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Report of the KB-WOT fisheries programme carried out in 2009

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Summary

This report documents the activities of the KB WOT fisheries programme carried out in 2009. It gives the results, products and documents the experience gained by staff through the programme. It also shows how the individual projects fit into the research priority areas of WOT fisheries programme for 2009. The finances spent are also documented in light of the experience and knowledge gained. The report also describes how KB WOT funding was used to maintain quality assurance for methods crucial for the WOT programme as a whole. It also shows how important international collaboration is to the KB WOT aims and objectives. Added value was achieved by using KB WOT funds within EU projects on climate variability, fish reproduction and the influence of fisheries on fish populations.

Two major KB WOT projects finished in 2009, RECLAIM and FISHACE. RECLAIM looked at the influence of climate change on fish. It showed that most previous published studies had been naive in their interpretation of the influence of climate change. By failing to account for the energetic and physiological consequences of a warming environment the projected responses of fish, suggested by earlier studies, were probably oversimplified and unlikely. Likewise the failure to account for changes in wind associated with climate change was an oversight especially in areas such as the southern North Sea. It could be possible that the wind fields would have as big an effect as the changes in temperature on the marine environment. FISHACE looked at Fisheries-induced adaptive change and fisheries management. It explored the issue of the unforeseen consequences of fishing on fish evolution and responses to exploitation. The project resulted in two articles published in Science. It showed that the way a population is fished (selectivity and timing) should be considered as important as how much overall fishing pressure it experienced. It proposed a new approach to assessing the impacts of fisheries on fish stocks.

KB WOT has encouraged innovation through the use of new methods for sampling and analysis and the development of new ideas. As a result of innovation one project now suggests that the biomass of bivalves in the Waddenzee is twice as high as previously estimated. At its core, the KB WOT programme has ensured that the future science needs of WOT and LNV are being anticipated and addressed. It is also ensuring that the key expertise required for the WOT fisheries commitments are maintained and the degree of experience held by scientists is increased.

Overall the 2009 programme should be viewed as a success in terms of stimulating innovation, looking forward for the requirements of LNV and society in the future, creating relevant products and publications, stimulating an international view and underpinning the knowledge base of fisheries science at IMARES. A major review of the programme is planned for April 2010 and this hopes to improve the quality of science, stimulate innovation and improve the relevance of research to advisory needs.

Samenvatting

Dit rapport is een voortgangsrapportage van het KB WOT visserijprogramma dat in 2009 is uitgevoerd. Het rapport presenteert de resultaten, de producten en vermeldt de verkregen expertise. Het laat ook zien hoe de individuele projecten pasten binnen de onderzoeksprioriteiten van het WOT Kennisbasisprogramma voor 2009. Tevens wordt aangegeven hoe KB financiering werd gebruikt om expertise te onderhouden die nodig is voor het uitvoeren van het WOT programma. Het laat ook zien hoe internationale samenwerking in belangrijke mate bijdraagt aan deze doelstellingen. Een toegevoegde waarde werd bereikt door KB middelen in te zetten voor EU- projecten over klimaat, visreproductie en de invloed van de visserij op de visstand.

Twee grote KBWOT- projecten, die in 2009 werden afgerond, waren RECLAIM en FISHACE. RECLAIM onderzocht de invloed van klimaatverandering op vis. Het toonde aan dat de meeste recente publicaties over dit onderwerp in hun interpretatie van de invloed van klimaatverandering naïef waren geweest. Door geen rekening te houden met energische en fysiologische gevolgen van een warmer wordende omgeving, zijn de gevolgen, zoals in eerdere studies werden voorspeld, niet reëel en waarschijnlijk te eenvoudig voorgesteld. Geen rekening houden met veranderingen in wind die met klimaatsveranderingen zijn geassocieerd, bijvoorbeeld, is een ommissie vooral in gebieden zoals de zuidelijke Noordzee. Het is zeer goed mogelijk dat de windrichting een even groot heeft op het mariene milieu als veranderingen in temperatuur. FISHACE onderzocht de onvoorziene gevolgen van visserij op de genetisch aanpassing van vissoorten als reactie op exploitatie. Het project resulteerde in twee publicaties in het tijdschrift Science. Het onderzoek toonde aan dat de manier waarop de vispopulaties worden geëxploiteerd (selectiviteit en timing) even belangrijk is als de mate van visserijdruk. Er wordt een nieuwe benadering voorgesteld met betrekking tot de beoordeling van de effecten van visserij op visbestanden.

Het KB WOT programma Visserij heeft innovatie gestimuleerd door het toepassen van nieuwe methodes voor bemonstering en analyse en het ontwikkelen van nieuwe ideeën. Als gevolg hiervan wordt bijvoorbeeld de biomassa van schelp–dieren in de Waddenzee tweemaal hoger geschat dan voorheen. Het KB WOT programma zorgt er voordurend voor dat in de toekomstige wetenschaps¬behoeften voor WOT en LNV wordt voorzien. Het zorgt er ook voor dat de belangrijkste expertise die nodig is voor de WOT gehandhaafd blijft en dat de kwaliteit van de expertise wordt verbeterd.

Over het geheel bekeken is het programma van 2009 succesvol geweest in het bevorderen van vernieuwing, het anticiperen op toekomstige behoeften van LNV en de maatschappij, het opleveren van relevante producten en publicaties, het stimuleren van een internationale aanpak en het versterken van de kennis binnen IMARES. In april 2010 is een evaluatie van het KB-WOT programma gepland met het oog de verbetering van de wetenschappelijke kwaliteit en de relevantie voor de WOT.

Introduction

As a result of (inter)national commitments and agreements, The Netherlands is obliged to carry out research in fisheries science and advice. These statutory tasks are covered by the Ministry of Agriculture, Nature and Food Quality (LNV) programme WOT-05. The statutory tasks in fisheries (WOT) are carried out by the Centre of Fisheries Research (CVO) which exploits the resources and expertise from the Wageningen Institute of Marine Resources and Ecosystem Studies (IMARES). To maintain the infrastructure required to carry out these tasks, and to help anticipate future strategic needs, a separate programme within IMARES has been established (Kennisbasis WOT). The programme is part of the larger Kennisbasis programme carried out by Wageningen UR and has been developed in consultation with LNV.

