gadoids and other fish larvae, Working Group on Integrated Assessments of the North Sea. |
| Target group for research | The fisheries science community |

**PROGRESS 2012**

| | |
|---|---|
| Results | Main results : IMARES active participation and contribution to 21 ICES lead workshops and study groups on fisheries, fish ecology, stakeholder involvement, evolutionary effects of fishing, development of new survey methods and age reading. See list of groups below. This brought in added value and technology transfer to the Netherlands |
| | Products : Reports of the various workshops and study groups (see list science publications) |
| Did the work follow plans (science or financial)? | Yes |
| Developed expertise | The developed expertise underpins IMARES research in technical measures, acoustic, fish identification, fish ecology, stock assessment methods, ageing and maturity determination in fish, pulse trawl, evolutionary effects of fishing, data provision, biodiversity and stock structure. |
| Science publications | ICES-ACOM 2012. Report of the Workshop2 on Sexual Maturity Staging of sole, plaice, dab and flounder. 9-13 January 2012. Oostende, Belgium. ICES CM 2012/ACOM:55 REF. PGCCDBS<br>ICES-ACOM 2012. Report of the Workshop on Sexual Maturity Staging of Turbot and Brill (WKMSTB 2012). 5–9 March 2012. IJmuiden, |

Netherlands. ICES 2012/ACOM:56 REF. ACOM, PGCCDBS
ICES-WGDIM 2012. Report of the Working Group on Data and Information Management (WGDIM), 23-25 May 2012. Copenhagen, Denmark. ICES CM 2012/WGDIM:01 REF. SCICOM
ICES- SSGSUE 2012. Report of the Working Group on Interactive Physical-biological and Ecosystem Modelling (WGIPEM). 13–16 March 2012. ICES Headquarters, Copenhagen. ICES CM 2012/SSGSUE:01 REF. SCICOM
ICES-SSGEF 2012. Report of the Working Group on Fish Ecology (WGFE), 22-26 October 2012, Venice, Italy. ICES CM 2012/SSGEF:18
ICES- SSGSUE 2012. Report of the Working Group on Fisheries-Induced Evolution (WGEVO), 1-4 May 2012. Bergen, Norway. ICES CM 2012/SSGSUE:02 REF. SCICOM & ACOM
ICES SSGUE 2012. Report of the Workshop on the Value of Coastal Habitats for Exploited Species (WKVHES) 25-29 June 2012 Copenhagen, Denmark ICES CM 2012/SSGSUE:05 REF. SCICOM, ACOM
ICES-SSGSUE 2012. Working Group on Methods of Fish Stock Assessments (WGMG). 8-12 October 2012 Lisbon, Portugal. ICES CM 2012/SSGSUE:09 REF. SCICOM
ICES- SSGSUE 2012. Report of the Working Group on Multispecies Assessment Methods (WGSAM) 22-26 October 2012. Venice, Italy ICES CM 2012/SSGSUE:10 REF. SCICOM
ICES-SSGSUE 2012. Report of the Working Group on Maritime Systems 12-14 June 2012 Kiel, Germany ICES CM 2012/SSGSUE:07 REF. SCICOM
ICES- SSGESST 2012. Report of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB), 23-27 April 2012. Lorient, France. ICES CM 2012/SSGESST:07 REF. SCICOM, ACOM
ICES- SSGESST 2012. Report of the Study Group on Electrical Trawling (SGELECTRA), 21-22 April 2012. Lorient, France. ICES CM 2012/SSGESST:06 REF. SCICOM & ACOM
ICES-SSGESST 2012. Report of the Study Group on Standards in Ichthyoplankton Surveys (SGSIPS), 8-10 May 2012, Hamburg, Germany. ICES CM 2012/SSGESST:10.
ICES-SSGESST 2012. Report of the Working Group on Fisheries Acoustics, Science and Technology (WGFAST), 23-27 April 2012. Brest, France. ICES CM 2012/SSGESST:09 REF. SCICOM & ACOM
ICES-SSGESST 2012. Report of the Study Group on Calibration of Acoustic Instruments in Fisheries Science (SGCal) 7-8 May 2011 Reykjavik, Iceland ICES CM 2011/SSGESST:13 REF. WGFAST, SCICOM & ACOM
ICES-SSGESST 2012. Report of the Workshop on Egg staging, Fecundity and Atresia in Horse mackerel and Mackerel (WKFATHOM). 8-11 October 2012 and 5-9 November 2012. Vigo, Spain and IJmuiden, the Netherlands. ICES CM 2012/SSGESST:17 REF. SCICOM, WGISUR, WGMEGS & WGWIDE
ICES-SSGESST 2012. Report of the Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR). 24-26 January 2012. IJmuiden, the Netherlands. ICES CM 2012/SSGESST:20 REF. SCICOM, ACOM
ICES-SSGRSP 2012. Report of the Working Group on Integrated Assessments of the North Sea (WGINOSE). 26–30 March 2012 Stockholm, Sweden. ICES CM 2012/SSGRSP:03 REF. SCICOM

| | |
|---|---|
| | ICES-SSGESST 2012. Report of the Workshop on Survey Design and Mackerel and Horse Mackerel Spawning Strategy (WKMSPA) 16-17 April 2012 Galway, Ireland ICES CM 2012/SSGESST:05 REF. SCICOM, WGISUR, ACOM & WGWIDE |
| General publications | See results of group reports at http://www.ices.dk/community/groups/Pages/default.aspx |
| Other outputs | |
| Any links to Wageningen University projects? | No |
| What is relevant for EZ fisheries or ecosystem management? | This programme is core to the maintenance of expertise and quality assurance for fisheries related applied research. |
| Describe collaboration with any partners outside WUR (national) | None |

