WAGENINGEN UR
For quality of life

Stichting DLO
Centre for Fishery Research (CVO)

The Kennisbasis WOT Fisheries Programme carried out in 2010
Final Report

Mark Dickey-Collas and Frans van Beek

CVO report: 11.005

Commissioned by:
EL&I Directie DKI
PO Box 20401
2500 EK Den Haag

Project number:	KB WOT Fisheries 2010 Programme
BAS code:	KB-01-019
Publication date:	April 2011

Stichting DLO
Centre for Fishery Research (CVO)
P.O. Box 68
1970 AB IJmuiden
Phone. +31 (0)317-487418
Fax. +31 (0)317-487326

Visitor address:
Haringkade 1
1976 CP IJmuiden

CVO rapport UK V4

Table of Contents

Summary

The KBWOT Fisheries programme is core 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 KBWOT 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 programme operates through long term projects (multiannual) and annual projects in response to scientific and societal needs. The KBWOT 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.

In 2010 the KBWOT fisheries programme consisted of 16 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 EL&I, with more broad strategic research aimed at future policy development and research needs of EL&I. In the field of fisheries, many of these future needs come from existing or upcoming EU directives. Examples of operational research projects include an investigation of discarding of larger fish in the beam trawl fishery, a study of ways to measure pelagic fish biomass and researching traps for glass eel monitoring. Whereas work on the interaction of smelt populations, investigations of the long term growth and genetics of eel and research into fish reproduction illustrate the more strategic approach. KBWOT fisheries also provides 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 and maturity estimation techniques (maintaining standards in both are crucial to the maintenance of the quality of fish stock assessments). Likewise, the fisheries acoustic expertise with WUR was underpinned through the programme.

Of the 16 projects funded in 2010, twelve were carried out in collaboration with European and North American 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 and Cost action projects (see FACTS, FINE and FRESH). 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.

The programme was also very productive in terms of publications, presentations and developing new methods or tools for fisheries research. Over 35 international presentations were given at working groups and symposia. 14 new methods or codes were developed including new approaches for investigating fisheries discards, optical methods for investigating spawning origin of marine fish, new applications for acoustic survey algorithms, methods to consider fish interactions within a changing environment and a new approach to estimating the impact of porpoises on small fish populations (forage fish).

Also in 2010, the programme leadership had discussions with fisheries managers and research directors from LE&I to look at the future of the KBWOT fisheries research. This lead to changes in the approach taken in 2011 and a stronger collaboration between EL&I and IMARES on development and targeting of future research needs.

Samenvatting

Het KB programma voor de WOT visserij levert de basis voor het onderhoud en de ontwikkeling van kennis en expertise die nodig is om de wettelijke verplichte taken die betrekking hebben op de visserij in Nederland uit te voeren. Aangezien er in de loop der tijd veranderingen kunnen optreden in de WOT is het noodzakelijk dat het KBWOT-programma flexibel blijft en kan inspelen op nieuwe beleidsbehoeften en de ontwikkelingen en innovaties in methoden. Uitgangspunt van het programma is het handhaven van expertise waarbij tevens naar de toekomst wordt gekeken, een kost effectieve programmering van het onderzoek en goede contacten met klant ministeries. Het programma bestaat uit zowel meerjarige als eenjarige projecten welke anticiperen op wetenschappelijke en maatschappelijke kennisbehoeften. Het visserij programma KBWOT moet ook functioneren in het kader van de hervorming van het gemeenschappelijk visserijbeleid (GVB), de ontwikkeling van de EU mariene strategie kaderrichtlijn (KRM) en het maritieme beleid van de EU.

In 2010 bestond het KBWOT visserij programma uit 13 projecten. De belangrijkste thema's in het programma waren: de veranderingen in de mariene ecosystemen, de gevolgen van de visserij op ecosystemen en het veranderende beheer van de visserij. Een deel van de activiteiten was gericht op het handhaven en verder ontwikkelen van de belangrijkste expertises die in de WOT worden gebruikt en het uitwisselen van wetenschappers en technologie op internationaal niveau waarmee toegevoegde waarde wordt verkregen.