This report describes outcome of the project support from the Kennisbasis WOT fisheries programme in 2009. The available budget in 2009 was €621 000. The programme concentrated on four research priority areas which have been identified to cover the major marine policy areas in the near future

1. influence of changes in the marine environment on marine ecosystems
2. impact of the fishery on ecosystem
3. changing fishery management
4. maintenance and international exchange of key WOT expertise

All of these areas fall under the wider WUR kennisbasis themes. A review of these themes will take place in 2010 in collaboration with the LNV, IMARES and international fisheries experts. To maximise the productivity of the KB WOT programme, some of the funding was allocated as co-financing (matching funding). Only projects that advance our understanding of the KB WOT four research priority areas (see above) are considered suitable for this approach. This approach adds value to the KB WOT programme. In addition exchange with other Europe Institutes and laboratories was encouraged to improve technology transfer and develop the experience base. All the projects carried out in 2009 were reviewed and agreed by the KB WOT permission team and must be seen to fit into the overall WOT programme. The reasoning behind the selection process of the KB WOT projects is fully described in Dickey-Collas and van Beek (2009)[1].

[1] Dickey-Collas & van Beek (2009). Kennisbasis Wettelijke Onderzoeks taken programme 406 in 2008 IMARES report to LNV.

Financing

In 2009, € 621 000 of the € 621 000 was spent. The allocation of funds to priority research areas was as projected (see below). In terms of adding value, by using KB WOT funds as co-financing for EU projects, over €200K of extra funding was added to the KB WOT programme in 2009 through the projects RECLAIM, FINE and FRESH.

Findings, consequences and implications of the KB WOT programme 2010

The KB WOT programme in 2009 successfully developed new techniques, underpinned existing knowledge, discovered new information and enabled expertise transfer. Our understanding and expertise increased in all four priority research areas of KBWOT. The international profile and collaborations also increased in 2009 (Table 1). The strength of the work within KBWOT is that it closely works with ICES and other regional bodies to ensure that the research can be applied and is relevant to management and advice. In fact over two thirds of the projects involved a high degree international collaboration with scientists, institutes and organisations across Europe. Links with Russia, Canada and the USA were also increased. Research publications came from the majority of projects. The research also crossed from shellfish to finfish, from system wide to process studies.

Two major KBWOT projects finished in 2009, RECLAIM and FISHACE. RECLAIM looked at the influence of climate change on fish. It showed that most previous published studies had been naive in their interpretation of the influence of climate change. By failing to account for the energetic and physiological consequences of a warming environment the projected responses of fish, suggested by earlier studies, were probably over simplified and unlikely. Likewise the failure to account for changes in wind associated with climate change was an oversight especially in areas such as the southern North Sea. It could be possible that the wind fields would have as big an effect as the changes in temperature on the marine environment. The KBWOT 2009 programme also showed that fisheries can impact populations in unexpected ways. The work on fisheries induced adaptive change and fisheries management has stimulated much debate and has received international recognition (FISHACE). The project explored the issue of the unforeseen consequences of fishing on fish evolution and responses to exploitation. The project resulted in two articles published in Science. It showed that the way a population is fished (selectivity and timing) should be considered as important as how much overall fishing pressure it experienced. It proposed a new approach to assessing the impacts of fisheries on fish stocks.

KB WOT fisheries programme has encouraged innovation through the use of new methods for sampling and analysis and the development of new ideas. New techniques for sampling glass eels at low abundances have been investigated and new models developed to consider species interactions and also the influence of changes in natural mortality on fish stocks. At its core, the KB WOT programme has ensured that the future science needs of WOT and LNV are being anticipated and addressed. The project on net and tank slippage in the pelagic fishing fleet pre-empted the needs of LNV as it deals with the issue at European level in 2010. Likewise the drive to build an approach to marine invasive species demonstrates a forward looking approach to future advisory roles. The programme also ensures that the key expertise required for the WOT fisheries commitments are maintained and the degree of experience held by scientists is increased.

The link between KB WOT and the ICES system also means that research on elasmobranches, fish ecology, multispecies interactions, system analysis, individual based modelling, fishing

technology, stock assessment method development etc can lead to improvements in advice that have not been passed through the standard stock assessment route and address the ecosystem approach. An example of this is the use of KB WOT science and research to answer OSPAR questions via the ICES fish ecology and multispecies working groups. Likewise the research to address ecosystem regime change in the North Sea, as illustrated by the anchovy outburst, has benefited from the international links.

We consider that the specific targeting of relevant research areas, within the fisheries and marine environment context, has resulted in a KBWOT fisheries programme in 2009 that has provided strong support for the WOT research and address the research needs of LNV. This approach will be further developed in 2010 with a planned major review of the programme in April probably leading to a restructuring of the research areas. This will hopefully lead to a greater ability to foresee the research needs in fisheries, stimulate innovation, and also improve the quality and relevance of the science.

International Collaboration

The KBWOT values international collaboration as a way to further develop in house expertise. Most projects involved partners from outside the Netherlands (Table 1).

Table 1. Selected and major collaborations (both national and international) from the KBWOT 2009 programme.

Institute/Organisation	Country	KB WOT project no.
NIOZ, Texel, The Netherlands	The Netherlands	D2
Wageningen, Animal Sciences Group	The Netherlands	A2
University of Amsterdam	The Netherlands	B3
Institute for Agricultural and Fisheries Research	Belgium	D2, D3
International Institute for Applied Systems Analysis (IIASA, Laxenburg)	Austria	B1, D3
Department of Fisheries and Oceans (DFO, St Johns)	Canada	C3, D3
Technical University of Denmark AQUA	Denmark	A1, B1, B3, C3, D2, D3
University of Aalborg	Denmark	A1, B1, D3
Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France	A1, B1, B2, B3, D2, D3
Heinrich-Heine Universität Düsseldorf	Germany	B1
University of Hamburg	Germany	A1, A2, B3, D3
Hellenic Centre for Marine Research	Greece	C3
Marine Research Institute	Iceland	C3, D2, D3
University of Reykjavik	Iceland	B1, D2, D3
International Council for the Exploration of the Sea (ICES)	International Body	A1, A2, B3, D2, D3
Northwest Atlantic Fisheries Organisation (NAFO)	International Body	C3
Marine Institute (MI Galway)	Ireland	C3, D2, D3
University of Bari	Italy	B1
Institute of Marine Research (IMR, Bergen)	Norway	A1, B1, B3, D2, D3
University of Bergen	Norway	A1, B1, B3, D3
Sea Fisheries Institute/Morski Instytut Rybacki	Poland	C3, D2, D3
Instituto Português de Investigação das Pescas e do Mar	Portugal	C3, D2, D3
AZTI-Tecnalia	Spain	A1, A2, B1, C3, D2, D3
Consejo superior de investigaciones cientificas (Vigo)	Spain	C3, D2, D3
Instituto Español de Oceanografía (Vigo, Cadiz, Madrid)	Spain	A1, A2, C3, D3
University of Cadiz	Spain	A2, C3, D3
University of Stockholm	Sweden	B1, D3
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK	A1, B3, C3, D2, D3
Marine Scotland Science (Aberdeen)	UK	A1, B3, C3, , D3
Sir Alister Hardy Foundation for Ocean Science (SAHFOS, Plymouth)	UK	A2, D3
University of Aberdeen	UK	B3, C3, D3
University of Liverpool	UK	C3, D3
NOAA Fisheries - National Marine Fisheries Service	USA	C3, D3

Priority Research Area A. Influence of changes in the marine environment on marine ecosystems

Planned Budget: € 175 000. Realised Budget: € 175 000

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 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.