**SAMENVATTING VOOR KENNIS ONLINE**

| | |
|---|---|
| Non-scientific partners | |
| Summary and Conclusions of Project | IMARES active participation and contribution to 21 ICES lead workshops and study groups on fisheries, fish ecology, stakeholder involvement, evolutionary effects of fishing, development of new survey methods and age reading. This brought in added value and technology transfer to the Netherlands. |
| Dutch summary and conclusions | IMARES actieve deelname en bijdrage aan 21 ICES workshops en studiegroepen over de visserij, vis ecologie, belanghebbenden betrokkenheid, evolutionaire effecten van de visserij, de ontwikkeling van nieuwe onderzoeksmethoden en leeftijd aflezen. Dit bracht toegevoegde waarde en de overdracht van kennis en technologie naar Nederland. |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | Yes, part of ICES |
| Who were the international partners? | Institutes and universities from Belgium, Canada, Denmark (including Greenland and Faroe Islands), Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, the United Kingdom, and the United States of America. Plus links to FAO fisheries units. |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No, but underpins the research behind the Data Collection Framework (DCF Council Regulation (EC) No 199/2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy. |
| How much funding came from these sources? | None |
| How did the project position IMARES internationally? | The project is crucial to maintain IMARES at the cutting edge and the centre of the European network of fisheries research organisations. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 135.530,- | 1153 | 141.502,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 4. PROGRAMME MANAGEMENT AND COMMUNICATION |
|---|---|
| Number | KB-14-012-012 |
| Project leader | Cindy van Damme |
| Other researchers in WUR | Mark Dickey-Collas, Frans van Beek and Rian Schelvis |
| Researchers outside WUR | None |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 24000 |
| Goals of project | To Manage the KB WOT fisheries programme |
| Target group for research | Fisheries advice, research and data collection |

**PROGRESS 2012**

| | |
|---|---|
| Results | Main results : The programme ran according to plans. |
| | Products : Planning and results report |
| Did the work follow plans (science or financial)? | Yes |
| Developed expertise | The programme has maintained and developed expertise to underpin the statutory task of the Netherlands in fisheries research. |
| Science publications | N/A |
| General publications | The planning report for KB WOT fisheries 2013, and the final report for KB WOT 2011.<br>1. The KennisBasis WOT Fisheries Programme carried out in 2011. Final Report. CVO report: 12.005. March 2012.<br>2. insert reference |
| Other outputs | |
| Any links to Wageningen University projects? | N/A |
| What is relevant for EZ fisheries or ecosystem management? | The KB WOT Fisheries programme is fundamental to the maintenance and development of the expertise that underpins the statutory obligations of fisheries monitoring and advice for the Netherlands. The structure of the KBWOT Fisheries programme reflects the recent discussions on the research direction between IMARES, CVO and EL&I. |
| Describe collaboration with any partners outside WUR (national) | N/A |

**SAMENVATTING VOOR KENNIS ONLINE**

| | |
|---|---|
| Non-scientific partners | Fisheries managers and research coordinators in EL&I. |
| Summary and Conclusions of Project | The project manages the KB WOT fisheries programme. |
| Dutch summary and conclusions | Het project beheert het KB WOT visserijprogramma. |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | By its very nature, and due to its embedding in the European Fisheries Policy, fisheries research is highly international. Fish do not observe virtual man-made boundaries. Thus many of the WOT tasks are carried out in collaboration with research organisations from abroad. In particular the research at sea, the sampling of the catches, the development of methods and models and also the international advisory process itself. Thus it is evident that international cooperation is often required to develop the skills base to complete the WOT and maintain quality. All collaboration must conform to the aims and priorities of the WOT programme. |
| Who were the international partners? | Through the KB WOT Fisheries programme IMARES scientists collaborated with scientists from over 35 institutes from a wide range of countries including: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Norway, Poland, Portugal, Russia, Spain, Sweden, United Kingdom, United States of America, Austria, Switzerland, Italy, Greece, Georgia, South Africa, Australia, Greenland and the Faroe Islands. |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | Not in 2012. |
| How much funding came from these sources? | |
| How did the project position IMARES internationally? | N/A |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 24.000,- | 184 | 24.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 5. FMSY TARGETS FOR NORTH SEA DEMERSAL FISHERIES |
|---|---|
| Number | KB-14-012-013 |
| Project leader | Jan Jaap Poos |
| Other researchers in WUR | |
| Researchers outside WUR | |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 120.000 |
| Goals of project | Our aim is to synthesize the progress in different modelling fields by linking different models and derive a full ecosystem model, including the dynamics of the largest source of mortality for most species: the fishery. By doing so, we can exhibit the trade-offs in fisheries management aiming for FMSY in the light of integrated food web interactions and fisheries dynamics |
| Target group for research | There is a science need within the Ministry of ELI for fisheries management in the southern North Sea. The call for MSY management by 2015 made clear that the trade-offs in fisheries management aiming for FMSY that result from the ecosystem complexities needs to be assessed. These trade-offs come from the spatial distributions of target species, incidental bycatch, the North Sea habitats, and the fishery. The reports delivered by the project can be used in the discussion about appropriate MSY targets. |

**PROGRESS 2012**

| | |
|---|---|
| Results | Main results: The project resulted in 3 publications related to the use of MSY in fisheries management. First, there is a publication describing the effects of MSY management plans for flatfish fisheries in the North Sea. Spawning closures at MSY effort were used as a case study. The performance of different scenarios was evaluated using indicators of stock status (spawning stock biomass), economic performance of the fishery (yield, revenue) and ecosystem impact (discards, bycatch of cod and rays, seabed integrity, fisheries-induced evolution). The results indicated that in a single-species context, spawning closures maybe beneficial for the target species, while in a mixed fisheries and ecosystem context, negative effects may occur. A second study focussed on the effects of fuel costs on trawling speeds and navigating speeds within the Dutch beam trawl fleet. Both trawling speeds and navigating speeds have decreased as fuel costs increased. The study also aimed to develop a mechanistic understanding of the observed reduction in fishing speeds. This was only partially successful because the models predicted a stronger decrease than was observed. The findings are important for the use of catch and effort data for sole on which stock assessments and derived MSY levels are based<br>Finally, a third study detailed the use of stakeholder participation in developing models. One of the lessons learnt from studying such stakeholder participation was that it allowed integrating different objectives and analyse trade-offs among those objectives when devising management plans. |