In het programma dat in 2010 is uitgevoerd, zijn we erin geslaagd om onderzoek, gericht op urgente vragen van EL&I te combineren met meer breed strategisch onderzoek gericht op de toekomst. Op het gebied van visserijbeheer zijn vooral bestaande of in ontwikkeling zijnde EU-richtlijnen richting gevend aan de te ontwikkelen toekomstige kennisbehoefte. Voorbeelden van onderzoeksprojecten gericht op urgente vragen waren gericht op het discardprobleem van grotere vis in de boomkorvisserij, een studie naar methoden om pelagische visbestanden te meten en een methode om lichtvallen in te zetten bij de monitoring van glasaal. Meer strategische projecten waren gericht op de interactie van zandspiering populaties, onderzoek naar de historische veranderingen in de groei en genetica van paling en onderzoek naar de voortplantingsstrategie van vis. Een deel van het KBWOT visserij budget wordt gebruikt voor het onderhouden van de expertise die nodig is de WOT visserij programma uit te voeren zoals standaardiseren, harmoniseren en verbeteren van technieken voor de bepaling van de leeftijd en geslachtrijpheid van vissen. Het handhaving van internationale normen hierbij zijn cruciaal voor de kwaliteit van toestandsbeoordeling van visbestanden en daarmee voor de kwaliteit van de advisering ten aanzien van het beheer. Ook de ontwikkeling en vernieuwing van akoestische expertise, die gebruikt wordt bij bestandsopnamen op onderzoeksvaartuigen, is ondersteund door het programma.

Van de 13 projecten die in 2010 werden gefinancierd, werden twaalf uitgevoerd in samenwerking met Europese en Noord-Amerikaanse partners. Dit leverde een grote hoeveelheid toegevoegde waarde voor het programma omdat op deze wijze middelen en expertise uit andere landen bijdroegen aan het strategische WUR onderzoek. De toegevoegde waarde werd ook verhoogd door het combineren van KB fondsen met die uit het EU KP7 en COST netwerk (FACT, FINE en FRESH). Een onderdeel van het programma is specifiek gewijd aan internationale samenwerking. Dit zorgt ervoor dat WUR op het snijvlak van wetenschappelijke ontwikkelingen en in het centrum van het visserijonderzoek in Europa blijft. Dit project, genaamd "international exchange", stelde WUR collega's in staat om deel te nemen aan de studies over sterfte van vislarven, predator-prooi interacties, ecosysteem modellering, regime verschuivingen in de Noordzee, visserij geïnduceerde evolutie, ontwikkeling van nieuwe methoden voor toestandsbeoordelingen van visbestanden, verbetering van survey- (inclusief plankton surveys) en visserij technologieën, evaluatie van de beheersmaatregelen voor de verschillende vis bestanden en mariene biodiversiteit.

Het programma was ook productief in de vorm van publicaties, presentaties en het ontwikkelen van nieuwe methoden en hulp middelen voor visserijonderzoek. Er zijn meer dan 35 internationale presentaties gegeven voor werkgroepen en symposia. Bovendien zijn 14 nieuwe methoden of modellen ontwikkeld met inbegrip van nieuwe benaderingen voor discardonderzoek, een methode om de oorsprong te bepalen van een individuele vis (welke paaipopulatie), nieuwe toepassingen voor acoustic survey algoritmen, methoden om vis interacties binnen een veranderende omgeving te bestuderen en een nieuwe benadering om de impact van bruinvissen op populaties van kleine vissoorten (prooivis) te schatten.

Met het oog op de afstemming van het KBWOT visserijonderzoek naar de toekomst heeft de programmaleider in 2010 overleg gevoerd met beleidsmedewerkers van EL&I (AKV en DKI) over de te verwachten toekomstige vragen van het visserijbeheer. Dit overleg heeft geleid tot aanpassingen van het programma in 2011. Ook heeft het overleg bijgedragen aan een sterkere samenwerking tussen EL&I en IMARES in het ontwikkelen en sturen van de kennisbehoefte in de toekomst.