The role of ecosystem variability and climate change within the provision of fisheries advice is expected to increase. This has been specifically mentioned as a goal by the International Council of the Exploration of the sea (ICES). There is a need to build up expertise in this field. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications.

A1 KB WOT RECLAIM - Resolving climatic impacts on fish stocks [4302501601]

Both KB WOT and the EU funded the project RECLAIM which investigated climate change in relation to fisheries. The project began in 2007 and 2009 was its final year. RECLAIM has developed an operational conceptual framework regarding climate change and its impacts on the productivity and distribution of fish and shellfish populations. The framework described the relationships of abiotic and biotic factors on fish dynamics. It used biophysical modelling and ecotypology of species to look at ecosystem impacts.

RECLAIM has made some important progress in our understanding of the likely effects of climate change on fish and fisheries. It has shown that previous approaches were naive in that they concentrated on the effect of temperature on distribution and depth of fish. They have not accounted for the impact of climate change on physiological and community interactions. They also have not accounted for life cycle closure. RECLAIM showed that you must consider these factors when investigating the potential impact of climate change. Previous studies also usually assumed that climate change will influence the system through temperature change and have yet failed to consider the impact of changes to wind and precipitation. In the southern North Sea, wind and precipitation are very important drivers of the processes in the marine ecosystem. They are also two factors that are the very difficult to predict in future climate scenarios. Although substantial progress was made by RECLAIM in developing ecosystem individual based models (e.g. to model the survival of fish eggs and larvae), RECLAIM showed there are still substantial

obstacles to overcome to successfully "down-scale" the global climate model to the regional scale.

Specifically to the Netherlands, RECLAIM showed that attributing the recently observed changes in growth and distribution of North Sea plaice to warming seas was also naive. By using eco-physiological models, it was shown that it is a complex interaction of energy allocation, warming waters and distribution resulted in the growth changes, not temperature alone. Likewise with herring, whilst RECLAIM showed that temperature changes are unlikely to effect the distribution of juvenile and adult herring; temperature will and does effect their growth and the interaction of temperature, larval energetics and prey availability probably results in changes in larval mortality, thus recruitment strength.

2009 was a very productive year for this project with six major reports created which are now being turned into peer review publications.

1. Changes in key hydrodynamic features including connectivity among regions
2. Changes in fish recruitment and related ecosystem attributes across regions
3. Climate effects on distribution and production of species of contrasting ecotypes
4. Cross mapping and statistical analyses quantifying the likely impacts of climate change on suitable habitat for different life stages of key species in different regions
5. The effects of future climate change on the physical oceanography and comparisons of the mean and variability of the future physical properties with present day conditions
6. The response to climate change of fish populations with complex life cycles

Importantly RECLAIM has taken our understanding of how climate change will impact fish and fisheries beyond the idea that "things will change". It has looked closely at the physiological and life history closure of fish and compared these factors to the likely changes in oceanography. Another important part of the project was outreach to the fishing industry and RECLAIM scientists have shown their results to many of the fisheries Regional Advisory Councils (RACs). A full detailed final project report is now being constructed for both the EU and KBWOT.

Published papers from RECLAIM include:

Brunel T & Dickey-Collas, M (in press) Effects of temperature and density dependence on Atlantic herring growth: a macro-ecological analysis. MEPS

Hal van R., Smits K., Rijnsdorp A.D. 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research. doi:10.1016/j.seares.2009.10.008

Hinrichsen, HH, Dickey-Collas, M, Huret, M, Peck, MA & Vikebø, F (in press). Evaluating the suitability of coupled bio-physical models for fishery management. ICES J Mar Sci

Petitgas P, Huret M, Léger F, Peck MA, Dickey-Collas M, Rijnsdorp AD. 2009. Patterns and schedules in hindcasted environments and fish life cycles. ICES CM 2009/E:25.

Rijnsdorp AD, Peck MAP, Engelhard G., Pinnegar JK 2010. Resolving climate impact on fish. ICES Cooperative Research Report. (in press)

Rijnsdorp AD, Peck MA, Engelhard GH, Möllman C, Pinnegar JK. 2009. Resolving the effect of climate change on fish populations. ICES Journal of Marine Science, 66:1570-1583

Other manuscripts submitted or in preparation:

Hufnagl, M., Peck., M.A., Dickey-Collas, M, Nash, R.D.M. Pohlmann, T. (in prep). Climate-driven, Bottom-up Control of North Sea Herring Recruitment. Fisheries Oceanography

Röckmann C., Dickey-Collas M., Payne M. R., van Hal R. (submitted). Realised habitats of early stage North Sea herring – looking for signals of environmental change. ICES Journal of Marine Science

A2 Dynamics and impact of Anchovy in the North Sea [4301900303]

This project specifically targeted the tropho-dynamics of anchovy in the North Sea, which are viewed as an indicator of climate or regime change in the North Sea. This project was carried out by a PhD student based at IMARES and registered with Wageningen University. The work has so far determined the diet of North Sea anchovy by stomach content analysis and reconstructed the historical changes of pelagic populations of the North Sea and their sequence and related these to large-scale climatic patterns. These finding have now been submitted in a manuscript to a peer reviewed journal for publication (see below). Substantial progress on two further publications was made in 2009; one comparing the trophic competition between herring, sprat and anchovy and one investigating the environmental changes of the North Sea which are associated with increases in anchovy. The work is being carried out with the University of Hamburg, the Sir Alister Hardy Foundation for Ocean Science and the Spanish and Basque fisheries institutes. It also contributes to the ICES Workshop on Changes in distribution and abundance of clupeiform small fish in relation to climate variability and global change and will feed into the ICES workshop on sardine and anchovy in the North Sea.