| | |
|---|---|
| Did the work follow plans (science or financial)? | Not all sub-projects have finished in 2012. Owing to planning issues of some team members, analyses of some of the biological parts of the project were only done in the last quarter of 2012. Publication of the results is foreseen in 2013. |
| Developed expertise | One of the highlights of the project is the methodology developed in Rijnsdorp et al 2012, on integrating and visualizing trade-offs between different effects of MSY management plans |
| Science publications | Rijnsdorp AD, Van Overzee HMJ, Poos JJ (2012) Ecological and economic trade-offs in the management of mixed fisheries: A case study of spawning closures in flatfish fisheries. Marine Ecology Progress Series 447, 179-194<br>Poos JJ, Turenhout MNJ, van Oostenbrugge H, Rijnsdorp AD (accepted) Adaptive response of beam trawl fishers to rising fuel cost. ICES Journal of Marine Science.<br>Röckmann C, Ulrich C, Dreyer M, Bell E, Borodzicz E, Haapasaari P, Hauge KH, et al. (2012) The added value of participatory modelling in fisheries management - what has been learnt? Marine Policy 36 (5), 1072-1085 |
| General publications | N/A |
| Other outputs | The resulting publications clearly help in devising advice for future management plans |
| Any links to Wageningen University projects? | The publication on the effects of fuel costs was done in collaboration with LEI. One of the authors on the publication on stakeholder involvement was part of CMP. |
| What is relevant for EZ fisheries or ecosystem management? | Not all sub-projects have finished in 2012. Owing to planning issues of some team members, analyses of some of the biological parts of the project were only done in the last quarter of 2012. Publication of the results is foreseen in 2013. |
| Describe collaboration with any partners outside WUR (national) | One of the highlights of the project is the methodology developed in Rijnsdorp et al 2012, on integrating and visualizing trade-offs between different effects of MSY management plans |

**SAMENVATTING VOOR KENNIS ONLINE**

| | |
|---|---|
| Non-scientific partners | |

| | |
|---|---|
| Summary and Conclusions of Project | The call for "maximum sustainable yield" management by 2015 made clear that the trade-offs in fisheries management aiming for FMSY that result from the ecosystem complexities needs to be assessed. These trade-offs come from the spatial distributions of target species, incidental bycatch, the North Sea habitats, and the fishery. The project contributed to the knowledge base of developing management plans that are in accordance with the MSY requirements for mixed fisheries. This was done in 3 (co-)funded peer-reviewed publications: The first described the effects of MSY management plans for flatfish fisheries in the North Sea. The performance of different scenarios was evaluated using indicators of stock status (spawning stock biomass), economic performance of the fishery (yield, revenue) and ecosystem impact (discards, bycatch of cod and rays, seabed integrity, fisheries-induced evolution). A second study focussed on the effects of fuel costs on trawling speeds and navigating speeds within the Dutch beam trawl fleet. Both trawling speeds and navigating speeds have decreased as fuel costs increased. The findings are important for the use of catch and effort data for sole on which stock assessments and derived MSY levels are based. A third study detailed the use of stakeholder participation in developing models. One of the lessons learnt from studying such stakeholder participation was that it allowed integrating different objectives and analyse and discuss trade-offs among those objectives when devising management plans |
| Dutch summary and conclusions | De transitie naar beheer volgens de "maximaal duurzame oogst" in 2015 heeft duidelijk gemaakt dat de trade-offs in het beheer als gevolg van ecosysteem effecten in ogenschouw genomen moeten worden. Zulke trade-offs worden bepaald door de ruimtelijke verdeling van de doelsoorten van de visserijen, bijvangsten, de Noordzee habitats en de visserijkenmerken. Dit project heeft getracht bij te dragen aan de KennisBasis die nodig is voor de ontwikkeling van beheerplannen volgende de maximaal duurzame oogst. Dit is gedaan in 3 deelstudies die gepubliceerd zijn in wetenschappelijke tijdschriften: De eerste studie beschrijft de effecten van beheerplannen voor Noordzee platvisvisserij. De performance van verschillende scenario's werd geëvalueerd met behulp van indicatoren voor het visbestand( paaibiomassa), de economische performance van de visserij (aanlandingen, opbrengsten) en ecosysteem impact (discards, bijvangsten van kabeljauw en roggen, integriteit van de zeebodem, evolutionaire selectiedruk als gevolg van visserij). Een tweede studie heeft zicht toegespitst op de effecten van brandstofkosten op de vissnelheid en stoomsnelheid van de Nederlandse boomkorvloot. Zowel vissnelheid en stoomsnelheid zijn afgenomen als gevolg van de stijgende brandstofkosten. Deze resultaten zijn belangrijk omdat de aanlandings en visserij-inspannings gegevens van de Nederlandse boomkorvloot gebruikt worden voor de bestandsschattingen en schattingen voor de maximaal duurzame oogst van tong. Een derde studie richtte zich op de inbreng van stakeholders in de ontwikkeling van visserijmodellen. Een van de belangrijke punten die uit dit onderzoek naar voren kwam is dat dat zulke inbreng het mogelijk maakt om verschillende doelstellingen voor het beleid die belangrijk zijn voor de visserij te integreren. Tevens kunnen trade-offs samen met de visserijsector geanalyseerd en besproken worden in de ontwikkeling van beheerplannen. |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | The publication on stakeholder involvement was an international effort with many partners, led by an IMARES team member. |
| Who were the international partners? | DTU Aqua, DIALOGIK, CEFAS, Portsmouth Business School, University of Helsinki, IMR, HCMR |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | Yes, the publication on stakeholder participation was funded by EU FP7 project JAKFISH (contract no. 212969) |
| How much funding came from these sources? | |
| How did the project position IMARES internationally? | These publications have already caught attention in STECF and likely will be used in future evaluations of MSY management plans |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 120.000,- | 1085 | 120.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 6. ATLAS OF THE FISHES OF THE NORTHERN EUROPEAN SHELF |
|---|---|
| Number | KB-14-012-015 |
| Project leader | Henk Heessen |
| Other researchers in WUR | |
| Researchers outside WUR | Jim Ellis (CEFAS, Lowestoft UK) |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 25000 |
| Goals of project | To publish a fish atlas, initially as a book, later the information should become available through the internet. |
| Target group for research | Even in 2011, our 1993 Atlas is being used as an example: an atlas for the Barents Sea was published by Norwegian and Russian colleagues earlier this year, and was based on our 1993 atlas. |