1 Introduction to The KB WOT Fisheries Programme

The KBWOT Fisheries programme is a core to the maintenance and development of expertise to underpin the statutory obligations of the Netherlands in fisheries monitoring and advice. It is an annually reviewed multiannual programme with clear objectives and deliverables. As the WOT obligations of the Netherlands change over time, the KBWOT fisheries 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 operates within the overall WUR KB programmes. Within WUR, kennisbasis is classified in seven themes. The kennisbasis for the WOT related to fisheries is in theme 1: "groen-blauwe ruimte" which translates to use of the green and blue space.

The fishery WOT tasks cover the advice and actions required to support the national and European fishery policy. 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 where relevant to fisheries. The tasks include the collection of information and data, the development of understanding and the provision of evidence based advice. It is necessary to anticipate the future needs of EL&I and the EU when developing the structure of the kennisbasis WOT programme. Importantly for the kennisbasis programme in 2011, the EU is attempting to move towards a gradual implementation of the ecosystem considerations into fishery management and the next reform of the CFP. This is also true for the national policy. Thus KB WOT fisheries 2011 must respond to these needs.

The KBWOT Fisheries programme has an active policy of underpinning the key-expertise required to carry out the statutory tasks, and of encouraging the further development the expertise needed to complete those tasks. The development and maintenance of this knowledge and expertise base is 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 common fisheries policy (CFP) and the fisheries component of marine strategy framework directive (MSFD). It is hoped that the programme will combine operational research, aimed at some immediate challenges to EL&I, with more broad strategic research aimed at future policy development and research needs of EL&I. In the field of fisheries, many of these future needs come from existing or upcoming EU directives.

In a practice the KB WOT resources are 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). Also to maintain and underpin key expertise to carry out the WOT programme and improve the efficiency of carrying out the WOT tasks. In addition the programme strives to maintain/enforce the scientific reputation of the research organisation carrying out the statutory tasks and build international links and to add research value via co-finance initiatives.

2 The Programme in 2010

The research priorities for 2010 were based on the perceived needs of the WOT programme. Within these research priority areas, the maintenance of key expertise necessary to WOT takes priority, followed by the development and innovation required for future WOT work, then part of the available resources can be used for strategic purposes using added research value via co-financing of other funding sources.

It is crucial for the provision of robust science that the research be cutting edge and innovative. EL&I requires advice and services that can stand international scrutiny and also be forward looking. Therefore innovation is an important core component of the KB WOT programme. For the maintenance of the scientific reputation of IMARES and for quality control of the research; scientific, peer reviewed, publications are essential. A small part of the KB-WOT budget will be used for stimulating publishing of research which supported the WOT programme. Also a small 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 KBWOT Fisheries in 2010:

a) influence of changes in the environment on marine ecosystems

b) impact of the fishery on ecosystems

c) changing fishery management

d) maintenance and international exchange of key WOT expertise

2.2 The rationale for the choice of research areas

The productivity of the sea changes over a range of temporal scales. These changes interact with anthropogenic pressure to make the fisheries system dynamic and sometimes unpredictable. There have been many recent, well documented, changes in the aquatic ecosystems, some are inter-annual variability and some are trends over time. Different parts of an ecosystem can become stronger or weaker with time (e.g. a move from demersal to pelagic production of fish in the North Sea). Some of these changes reflect regular cycles (e.g. salt waters flows into the Baltic, or the Atlantic Multidecadal Oscillation) whereas others are trends associated with longer term change. Some of these changes have been attributed to climate change. An understanding of the cause, variability and magnitude of change is important for a manager. This understanding will allow a proper assessment of risk, an analysis of the probability of stock recovery (or what is over exploitation), and hopefully to distinguish between anthropogenic and non-anthropogenic effects on the ecosystem.

IMARES, in recent years, has developed a significant amount of knowledge on the impact of fisheries on the ecosystem. However there is still a need for further knowledge to assist managers. In 2010, EU legislation will oblige Member States to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Also EU legislation is under development to reduce the amount of discarding. Resources from kennisbasis have been used to prepare for this international obligation. As this is a wide research area, projects will be carefully selected to address 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.