Raab, K., Nagelkerke, L.A.J., Boerée, C., Rijnsdorp, A.D., Temming, A. & Dickey-Collas, M. (submitted). Anchovy Engraulis encrasicolus diet in the North and Baltic Seas. ICES Journal of Marine Science.

A3 The role of climate and fisheries in observed changes in the North Sea demersal ecosystem [4301900311]

The project looked at the competition between different flatfish species. It appeared that while the growth rates of sole and plaice were decreasing in recent years, the abundance of the non-commercial solenette and scaldfish was increasing. This project investigated for possible linkages between these two features? A modelling approach was used to test whether solenette and scaldfish were affected by increased temperature and whether the decline in growth rate in sole and plaice was caused by an increase in metabolic rate caused by temperature and increased competition for food with the other increasing flatfish.

A model was used to study how the competition between these groups plays out under different scenarios of harvesting and climate change. It predicts that plaice and solenette will have difficulties persisting together in an equilibrium environment. However the environment is always changing and complex, this thus provides each fish with opportunities to survive. However, even a simple model, as used here, can show that the interaction between the two species is likely to be dynamic.

The project delivered a parameterised food web model, applicable in other projects and for further studying of hypothesis on competition between species and an ICES paper.

Van Kooten, T., Van der Zon, S., Van Hal, R., Hille Ris Lambers, R., Hintzen, N.T., Rijnsdorp, A.D. (2009). Modelling the competition for food by flatfish species in the North Sea under varying climate regimes and fishing pressures. ICES CM 2009/(F:02). http://www.ices.dk/products/CMdocs/CM-2009/F/F0209.pdf

Priority Research Area B. Impact of the fishery on ecosystem

Planned Budget: € 140 000 Realised Budget: € 140 000

Priority Area A dealt with the influence of natural factors on the marine ecosystems. Priority Area B deals with the human impact on the ecosystem, in particular what society now views as the undesirable side effects of fishing. Wageningen IMARES, in recent years, has developed a significant amount of knowledge in this area. However there is still a need for further knowledge to assist managers. EU legislation has obliged Member States to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Resources from kennisbasis must be 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 Wageningen IMARES and to our quality control through peer reviewed publications.

B1 Fisheries-induced adaptive change and fisheries management [4301900307]

This research project deals with the genetic consequences of exploitation, with particular emphasis on the evolutionary effects of fishing. North Sea plaice and sole are the model organisms studied. In empirical studies the problem of inferring on genetic changes from phenotypic observations lies in the disentangling of the phenotypic plasticity caused by environmental variations from the potential genetic change. This is at least partly achieved by constructing norms of reaction that accounting for this environmental variation. Because the life history traits like growth, maturation and reproductive investment are correlated due to tradeoffs on the individual level, a method was developed that fits an energy allocation model to individual growth trajectories, obtained by the back-calculation otoliths. This method provides estimates of the mechanistic life history tradeoffs and imposed selection differentials and allows for novel techniques of disentangling phenotypic plasticity from potentially genetic changes. The results suggest that maturation genetically shifted to occur earlier, whereas the changes in growth and the increase in reproductive investment might also be due to environmental factors other than fishing mortality.

Eco-genetic models include the inheritance of traits determining the observed phenotype and environmental factors that may affect the evolutionary fitness optimum (frequency-dependent selection) and are therefore a powerful tool to study fisheries induced evolution. Such a model was constructed to explore the evolutionary causes of sexual size dimorphism in the case of flatfish. The hypothesis that males are smaller than females because of the energy loss in behavioural reproductive investments has to be rejected in an evolutionary perspective. The results show that males are smaller because less reproductive investment is sufficient to be successful. It also showed that many males are now becoming sexually mature at sizes where they are usually discarded by the fishing fleet. The model is fitted to the estimated evolution of plaice and the evolutionary impact of different management scenarios is assessed.

The so called maximum sustainable yield MSY and the corresponding maximal fishing mortality FMSY evolve with the population life history and occur both at lower levels after a while (and are thus not sustainable). By a dome-shaped exploitation pattern being protective for larger fish the evolutionary trends could be reversed and so the negative evolutionary impact. However, the evolutionary impact trades off against the short term loss in yield: by protecting the large fish the evolutionary impact is minimized but the instantaneous yield is decreased too – the optimal strategy for a given time horizon is somewhere in between. This project also allows IMARES to maintain itself as a world leader in this area, it has resulted in 2 Science papers and through the

addition of EU framework funding, the KBWOT programme gained added value (through the FINE project and the Marie-Curie Research and Training Network FishACE).

Two peer reviewed papers were published from this project and one is submitted, plus a PhD thesis was submitted.

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.

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. doi:10.1016/j.seares.2009.07.003

Brunel, T., Ernande, B, Mollet, FM, Rijnsdorp AD. 0000. Coupling non-linear mixed statistical models and dynamic energy allocation models to determine the onset of maturation and related energy allocation parameters from somatic growth data. Oecologia submitted.

Mollet 2010. Adaptation and fisheries-induced adaptive change in North Sea flatfish. PhD thesis Wageningen Universiteit. Planned date of the defense May 7, 2010.

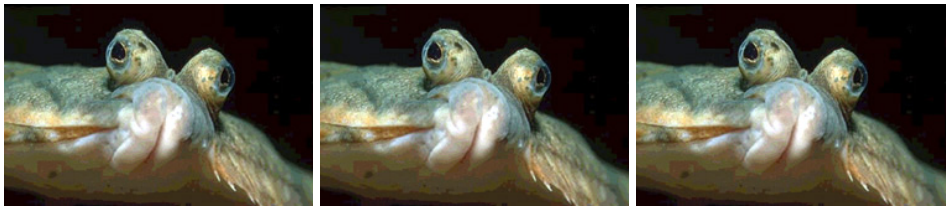
B2 Is there a reason for slippage? [4301900304]

Pelagic fisheries target schooling fish. This generally leads to catches with a low diversity of species and sizes. During the normal procedure of processing catch onboard, unwanted fish are removed from the conveyer belt where the catch is sorted and flushed over board. This practice is called “discarding”. Besides the discards that are sorted by the crew sometimes part of or the total catch is discarded before the catch has been sorted, an incident that is usually referred to as “slippage”. Relatively large amounts of catch are released from the cooling tanks (tank slippage) or straight from the net (net slippage). Fish do not normally survive the catch and sorting procedure.