**PROGRESS 2012**

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|---|---|
| Results | Main results : Progress made with the organisation of the project. Co-authors were approached to write species-accounts.<br>Drafts were written of the introductory chapters. 50 (out of a total of 200) species-accounts were written. |
| | Products : Draft texts of part of the Atlas. |
| Did the work follow plans (science or financial)? | Yes, but progress is slower than expected. |
| Developed expertise | |
| Science publications | expected mid 2014 |
| General publications | |
| Other outputs | |
| Any links to Wageningen University projects? | No |
| What is relevant for EZ fisheries or ecosystem management? | The final Atlas will provide easy access to overviews per species of all fish species relevant for fisheries in the NE Atlantic and for nature management in the area. |
| Describe collaboration with any partners outside WUR (national) | |

**SAMENVATTING VOOR KENNIS ONLINE**

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|---|---|
| Non-scientific partners | |
| Summary and Conclusions of Project | Funds were used to further the production of the Atlas. In all, 50 out of 200 species accounts (description of distribution and natural history) have been written. Drafts have been produced of the introductory chapters of the Atlas. |
| Dutch summary and conclusions | De beschikbare uren zijn gebruikt om verder te schrijven aan delen van de Atlas. In totaal zijn nu 50 soortbeschrijvingen (verspreiding en biologie) gemaakt. Van de inleidende hoofdstukken zijn eerste concepten geschreven. |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | Yes |

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|---|---|
| Who were the international partners? | CEFAS Lowestoft |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | - |
| How did the project position IMARES internationally? | As a key player in the analysis of data from trawl surveys |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 25.000,- | 183 | 25.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 7. HABITAT QUALITY OF FORAGE FISH FROM ACOUSTIC MULTIFREQUENCY INFORMATION (HAQUAFAMI) |
|---|---|
| Number | KB-14-012-016 |
| Project leader | Sascha Fassler |
| Other researchers in WUR | |
| Researchers outside WUR | S.M. Lusseau (Marine Scotland Science) and P. Ruardij (NIOZ) |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 31360 |
| Goals of project | To infer abundance of planktonic organisms from acoustic multifrequency data; use plankton production in combination with a physiological model (DEB) to model habitat quality of organisms at higher trophic levels; to investigate the link between annual variability in production, habitat quality (based on DEB) and realised spatial dynamics of forage fish (acoustic data). Herring will be used as an example forage fish species. |
| Target group for research | The project will address the value of acoustic multifrequency methods to deliver data for the ecosystem approach. This is a relatively novel approach and would place IMARES at the forefront of this particular field of research. Results will trigger further applications of multifrequency acoustic data to be used in ecosystem modelling. |

**PROGRESS 2012**

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|---|---|
| Results | Main results: Possibility to filter out macrozooplankton from standard multifrequency acoustic survey data. Resulting plankton maps can be used with Dynamic Energy Budget (DEB) model to predict habitat quality of forage fish such as herring. |
| | Products : Macrozooplankton bi-frequency algorithm implemented in acoustic post-processing software EchoView. Presentation and conference paper presented at ICES ASC 2012 in September in Bergen. Plankton maps of the northern North Sea 2003-2010. |
| Did the work follow plans (science or financial)? | yes |
| Developed expertise | Plankton acoustics<br>DEB parameters for North Sea herring |
| Science publications | Fässler, S.M.M., L.R. Teal, S.M. Lusseau and P. Ruardij. 2012. Determining herring habitat quality from acoustically derived zooplankton abundance in the northern North Sea. ICES CM 2012/B:04 |
| General publications | - |
| Other outputs | - |
| Any links to Wageningen University projects? | - |

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| What is relevant for EZ fisheries or ecosystem management? | The project provided some very useful ways to make use of the high-resolution acoustic survey data standardly collected to produce abundance and distribution information on "fish food" (macrozooplankton). This is likely to become more important in the future when innovative ways will be needed to make use of existing survey data in the light of increased data needs for the ecosystem approach to management.<br>A point to note is that during Imares acoustic surveys, only usable data are collected at one standard frequency to support minimum data requirements to produce abundance estimates of the "target fish" species. This is due to the limited acoustic surveying capabilities of the research vessel Tridens – the installation of an acoustic drop keel would improve this situation. |
| Describe collaboration with any partners outside WUR (national) | Collaboration took place with partners at NIOZ who have expertise in a North Sea ecosystem model (Ersem) to be used with the DEB modelling done in this project. |

**SAMENVATTING VOOR KENNIS ONLINE**

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| Non-scientific partners | None |
| Summary and Conclusions of Project | Most acoustic fish surveys commonly collect usable data at several frequencies. This is done primarily to facilitate "target fish" species identification and distinction from other fish based on different sound scattering properties at different frequencies. Indeed, acoustic data contain qualitative and quantitative information on various trophic levels within an ecosystem, ranging from plankton to larger predators. Generally, however, backscatter information coming from plankton or other non-target fish species is currently discarded. In this project a bi-frequency algorithm was applied to multi-frequency data collected in the northern North Sea during acoustic surveys for herring from 2003 to 2010. This algorithm can be used to identify acoustic backscatter coming from macrozooplankton. The method allowed production of high-resolution maps of distributions, abundances and biomass of macrozooplankton in the northern North Sea. Forage fish species like herring feed directly on macrozooplankton, which are mainly composed of copepods or euphausids. Knowledge about the location and abundance of food (macrozooplankton) and environmental conditions (temperature) can then for example be used to identify preferable habitat for herring. A Dynamic Energy Budget (DEB) model was used to estimate food intake requirements of herring, given prey abundance and temperature, and consequently map the quality of the habitat in the survey area. |
| Dutch summary and conclusions | |