In many ways current fisheries management needs to change. The EU has recently progressed from the management of fish stocks to fisheries management. The EU, and national governments, are also expecting greater flexibility in the provision of advice and the terms in which the advice is given. The

obligation for biological and economic data collection of fish and fisheries data by the Member States has been adjusted accordingly. The international advisory framework for fisheries is in a state of flux and is looking at new possibilities for managers, and this includes the management of fishing effort as well as catch. The Kennisbasis WOT resources will be used to develop new approaches to management and management models. Resources are also required for the development and adjustment of data collection, data storage and data access. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications.

Further, kennisbasis resources will be put aside for the maintenance and quality control of the present expertise base and routine techniques and skills. IMARES needs to maintain core competencies. This covers age reading, stock assessments, acoustic techniques and data collection. Courses, workshops and exchanges are an important part of maintaining and developing core skills. The sharing and gaining of experience is a core part of the development of fisheries science within the EU, through study and working groups and workshops usually coordinated by ICES. These 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 2010.

The following projects were funded in 2010 by KBWOT Fisheries. Descriptions of these projects can be found at (www.kennisonline.wur.nl/kennisonline/projecten2010/Thema.aspx?id=862).

BAS code	Title	Project leader
KB-01-019-005-IMARES	Forage Fish Interactions (FACTS EU FP7)	Dickey-Collas, Mark
KB-01-019-018-IMARES-1	Fisheries Induced Evolution (FINE EU Network)	Rijnsdorp, Adriaan
KB-01-019-015-IMARES	Exchange populations of smelt	Tulp, Ingrid
KB-01-019-017-IMARES	Assessments of pelagic fish	Damme, van, Cindy
KB-01-019-004-IMARES	Underpinning Acoustics	Fassler, Sascha
KB-01-019-014-IMARES	Fish aging, quality and standards	Bolle, Loes
KB-01-019-016-IMARES	Ecological fish Atlas Britain	Heessen, Henk
KB-01-019-012-IMARES	Light trap glass eel	Graaf, de, Martin
KB-01-019-013-IMARES	European eel populations	Dekker, Willem
KB-01-019-009-IMARES	Spatial planning North Sea	Poos, Jan Jaap
KB-01-019-018-IMARES	Adaptive changes	Poos, Jan Jaap
KB-01-019-008-IMARES	Fish reproduction (FRESH EU COST Action)	Dickey-Collas, Mark
KB-01-019-007-IMARES	KB WOT International exchange	Dickey-Collas, Mark
KB-01-019-006-IMARES	KB WOT Programme Management	Dickey-Collas, Mark
KB-01-019-010-IMARES	Discarding marketable plaice	Bierman, Stijn
KB-01-019-011-IMARES	Sexual maturity staging of sole, plaice, dab and flounder	Damme, van, Cindy

The total budget over €621000 was expended in 2010.

3 The Highlights of the Programme

The diversity and breath of the programme ensures that there are many highlights and benefits to WOT, WUR and EL&I.

3.1 Science for Fisheries Management

The new population of anchovy in the North Sea (since 1995) comes from increased productivity of local populations and not from a move northwards of Bay of Biscay anchovy. The increased productivity is probably due to increased water temperatures providing a longer window for larval development and less severe winters allowing anchovy juvenile to survive. So the management of Bay of Biscay anchovy, does not need to consider factors in the North Sea and the stocks are not greatly connected. This work was supported through FACTS and International Exchange.

Mechanism for describing the underlying stock structure of herring populations were developed which provide input for our understanding of within stock dynamics and biodiversity. This has allowed us to demonstrate large interannual variability in within-population dynamics. It also means that methods can now be developed to investigate the appropriateness of the management of Downs herring by an area TAC, separate of North Sea herring.