Incidents of slippage have not been frequently observed (in 2003-2007: 4%-5% of the sampled hauls). However, it does appear to be an important component in the annual discard estimates of the Dutch pelagic fleet (fishing in European waters); it represented 17%-40% of the total discard estimations in 2003-2007. At present the species composition and length frequency of “slipped” catch is unknown.

This study considered data from the sampling programme for the period 2006—2008 (36 fishing trips). During the sampled trips slippage occurred in approximately ~5% of the hauls. For the majority of the slippage incidents, the observers could determine why slippage occurred and the dominant reason was the lack of pre-processing room on board. Further analysis showed that slippage is more likely to occur when the catch (corrected for volume of ship) is high. This again supports the idea that the probability of slippage is higher when there is lack of pre-processing room. The probability of slippage seems to be constant over the different years but it does vary between months, target species and ship.

Helmond , A.T.M. van and H.M.J. van Overzee, 2009. Discard sampling of the Dutch pelagic freezer fishery in 2003-2007. CVO Report 09.001, 60p.



B3 Plaice and cod eggs in the North Sea [4301900305]

There are many methods for monitoring the impact of fisheries of fish stocks. These include the "standard" approaches such as stock assessments but increasingly survey only methods are being developed as often the assumptions in stock assessments are broken and catch independent methods are preferable. IMARES has been core to a group of European institutes that are developing egg methods to monitor and assessment fish stocks. These survey based approaches do not rely on catch or ageing data, but use the abundance of planktonic fish eggs combined with estimates of fecundity and sex ratio to determine the size of the spawning stock biomass.

In 2009, an international survey of cod and plaice eggs took place. Participating countries were Scotland, Denmark, Germany, France and the Netherlands. The Dutch participation consisted of the egg identification and staging in the herring larvae surveys in December 2008 and January 2009 in the English Channel and the Southern North Sea. The small contribution from KBWOT was small relative to the large contribution from WOT, or the expenditure of the other institutes, but the rewards to KBWOT were great. These data from all institutes will now be used in 2010 to re-estimate the biomass of plaice and cod in the North Sea. The strength of this approach is its unique ability to provide high density spatial information about the distribution of active spawning components of fish. These data are in the process of being written up and will be published in the primary literature in late 2010.

B4 Biodiversity and population development of benthic invertebrates in the Dutch coastal zone [4301900313]

Annual shellfish surveys are conducted to obtain stock assessments for commercial bivalve species, such as mussels, cockles and razorshell clams. Samples are taken using large dredge samples ($15m^2$) or hydraulic dredge samples ($30m^2$) at a stratified grid. In total 3500 to 4000 sampling stations are visited each year, since 1992. Along with the target species, a diversity of benthic invertebrates and fish is sampled. While in the early days of these surveys these discards were ignored, an increasing number of species were identified, counted, weighted and recorded, each year. By now, the fast majority of species in our samples end up in our database. This data on the biodiversity and population dynamics of benthic mega fauna has been accumulating for several years.

This project funded the creation of an overview of the area and species studied, the report is now in preparation. We reported when and where they were registered / ignored and made remarks on their catchability in our dredges (fishing efficiency). The project will also allow the construction of spatial maps of species distribution in the Dutch coastal zone.

Priority Research Area C. Changing fishery management

Planned Budget: € 97 000 Realised Budget: € 97 000

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 legal framework formulation the obligation for biological and economic data collection of fish and fisheries data by the Member States is 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 and now the potential of results based management. The Kennisbasis WOT resources are 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 also contributes to the scientific status of Wageningen IMARES and to our quality control through peer reviewed publications.

C1. Improving Glass eel sampling [4301900309]

The management and exploitation of eel in Dutch waters was a dominant issue in 2009 for LNV. Much of the science underpinning the advice on the status of the stock of eel is very strong. However due to the current low abundance of glass eel, the traditional survey technique does not operate well as catches are too low to describe accurately changes in population dynamics. The variability in the survey series has become too high as the likelihood of catching a glass eel is low. Catching two individuals rather than one will give an apparent increase of 100% in the population and thus a sample size of 2, could be inferred into a doubling of the population size. An alternative sampling method is needed that results in increased catch rates, even in years when recruitment is very low.

Four types of alternative sampling gear were tested in the field in March and April 2009, near the location in Den Oever that has been used in glass eel monitoring since 1938, the longest continuous monitoring time series for glass eel that exists. The four types of sampling gear were based on combinations of different approaches: the use of a siphon, the use of a fresh water stream into salt water to attract larvae, the use of a light source to attract larvae, different water pumps.

Of the four different types of traps only the traps that used light to attract the larvae resulted in catches. The light traps were then tested near the surface and deeper in the water. The deeper traps resulted in slightly larger catches than the traps near the surface. These results will be taken forward to further develop and quantify the catchability of the light traps.

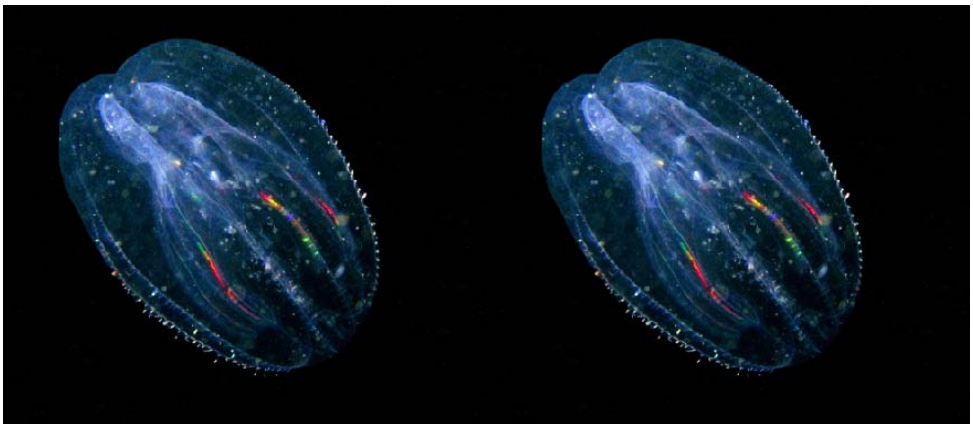
Report:

T.B. Leijzer, H.J.A. Dijkman Dulkes, J.W. van der Heul & J.A. van Willigen (2009). Het ontwikkelen van een glasaalval ten behoeve van monitoring. IMARES Rapport C069/09

C2. Approach to invasive species [4301900312]

The establishment of the "team invasieve exoten" bij LNV, and the inclusion of non-indigenous species in the descriptives for good environmental status (GES) in the Marine Strategy Framework Directive indicates that there is a growing concern with the impacts of invasion of non-native species. Within IMARES, knowledge on invasive species is fragmented across locations and departments. This project brought together experts from across IMARES to discuss opportunities, strategies and provision of advice for invasive species research within IMARES. The project initiated an informal network of researchers concerned with and interested in invasive species. It also lead to an IMARES document demonstrating the need for coordination of invasive species research, and exploring scientific, advisory and market challenges in the future.