**INTERNATIONAL**

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| Was the project part of an international network? | Yes |
| Who were the international partners? | Marine Scotland Science (Aberdeen, UK) |

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| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | Yes, EU FP7 project "Vectors" |
| How much funding came from these sources? | The KBWOT project served as co-funding for the EU project |
| How did the project position IMARES internationally? | IMARES increased its status internationally in the field of acoustic monitoring of the wider ecosystem and plankton identification from acoustic survey data. The presentation of the project results at the ICES Annual Science Conference was well received and triggered fruitful discussions for further work. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 31.360,- | 330 | 31.360,- | |
| R&D en Licentie ed. | | | | |
| Anders, nl .... | | | | |
| Totaal | | | | |
| Toelichting budget | - | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 8. Phytoplankton abundance and productivity impacts the distribution of pelagic fish and has consequences for fisheries |
|---|---|
| Number | KB-14-012-017 |
| Project leader | Sven Gastauer |
| Other researchers in WUR | |
| Researchers outside WUR | |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 40120 |
| Goals of project | This project will provide insight into the spatial and temporal variability of phytoplankton standing stock and associated primary production in the ocean and its impact on exploitation and management of fish. It will use information from MODIS AQUA,ENVISAT MERIS and NOAA satellites. Existing knowledge of the spatial dynamics of the fish populations, satellite observations, VMS and survey data will be combined to explore interactions between primary producers, fish and fisheries. The project will thereby assess the roles of both phytoplankton standing stock and primary production in delimiting the distribution and migrations of the feeding fish and the areas fished. |
| Target group for research | The project will address the value of acoustic survey data in combination with auxiliary data such as satellite information on chlorophyll and work towards the development of novel approaches enhancing the value of survey data. |

**PROGRESS 2012**

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|---|---|
| Results | Main results : Possibility to link acoustic survey data with auxiliary data sources and development of automated scripts to analyse such datasets, in order to increase our knowledge on interaction of different trophic levels as well as the influence of the environment on the latter noted. |
| | Products :<br>Automated scripts to link acoustic survey data with satellite data and GAMs to analyse the relationship between different datasets. Presentation and conference paper presented at ICES ASC 2012 in September in Bergen. Phytoplankton maps of the North Sea 2003-2010. |
| Did the work follow plans (science or financial)? | yes |
| Developed expertise | Remote sensing<br>GAM modelling |
| Science publications | Gastauer, S., M. Dickey-Collas, N. Davaasuren, N. Hintzen, T. Brunel and S. Fässler. 2012. Phytoplankton abundance and productivity impacts the distribution of herring in the North Sea. ICES CM 2012/B:07 |
| General publications | |
| Other outputs | |
| Any links to Wageningen University projects? | |
| What is relevant for EZ fisheries or ecosystem management? | The project developed novel ways to enhance the value of available survey data to analyse the effects of environmental parameters on fish stocks. The development of such tools is very likely to become more relevant with regards to a more ecosystem based approach and the collection of more environmental datasets. |

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| Describe collaboration with any partners outside WUR (national) | |

**SAMENVATTING VOOR KENNIS ONLINE**

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| Non-scientific partners | |
| Summary and Conclusions of Project | Acoustic survey data can be linked with auxiliary data sources, including information about temperature, salinity, chlorophyll and zooplankton data developed with the HAQUAFAMI project. Generalised additive models (GAM) were developed to reveal the relation between these factors and herring distribution. No direct relation was found between phytoplankton and the distribution of herring in the entire North Sea, but a strong negative relationship could be found between zooplankton and phytoplankton concentration in the Northern North Sea. Similarly herring abundance was shown to be closely linked with zooplankton concentrations. This might be an indication that at the time where herring occurs in the area of the Northern North Sea, most of the chlorophyll has already been transformed into zooplankton. Herring showed a preference for lower temperatures in the North Sea.<br>Further the linkage of acoustic survey with VMS data showed a good overlay of both datasets, indicating that no major parts of the stock were missed out by the survey. |
| Dutch summary and conclusions | |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | |
| Who were the international partners? | - |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | - |
| How much funding came from these sources? | - |
| How did the project position IMARES internationally? | IMARES increased its international renowned status in the field of developing novel techniques to analyse complex datasets and work on the improvement of monitoring methodologies. The presentation of the project results at the ICES Annual Science Conference was well received and triggered fruitful discussions for further work. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 40.120,- | 385 | 40.120,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 9. QUALITY CONTROL OF MATURITY STAGING AND EGG IDENTIFICATION OF MARINE FISH |
|---|---|
| Number | KB-14-012-019 |
| Project leader | Cindy van Damme |
| Other researchers in WUR | Loes Bolle, Ingeborg de Boois, Sieto Verver, Edwin van Helmond, Sebastian Uhlmann and technicians |
| Researchers outside WUR | Participants in the ICES workshops. |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 31720 |
| Goals of project | Quality control and maintaining the high standard of maturity staging, egg identification and fecundity estimation of the routine samplings carried out by IMARES.<br>Ensuring a good education of technicians in maturity staging, egg identification and fecundity estimation |
| Target group for research | Results will be published in the 3 ICES workshop reports |