A mechanistic, process-based model of the energetics of plaice provides an step towards simulations of how environmental changes affect spatial distributions. This is key to the sustainable management of marine living resources, for instance to explore how climate change and human impacts interact and affect connectivity of essential fish habitats and population persistence and allows the concept of spatial fishing behaviour to be brought into alignment with fish distributions.

3.2 Novel Insights

Advances in our understanding of the spawning behaviour of herring and horse mackerel were made, which can be applied directly to both population simulations and surveys of the stocks. New work has also taken place that suggests that it is the food environment that helps determine the regulations of egg development of fish in temperate waters.

The KBWOT programme showed that the concept that limited age structure in fish populations results in less or more variable fish recruitment could not be proven with empirical evidence. Some fish stocks showed reduced recruitment with a reduced age structure in the population, but they were in the minority. This raises questions for some of the accepted paradigms in fisheries management.

Anchovy in the North Sea are planktivorous but are much more generalist than either herring or sprat. This suggests that there is limited direct competition.

No salt water smelt have been found in the IJsselmeer, however freshwater smelt have been found in the inshore Waddenzee, but not further out. This suggests that the interconnectedness of the two populations (marine and freshwater) may be more complex than originally thought.

3.3 Tools and method development

A new computer code was developed to analyse the discarding behaviour of highgrading. This is being applied to the beam trawl fishery.

An algorithm for the acoustic detection of mackerel was tested. This will potentially provide a new tool for surveying mackerel.

An ecogenetic model was developed to investigate the impact of area closure for fishing on the plaice population. This is supported by a new R library for ecogenetic studies.

The programme has shown that DNA can be extracted from archives of eel otoliths (ear bones) which will provide us the information required to track population demographics of European eel.

Through FACTS, the programme is developing new operational models that estimate the biological and economic trade-offs associated with various exploitation strategies of forage fish stocks in the North Sea (herring, sprat, sandeel, Norway pout and anchovy).

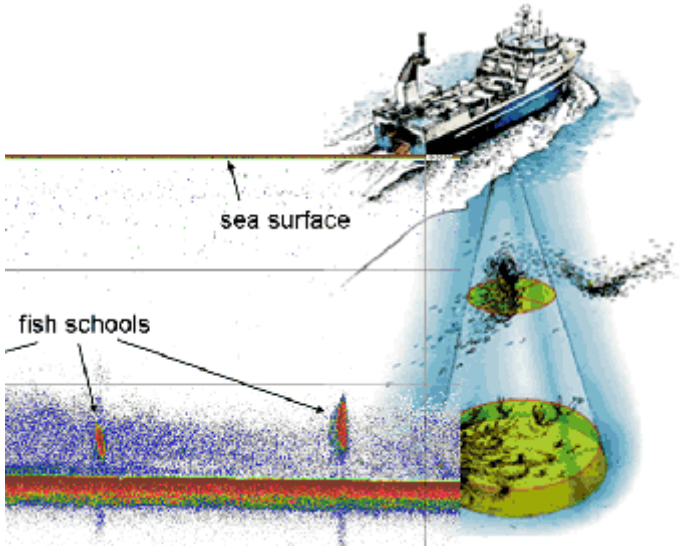
The development of eel light traps demonstrate that these light traps could, at most, be used to determine relative seasonal patterns glass eel recruitment but are not a suitable replacement for or even an improvement on the traditional lift net programme.

Advances were made in developing a dynamic energy budget models to calculate size, temperature, and food density dependant growth rates allow assessing the spatial differences in growth potentials for varying size classes of fish under different temperature and food conditions. These were linked to an evolutionary algorithm (including growth and mortality) to predict the annual migration cycles.

3.4 Standardisation of techniques and quality control

Advances were made in a pan European approach to fish ageing and maturity staging of flatfish (sole, plaice, dab and flounder), pelagic fish (herring, mackerel and blue whiting) and eel. IMARES is at the centre of drives to standardise monitoring of these variable, which form the most important input data in stock assessments.

Improvement of storage of acoustic survey data and the building of an R library (computer code) for the analysis of acoustic information and data transfer.