The project recommended that further coordination on the provision of advice on invasive species and on the science of the introduction and decline of their populations.



C3. Reproductive Biology and Management in Marine Fish (FRESH) [4301900302]

Fresh (www.fresh-cost.org) is an EU network that funds travel and small science projects for the introduction of more knowledge of fish reproduction into the fisheries advice and the management. The Netherlands is a core member of this Cost Action (www.cost.esf.org). The group is tasked developing novel and innovative methods for managers that account for biology. KBWOT provides funding for scientist in IMARES to participate and give their time to the projects and techniques being developed by FRESH. This collaboration is not strictly co-financing but the expertise being provided by KBWOT and the facilities and travel being provide by the EU cost action FRESH.

In 2009 this project pushed our understanding of plaice, herring and horse mackerel fecundity and maturity forward. It provided the stimulus for an analysis of the impact of stock structure recruitment (Brunel in press). Some of 2009 was spent planning for the 2010 egg production method workshop which will take place in March 2010 which has both ICES and FRESH support.

Damme, van CJG, Dickey-Collas, M, Rijnsdorp AD & Kjesbu, OS (2009). Fecundity, atresia and spawning strategies of Atlantic herring (Clupea harengus). Can J Fish Aquat Sci. 66: 2130-2141.

Damme van CJG, Bolle LJ, Fox, CJ, Fossum, P, Kraus, G, Munk, P, Rohlf, N, Witthames P & Dickey-Collas, M (2009). A reanalysis of North Sea plaice spawning-stock biomass using the annual egg production method. ICES J Mar Sci. 66: 1999–2011.

Brunel, T. 2010. Age-structure dependent recruitment: a meta-analysis applied to Northeast Atlantic fish stocks. – ICES Journal of Marine Science, 67: 000-000.

C4. Does accounting for variation in natural mortality matter? [4301900310]

This project was designed to quantify how sensitive populations are to incorrectly accounting for natural mortality. This is a new area of research for IMARES and it is cutting edge in that very little international research effort has been given to this issue. The project provides information for our understanding of natural mortality, its relevance and sensitivity of our advice to assumptions about mortality in general. The project developed a size structured population model, based on the life-history of North Sea herring. It was specifically structured to be utilised for both advice and scientific understanding of population dynamics. The model used automated bifurcation analyses which are innovative to IMARES.

The project encompassed a literature study to design the model structure, based on three different life stages of North Sea Herring in three spatially distinct spatial areas. The size structured model was designed and tested with diagnostics. It was important to ensure that the model captured realistic population dynamics. Effort was also given to the presentation of model outputs and communication of results. Initial results from the model show that natural mortality on the adult life stages is more likely to impact on stock collapse than the juvenile life stages. Within the near future the boundary conditions of the model, i.e. what are the characteristics of the environment the life stages live in, should be better approximated. It is also planned to analyse the different aspects of the model, like the change in lifetime reproductive output under different juvenile and adult mortality rates.

A side benefit of the project is that the developed model can now be used the environment department of IMARES to study the importance and sensitivity of contaminants on population dynamics. A manuscript is in preparation to be given at the ICES annual science meeting in September 2010.

Priority Research Area D. Maintenance and international exchange of key WOT expertise

Planned Budget: € 208 000 Realised Budget: € 208 000

Further, kennisbasis resources have been 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 usually coordinated by ICES. These study groups also produce new ideas, innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.

D1. KB WOT programme leadership [4301900301]

This project provided the resources to manage the KB WOT programme through 2009. The overall coordination costs were less than 3% of the total KB WOT programme. The coordination involved setting up and reporting of the programme, calling for project bids, attending KB meetings at Wageningen and discussing the results with LNV. Planning for a 2010 review of KBWOT also took place.

D2. Quality and maintenance of expertise in fish aging [4301900308]

This project supports and underpins a core technique for fisheries science and the provision of fisheries advice, namely the determination of the age of fish. Thus it is considered core to the work of KB WOT. This technique is commonly referred to as “fish ageing”. Much of the work is carried out under the auspices of both ICES and the EU and is monitored by an ICES and EU Planning Group on Commercial Catch, Discards and Biological Sampling (ICES CM 2009\ACOM:39). The Netherlands has major international commitments under the data collection regulation of the EU to carry out fish ageing on its main fisheries. This project is used to support and maintain the core competency of determining the age of fish. Almost all stock assessments carried out by IMARES rely on robust age data.

In 2009 the following new age readers were trained: 2 new readers for blue whiting, 2 new readers bream and roach, 1 new reader for turbot and brill, 1 new reader for horse mackerel and 1 new reader for gadoids.

This project also funded participation in the following workshops. These workshops are vital for maintaining quality control of input data for international fisheries: Cod workshop (Denmark), Turbot workshop (Belgium), Blue whiting otolith, sole exchange follow up.
To maintain the quality, additional work on the Internal QA procedures was also carried out.

Sectioned Cod Otolith *("Ear Bone")*

D3. International exchange (ICES WG and SGs) [4301900314]

This project covered active participation by IMARES staff of the core groups under the International Council for the Exploration of the Sea that are relevant to the WOT programme, but are not part of the direct statutory commitments. The groups are:

PGEGGS Working Group on Planning Egg Surveys
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=79

SGFIAC Study Group on Fisheries Induced Adaptive Change
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=203

SGHERWAY Study Group on the evaluation of assessment and management strategies of the western herring stocks
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=259

SGHIST Study Group on the History of Fish and Fisheries
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=269

WGCRAN Working Group on Crangon Fisheries and Life History
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=178

WGDIM Working Group on Data and Information Management
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=217

WGFAST Working Group on Fisheries Acoustic Science and Technology
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=141

WGFE Working Group on Fish Ecology
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=179

WGFS Working Group on Fisheries Systems
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=158

WGMG Working Group on Methods
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=159

WGPBI Working Group on Modelling Physical Biological Interactions
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=145