**PROGRESS 2012**

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|---|---|
| Results | Main results : Two workshops (chaired by Cindy van Damme and Ingeborg de Boois) were organised. Three technicians from IMARES participated in both workshops. Both resulted in new and updated internationally agreed maturity staging scales for plaice, sole, dab, flounder, brill and turbot. Staging exercises showed that the agreement in fresh fish was much higher compared to staging from pictures. Highest agreement was reached in the period two months before and during the spawning. Outside this period macroscopic maturity staging is uncertain.<br>The end of the year a workshop on egg staging and fecundity estimation of mackerel and horse mackerel (chaired by Cindy van Damme) was organised. Three technicians from IMAREs participated in the workshops. Agreement in egg staging and identification increased in the second round. Mackerel eggs were overestimated by 2% and horse mackerel eggs by 1%. The workshops resulted in manuals for sampling at sea and fecundity and atresia analyses. |
| | Products : Reports of the various workshops, maturity staging scales and manuals for sampling at sea and fecundity and atresia analysis. |
| Did the work follow plans (science or financial)? | yes |
| Developed expertise | IMARES technicians have been trained and calibrated in maturity staging of plaice, sole, dab, flounder, brill and turbot, fish egg identification and fecundity and atresia analysis. |

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|---|---|
| Science publications | ICES-ACOM 2012. Report of the Workshop2 on Sexual Maturity Staging of sole, plaice, dab and flounder (WKMSSPDF2). 9-13 January 2012. Oostende, Belgium. ICES CM 2012/ACOM:55 REF. PGCCDBS<br>ICES-ACOM 2012. Report of the Workshop on Sexual Maturity Staging of Turbot and Brill (WKMSTB 2012). 5–9 March 2012. IJmuiden, Netherlands. ICES 2012/ACOM:56 REF. ACOM, PGCCDBS<br>ICES-SSGESST 2012. Report of the Workshop on Egg staging, Fecundity and Atresia in Horse mackerel and Mackerel (WKFATHOM). 8-11 October 2012 and 5-9 November 2012. Vigo, Spain and IJmuiden, the Netherlands. ICES CM 2012/SSGESST:17 REF. SCICOM, WGISUR, WGMEGS & WGWIDE |
| General publications | Of each workshop an IMARES Nota with has been published with results of the workshop. |
| Other outputs | N/A |
| Any links to Wageningen University projects? | N/A |
| What is relevant for EZ fisheries or ecosystem management? | Maturity staging, egg identification and fecundity estimations are core to the data collected in the WOT routine samplings. These data are used by multiple ICES assessments groups for assessing SSB. The validation results will give a good estimate of the variation in the collected data. |
| Describe collaboration with any partners outside WUR (national) | These workshops are ICES coordinated international workshops. |

**SAMENVATTING VOOR KENNIS ONLINE**

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|---|---|
| Non-scientific partners | |
| Summary and Conclusions of Project | IMARES scientists chaired and technicians participated in three workshops (WKMSSPDF2, WKMSTB and WKFATHOM). The workshops resulted in new and updated international agreed maturity staging scales. IMARES technicians were trained in maturity staging of sole, plaice, dab, flounder, turbot and brill, fish egg staging and identification and fecundity and atresia estimation of mackerel and horse mackerel. |
| Dutch summary and conclusions | IMARES onderzoekers hebben 3 workshops georganiseerd en voorgezeten en IMARES assistenten hebben deel genomen aan WKMSSPDF2, WKMSTB en WKFATHOM. Nieuwe maturity staging schalen zijn ontwikkeld en gekalibreerd. IMARES assistenten zijn getraind in het bepalen van maturity stage van tong, schol, schar, bot, tarbot en griet, en het identificeren en ontwikkelingsstadia bepalen van viseieren en bepalen van fecunditeit en atresia van makreel en horsmakreel. |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | Yes, the workshops were coordinated by ICES. |
| Who were the international partners? | ICES participants in flatfish sampling and the mackerel and horse mackerel egg survey. |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | ICES coordinated flatfish surveys, market and discard sampling and ICES coordinated mackerel and horse mackerel egg surveys. |
| How much funding came from these sources? | No financial support. |

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| How did the project position IMARES internationally? | IMARES scientists organised and chaired these successful international ICES coordinated workshops. Calibration exercises showed that IMARES technicians do well in maturity staging, egg identification and staging and fecundity and atresia estimation. Agreement with other international participants was high. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 31.720,- | 353 | 31.720,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 10. ACOUSTIC SHELLFISH MAPPING |
|---|---|
| Number | KB-14-012-020 |
| Project leader | Karin Troost |
| Other researchers in WUR | Margriet van Asch, Emiel Brummelhuis, Johan Craeymeersch, Narangerel Davaasuren, Douwe van den Ende |
| Researchers outside WUR | Vera van Lancker and Matthias Baeye of MUMM Belgium. |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 40040 |
| Goals of project | Objectives of the project are:<br>study the ability to discern different types of seafloor (e.g. mud, sand, gravel, shellfish beds infaunal and epifaunal) using multibeam acoustic sounding system;<br>assess the applicability of multibeam for stratified sampling in the coastal zone: will it optimize the sampling strategy and enhance efficiency?<br>determine what will is needed to develop this innovative technique within IMARES and to apply it for stock assessments of shellfish and possibly other benthic communities (expertise, software, etc.)<br>determine with whom to cooperate in future regarding availability of multibeam equipment and analysis techniques |
| Target group for research | The report will be shared within IMARES and to other parties if requested. If the contents allow for it, the results will be shared with the international scientific community by means of a peer-reviewed paper |

**PROGRESS 2012**

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| Results | Main results :<br>- Multibeam image of a section of seafloor in the Voordelta;<br>- Data on shellfish occurrence at 179 sampling stations in the same area (sampled with two different sampling gears);<br>- An overview of multibeam data collected in the Dutch coastal zone by specialised companies and an estimate of costs involved;<br>- A correlation between multibeam data and shellfish occurrence;<br>- Preliminary results indicate that bottom types where Ensis beds occur can be detected with multibeam (parameter Moran's-I); |
| | Products: A report describing all results and implications for the WOT surveys. |
| Did the work follow plans (science or financial)? | Not entirely. First plans were to correlate multibeam data with presence of shellfish from the annual WOT survey. However, only few stations with high density of *Ensis* sp. were present in locations where we found a signal in the multibeam image. In November the area surveyed with multibeam was monitored again according to 179 stations in a dense sampling grid using both boxcore and bottom dredge at each station. This dataset was ideal for this study and we therefore postponed all analyses until the data were available. The data only became available at the beginning of December and therefore only preliminary results are ready to date (December 21st 2012). |
| Developed expertise | Analyses methods for multibeam images and correlations with shellfish occurrence. |
| Science publications | None. Whether this will be done still depends on the final results. |