3.5 Recent Publications resulting from KBWOT Fisheries

The following peer reviewed publications resulted from the KB WOT Fisheries programme in 2010:

Brunel, T. (2010). Age-structure-dependent recruitment: a meta-analysis applied to Northeast Atlantic fish stocks. ICES Journal of Marine Science, 67: 1921–1930.

Damme, Dickey-Collas, Rijnsdorp & Ksejbu (submitted).Reproductive strategies and fecundity type regulation through food availability in marine fish. Can J Fisheries & Aquatic Science

Dickey-Collas, M., Somarakis, S., Witthames, P.R., Damme, C.J.G. van, Uriarte, A., Lo, N.C.H, Bernal, M. (in press). Where do egg production methods for estimating fish biomass go from here?. Journal of Fisheries Research

Hofstede R, Hiddink JG, Rijnsdorp AD (2010). Regional warming changes fish species richness in the eastern North Atlantic Ocean. Marine Ecology Progress series 414: 1-9

Mollet, FM, Brunel, T., Ernande, B., Rijnsdorp, AD. 2010. Multiple life history traits (growth, maturation and reproduction) estimated simultaneously in individuals. Oikos 119: 10-26.

Petitgas, Alheit, Peck, Raab, Irigoien, Huret, van der Kooij, Pohlmann, Wagner, Zarraonaindia & Dickey-Collas (submitted) An exploration of anchovy dynamics of anchovy expansion in the North Sea. ICES Journal of Marine Science

Raab, K Nagelkerke LAJ, Boerée, C; Rijnsdorp AD Temming A Dickey-Collas M (2011). Anchovy *Engraulis encrasicolus* diet in the North and Baltic Seas. J Sea Res 65 131–140.

Raab, K Nagelkerke LAJ, Boerée, C; Rijnsdorp AD Temming A Dickey-Collas M (submitted). Comparison of the diets of anchovy, sprat and herring in the North Sea. Marine Ecology Progress Series.

Rijnsdorp AD, van Damme CJG, Witthames PR (2010). Implications of fisheries-induced changes in stock structure and reproductive potential for stock recovery of a sex-dimorphic species, North Sea plaice. ICES Journal of Marine Science 67: 1931-1938

Röckmann C., Dickey-Collas M., Payne M. R., van Hal R. (2011). Realized habitats of early stage North Sea herring – looking for signals of environmental change. ICES Journal of Marine Science 68: 537–546. (resulting from KBWOT 2009 programme)

Sebastian Uhlmann, Stijn Bierman, Edwin van Helmond (in press). Controlling data quality of Dutch discard at-sea sampling programmes: a mixed-model approach. ICES journal of Marine Science.

van Walraven, L, Mollet FM, van Damme CJG, Rijnsdorp AD. 2010. Fisheries-induced evolution in growth, maturation and reproductive investment of the sexually dimorphic North Sea plaice (Pleuronectes platessa L). Journal of Sea Research 64: 85-93.

In addition a further twelve manuscripts for submission are in preparation. There are also over 40 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.

The reports of all of the KBWOT Fisheries 2010 projects can be viewed at:
http://www.kennisonline.wur.nl/kennisonline/projecten2010/Thema.aspx?id=862

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 tasks must be 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 16 projects funded in 2010, twelve were carried out in collaboration with European and North American partners. This provided a large amount of added value to the programme, as resources and expertise from other countries contribute to the WOT research strategy. Added value was also increased by combining KB funds with those from EU FP7 and Cost action projects (see FACTS and FRESH). 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 35 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 KBWOT 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 2010. 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. In 2010, the programme leadership had discussions with fisheries managers and research directors from LE&I to look at the future of the KBWOT fisheries research. This has led to changes in the approach taken in 2011 and a stronger collaboration between EL&I and IMARES on development and targeting of future research needs, whilst maintaining the strategy for the science direction of IMARES.

The programme for 2011 has been published and some of the 2010 projects will continue in 2011.

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

Signature

Report CVO 11.005
Projectnumber: KBWOT Visserij

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

Signature:

Date: April 2011