WGSAM Working group on Multispecies assessment methods
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=193

WGFTFB ICES-FAO Working Group on Fishing Technology and Fish Behaviour
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=137

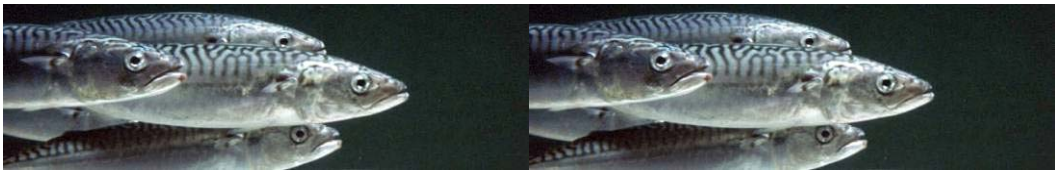
WGOOFE Working group on Operational Oceanography for Fisheries and Environment
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=322

WKAREA Workshop on Age Reading of European and American Eel
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=370

WKBLUR Workshop on Blue Whiting Recruitment
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=334

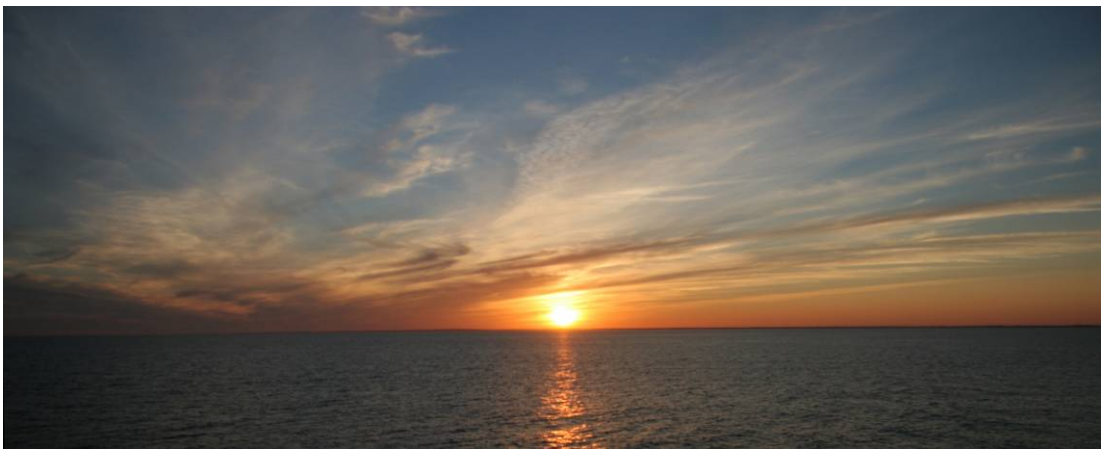
WKECHOSCRU PGNAPES Scrutiny of Echograms Workshop
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=332

WKMHMES Workshop on Mackerel and Horse mackerel egg staging and identification
www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=182



D4. Maintaining and improving quality in acoustic surveys [4301900306]

This project improves the quality assurance in the acoustic survey methods used for the WOT work and to develop expertise. It allows collaborative initiatives with acoustic researchers in other centres of excellence. The project summarised into one location all the improvements in quality assurance in recent years and lists all protocols currently used within IMARES acoustic surveys. It developed a framework to ensure that protocols are regularly updated and staff are educated and trained in the appropriate methods for acoustic surveys in IMARES.

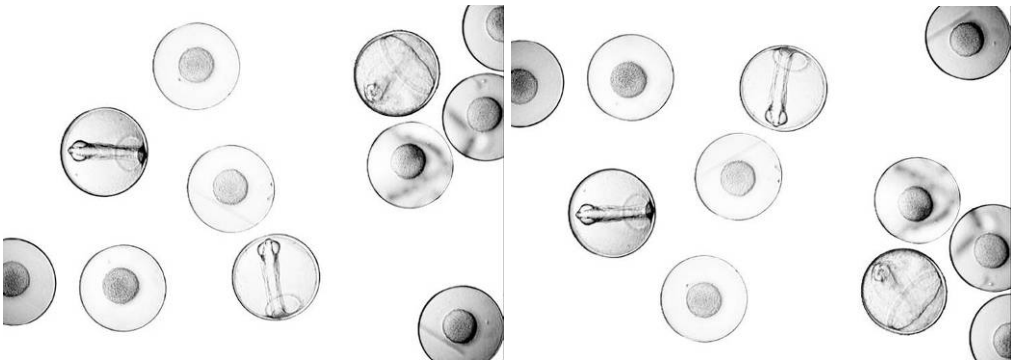


Conclusions

The majority of projects in 2009 were successful. Suitable expertise and knowledge capable of underpinning the WOT programme was developed. In contrasts to previous years, some of the research projects were not as innovative as suggested in the submitted proposals. This issue will be addressed in the planning review of KBWOT which will take place in April 2010. The added value projects, through EU funding have provided important information on the impact of climate change on fish stocks and the influence of fisheries on the stock demographics, evolution and reproductive output of fish. The 2009 programme could be criticised for failing to provide impetuous for real change in fisheries management, this will also be addressed in the up coming review. The majority of projects resulted in both internal and external publications.

Much of the work was done in collaboration with experts from out side The Netherlands. The international cooperation strengthens the transfer of expertise and contributes to the building expert networks. It ensures that the science within the programme remains “cutting edge” and uses up to date methods. This cooperation enables a robust quality control mechanism to develop in terms of both the methods use d and the science. It also allows scientists from IMARES to follow developments in terms of science needs by policy divisions of other governments and countries and relate these to the future science needs of The Netherlands. The understanding within IMARES of fisheries system analysis, oceanographic operational products, recruitment variability and fish ecology was broadened through participation in ICES working groups.

Overall KBWOT fisheries 2009 should be considered a success but the needs of WOT fisheries are numerous and challenging. Thus the KBWOT fisheries programme should also adapt and account for both the changing science landscape and the advisory needs of LNV.