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| General publications | Troost, K., M. van Asch, M. Baeye, E. Brummelhuis, N. Davaasuren, D. van den Ende, V. Van Lancker. 1013. KBWOT 2012: the use of an acoustic technique in mapping beds of razor clams (*Ensis* sp.). CVO report: CVO report 13.001 |
| Other outputs | None. |
| Any links to Wageningen University projects? | No. |
| What is relevant for EZ fisheries or ecosystem management? | Innovative techniques such as multibeam offer solutions for optimizing stratification and thereby efficiency of shellfish surveys. Acoustic techniques may be the only way to map biogenic structures such as shellfish beds in subtidal areas. We analysed whether multibeam offers a solution and is practically applicable. |
| Describe collaboration with any partners outside WUR (national) | None. |

**SAMENVATTING VOOR KENNIS ONLINE**

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| Non-scientific partners | None. |
| Summary and Conclusions of Project | Results are still preliminary but indicate that Ensis beds are not detected by multibeam but bottom types where Ensis beds occur may be detected. |
| Dutch summary and conclusions | De voorlopige resultaten laten zien dat Ensis banken niet gedetecteerd kunnen worden met multibeam, maar bodemtypen waarin Ensis banken voorkomen mogelijk wél. |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | We collaborated internationally with MUMM Belgium (Management Unit of the North Sea Mathematical Models) for the acquisition of multibeam data. |
| Who were the international partners? | Vera van Lancker and Matthias Baeye of MUMM Brussels. |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No. |
| How much funding came from these sources? | None. |
| How did the project position IMARES internationally? | The results will strengthen the leading position of IMARES in benthos monitoring. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 40.040,- | 401 | 40.040,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 11. (RE)MOVING THE GOALPOSTS |
|---|---|
| Number | KB-14-012-021 |
| Project leader | David Miller |
| Other researchers in WUR | Aukje Coers |
| Researchers outside WUR | - |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 30000 |
| Goals of project | Simplify fisheries management. |
| Target group for research | Propose an alternative to short term management in relation to long term single species target reference points. |

**PROGRESS 2012**

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| Results | Main results: A detailed methodology for running hind casts of alternative management measures was developed. Historical data needed to run and assess the results of the hind cast models were compiled |
| | Products: R code for retrospectively testing alternative management procedures, compiled data of historical ICES management regimes, draft paper to be fully developed in 2013. |
| Did the work follow plans (science or financial)? | In part. The budget of this project was reduced by 40%, this changed the focus to ensuring the methodology and work plan were in place to complete the work in 2013. |
| Developed expertise | Hind cast modelling of management strategies (a useful tool for studying management), improved understanding and knowledge of the ICES management regimes of the past. Work on this project in part served to develop the skills of IMARES employees working on ICES stock management projects. |
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| Science publications | None yet.<br>Hindcasting management of flatfish in the North Sea: is a stable management regime necessary? In prep. |
| General publications | Miller, D.C.M., 2012. (Re)moving the goalposts. ICES CM 2012/K:16 |
| Other outputs | |
| Any links to Wageningen University projects? | |
| What is relevant for EZ fisheries or ecosystem management? | It will aid the development of the ICES advisory process. Reference points underpin most of the single species stock advice currently given by ICES, but these will need to be rethought as ICES moves towards a more integrated ecosystem management approach. The conducted work will hopefully provide some insight into using 'soft' targets rather than hard-wired single values. |
| Describe collaboration with any partners outside WUR (national) | |

**SAMENVATTING VOOR KENNIS ONLINE**

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| Non-scientific partners | |
| Summary and Conclusions of Project | This project did not develop as far as hoped. On a reduced budget a |

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| | methodology and work plan were developed. This has lead to the development of R code that can be used to test the original hypotheses with an aim to publishing in 2013. This work aims to evaluate the impact of changing over-arching management regimes on the potential performance of a fish stock and fishery by evaluating what-if scenarios and comparing them to what has been achieved in the past. Simplified alternatives to fixed targets are examined. |
| Dutch summary and conclusions | |

**INTERNATIONAL**

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|---|---|
| Was the project part of an international network? | No |
| Who were the international partners? | |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | |
| How did the project position IMARES internationally? | Work on this project was discussed at various international (ICES) meetings. It is hoped that the eventual publication of the paper on this will be well received within Europe. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 30.000,- | 300 | 30.000,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 12. DEB REPRODUCTION MACKEREL AND HORSE MACKEREL |
|---|---|
| Number | KB-14-012-022 |
| Project leader | Cindy van Damme |
| Other researchers in WUR | Lorna Teal, Tessa van der Hammen |
| Researchers outside WUR | Bas Kooijman, VU, Netherlands; Alberto Murta, IPIMAR, Portugal; Ander Thorsen, IMR, Norway; Teunis Jansen, DTU Aqua, Denmark |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 32340 |
| Goals of project | Develop the reproductive part of the DEB model for mackerel and horse mackerel |
| Target group for research | The DEB model would give the possibility to model reproduction in the years between the egg surveys |

**PROGRESS 2012**

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|---|---|
| Results | Main results: DEB parameters for both mackerel and horse mackerel were estimated using MATLAB routines from Kooijman (VU). Subsequently, these parameters were used to model the amount of energy going into reproduction per year depending on temperature and food availability. |
| Did the work follow plans (science or financial)? | Yes |
| Developed expertise | The reproductive part of the DEB model has been developed and can be run for one spawning season. DEB parameters for Mackerel and Horse mackerel have been estimated, which can also be used for other DEB questions. |
| Science publications | |
| General publications | None yet |
| Other outputs | Extension of the DEB model with the reproductive part. |
| Any links to Wageningen University projects? | MEECE |
| What is relevant for EZ fisheries or ecosystem management? | It will aid the ICES assessment of mackerel and horse mackerel based on the WOT surveys. It can in the future also be used for other species, such as plaice, for which ICES egg surveys are also conducted. |
| Describe collaboration with any partners outside WUR (national) | Bas Kooijman (VU) provided help and expertise on the DEB modelling and development of the reproductive part of the DEB model. Alberto Murta (IPIMAR), Ander Thorsen (IMR) and Teunis Jansen (DTU Aqua) provided data and knowledge on mackerel and horse mackerel fecundity and reproduction. |

**SAMENVATTING VOOR KENNIS ONLINE**

| | |
|---|---|
| Non-scientific partners | |
| Summary and Conclusions of Project | Data on reproduction and fecundity as well as other life history parameters of mackerel and horse mackerel from various sources was collected. The DEB parameters were estimated using this data. The reproductive part of the DEB model was developed and the data was used for validating the model. The reproductive part can be run for mackerel and horse mackerel for one spawning season. Model runs for one spawning season to investigate effects of changes in temperature. |
| Dutch summary and conclusions | DEB parameters zijn geschat met behulp van parameters uit de literatuur en uit onze eigen databases. Gegevens over reproductie en fecunditeit van |

| | |
|---|---|
| | makreel en horsmakreel uit verschillende bronnen zijn verzameld. Het reproductie onderdeel van het DEB model werd ontwikkeld en de gegevens gebruikt voor de validatie van het model. Het reproductie deel kan worden gerund voor makreel en horsmakreel voor één paaiseizoen. Het model geeft de mogelijkheid om gedurende één paaiseizoen te onderzoeken wat de effecten van veranderingen in temperatuur zijn op de reproductie van makreel en horsmakreel. |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | Yes, through ICES. |
| Who were the international partners? | IPIMAR, Portugal, IMR, Norway and DTU Aqua, Denmark |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | - |
| How did the project position IMARES internationally? | IMARES is one of the few institutes with the unique DEB fish reproduction expertise. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 32.340,- | 342 | 32.340,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS

| Title | 13. COMPARING DIDSON AND SEAGIS VIDEO IMAGES FROM THE ACOUSTIC BLIND ZONE |
|---|---|
| Number | KB-14-012-023 |
| Project leader | Sven Gastauer |
| Other researchers in WUR | |
| Researchers outside WUR | |
| Length of project | 1-1-2012 t/m 31-12-2012 |
| Budget | 24520 |
| Goals of project | Develop methods to survey the acoustic blind zone<br><br>Evaluate the performance of the acoustic DIDSON camera and the SEAGIS stereo video camera system (recently acquired by IMARES; www.seagis.com.au) in our area of application |
| Target group for research | The project will analyse the use of acoustic DIDSON camera and optical camera systems to observe the upper water layer missed out by traditional acoustic methods. Such is a relatively new approach and would place IMARES at the forefront of this particular field of research. |

**PROGRESS 2012**

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| Results | Main results :<br>Both systems are delivering results which are difficult to compare as their optimal working conditions have different prerequisites. Calibrating the DIDSON is impossible at this moment. Both systems cannot be used as standard equipment during acoustic surveys, as the travelling speed is way too high. Mini surveys executed in the North Sea during the herring acoustic survey though suggest that the amount of fish missed out by traditional acoustic methodology is negligible. |
| Did the work follow plans (science or financial)? | yes |
| Developed expertise | Multibeam acoustics |
| | Behaviour of fish in near surface layers during the HERAS survey |
| Science publications | |
| General publications | |
| Other outputs | Target strength measurements of a standardised sphere from the DIDSON |
| Any links to Wageningen University projects? | |
| What is relevant for EZ fisheries or ecosystem management? | The project largely increased our knowledge on the functioning of the DIDSON acoustic camera, pointing out its main strengths but also its limitations. The project was an important step towards a more extensive use of multibeam acoustic systems and leading to an improved planning of future projects. |
| Describe collaboration with any partners outside WUR (national) | |

**SAMENVATTING VOOR KENNIS ONLINE**

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|---|---|
| Non-scientific partners | Collaboration took place with the producers of the DIDSON, discussing results and technical details of the system, Myrix, the producers of Echoview, one of the standard acoustic post-processing software package, towards the development of automatisation algorithms for target detection |

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|---|---|
| | on multibeam echograms used during this project. |
| Summary and Conclusions of Project | The project clearly showed that at the moment the DIDSON is largely underused within IMARES. It was pointed out that through the usage of state of the art software packages and algorithms automated target detection and length estimates can be done effectively. Comparing the DIDSON to camera systems proved to be more difficult than expected due to a lack of conditions allowing both systems to work effectively, further only under much supervised conditions a comparable space can be observed at the same time, allowing a direct comparison. When used in open waters, of the North Sea, virtually no targets were detected by any of the two systems, leading towards the conclusion that the amount of fish missed by traditional acoustic methodology during the North Sea herring survey is negligible. |
| Dutch summary and conclusions | |

**INTERNATIONAL**

| | |
|---|---|
| Was the project part of an international network? | Yes |
| Who were the international partners? | Marine Scotland Science (Aberdeen, UK) |
| Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes? | No |
| How much funding came from these sources? | |
| How did the project position IMARES internationally? | IMARES increased its status internationally in the field of experimental acoustics and the use of multibeam systems. The discussion of findings within ICES working and expert groups, were well received and ended up in fruitful discussions towards the development of future projects. |

**FINANCIEEL & UREN**

| (in 1.000 euro's) | Begroot 2012 (geld) | Begroot 2012 (uren) | Gerealiseerd 2012 (geld) | Gerealiseerd 2012 (uren) |
|---|---|---|---|---|
| KB | 24.520,- | 250 | 24.520,- | |
| R&D en Licentie ed. | | | Bedrag* | |
| Anders, nl .... | | | Bedrag* | |
| Totaal | | | Bedrag* | |
| Toelichting budget | | | | |

* = gebaseerd op (en aangeleverd door) financiële administratie via BAS