Annex 1. Expenditure from KB WOT 2009

Priority Research Area	Project Number	Title	Project manager	Projected spend	Actual spend
A1	4302501601	RECLAIM Onderzoek Cofin.	Deerenberg	94,000.00	94,000.00
A2	4301900303	KBWOT09 Anchovy North SEa	Dickey-Collas	35,000.00	35,000.00
A3	4301900311	KBWOT09 Role climate fisheries	van Hal	45,045.00	45,044.99
B1	4301900307	KBWOT09 Fishace Fine	Rijnsdorp	70,000.00	70,000.29
B2	4301900304	KBWOT09 Discards pelagisch	van Overzee	11,000.00	11,000.00
B3	4301900305	KBWOT09 PGEGGS-PLACES	van Damme	40,000.00	40,000.00
B4	4301900313	KBWOT09 Spisula SurvAnalysis	Jansen	20,000.00	20,000.00
C1	4301900309	KBWOT09 Glass eel sampl tests	Heessen	31,000.00	31,000.00
C2	4301900312	KBWOT09 invasives	Hille Ris Lambers	17,000.00	17,000.00
C3	4301900302	KBWOT09 FRESH	Dickey-Collas	20,000.00	20,000.00
C4	4301900310	KBWOT09 accounting nat mort	Hintzen	29,120.00	29,120.00
D1	4301900301	KBWOT09 Programme Leadership	Dickey-Collas	18,000.00	18,000.00
D2	4301900308	KBWOT09 fish ageing	Bolle	50,000.00	49,999.99
D3	4301900314	KBWOT09 International Exchange	Dickey-Collas	110835	110,835.00
D4	4301900306	KBWOT09 Underpining Acoustics	van Beek	30,000.00	30,000.00
				621,000.00	621,000.27

1.1 Titel	A1 KB WOT RECLAIM (4302501601)
1.2 BAS-nummer 2009	*A1*
1.3 BAS-nummer 2010	
1.4 Projectleider	C. Deerenberg

1.5 VOORTGANG 2009

1.6 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* Both KB WOT and the EU funded the project RECLAIM which investigated climate change in relation to fisheries. The project began in 2007 and 2009 was its final year. RECLAIM has developed an operational conceptual framework regarding climate change and its impacts on the productivity and distribution of fish and shellfish populations. The framework described the relationships of abiotic and biotic factors on fish dynamics. It used biophysical modelling and ecotypology of species to look at ecosystem impacts.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd RECLAIM has made some important progress in our understanding of the likely effects of climate change on fish and fisheries. It has shown that previous approaches were naive in that they concentrated on the effect of temperature on distribution and depth of fish. They have not accounted for the impact of climate change on physiological and community interactions. They also have not accounted for life cycle closure. RECLAIM showed that you must consider these factors when investigating the potential impact of climate change. Previous studies also usually assumed that climate change will influence the system through temperature change and have yet failed to consider the impact of changes to wind and precipitation. In the southern North Sea, wind and precipitation are very important drivers of the processes in the marine ecosystem. They are also two factors that are the very difficult to predict in future climate scenarios. Although substantial progress was made by RECLAIM in developing ecosystem individual based models (e.g. to model the survival of fish eggs and larvae), RECLAIM showed there are still substantial obstacles to overcome to successfully “down-scale” the global climate model to the regional scale. Specifically to the Netherlands, RECLAIM showed that attributing the recently observed changes in growth and distribution of North Sea plaice to warming seas was also naive. By using eco-physiological models, it was shown that it is a complex interaction of energy allocation, warming waters and distribution resulted in the growth changes, not temperature alone. Likewise with herring, whilst RECLAIM showed that temperature changes are unlikely to effect the distribution of juvenile and adult herring; temperature will and does effect their growth and the interaction of temperature, larval energetics and prey availability probably results in changes in larval mortality, thus recruitment strength.
1.7 Afwijking	

1.8	Bijdrage aan KB-thema (*)	**"Influence of changes in the environment on marine ecosystems"** 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. The role of ecosystem variability and change within the provision of fisheries advice is expected to increase. This has been specifically mentioned as a goal by ICES[1]. In 2006 new activities were started within the WOT 5 kennisbasis programme both in house and by joining initiatives by ICES or the EU 6th framework programme. There is a need to build up expertise in this field, hence the budget allocation for this priority research area is expected to remain similar into the near future. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications. 2009 was a very productive year for this project with six major reports created which are now being turned into peer review publications. 7. Changes in key hydrodynamic features including connectivity among regions 8. Changes in fish recruitment and related ecosystem attributes across regions 9. Climate effects on distribution and production of species of contrasting ecotypes 10. Cross mapping and statistical analyses quantifying the likely impacts of climate change on suitable habitat for different life stages of key species in different regions 11. The effects of future climate change on the physical oceanography and comparisons of the mean and variability of the future physical properties with present day conditions 12. The response to climate change of fish populations with complex life cycles Importantly RECLAIM has taken our understanding of how climate change will impact fish and fisheries beyond the idea that "things will change". It has looked closely at the physiological and life history closure of fish and compared these factors to the likely changes in oceanography. Another important part of the project was outreach to the fishing industry and RECLAIM scientists have shown their results to many of the fisheries Regional Advisory Councils (RACs). A full detailed final project report is now being constructed for both the EU and KBWOT.

1 International Council of the Exploration of the Sea

1.9 Betekenis ontwikkelde producten en expertise	
1.10 Wetenschappelijke publicaties (*)	*Brunel T & Dickey-Collas, M (in press) Effects of temperature and density dependence on Atlantic herring growth: a macro-ecological analysis. MEPS* *Hal van R., Smits K., Rijnsdorp A.D. 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research. doi:10.1016/j.seares.2009.10.008* *Hinrichsen, HH, Dickey-Collas, M, Huret, M, Peck, MA & Vikebø, F (in press). Evaluating the suitability of coupled bio-physical models for fishery management. ICES J Mar Sci* *Petitgas P, Huret M, Léger F, Peck MA, Dickey-Collas M, Rijnsdorp AD. 2009. Patterns and schedules in hindcasted environments and fish life cycles. ICES CM 2009/E:25.* *Rijnsdorp AD, Peck MAP, Engelhard G., Pinnegar JK 2010. Resolving climate impact on fish. ICES Cooperative Research Report. (in press)* *Rijnsdorp AD, Peck MA, Engelhard GH, Möllman C, Pinnegar JK. 2009. Resolving the effect of climate change on fish populations. ICES Journal of Marine Science, 66:1570-1583* Other manuscripts submitted or in preparation: *Hufnagl, M., Peck., M.A., Dickey-Collas, M, Nash, R.D.M. Pohlmann, T. (in prep). Climate-driven, Bottom-up Control of North Sea Herring Recruitment. Fisheries Oceanography* *Röckmann C., Dickey-Collas M., Payne M. R., van Hal R. (submitted). Realised habitats of early stage North Sea herring – looking for signals of environmental change. ICES Journal of Marine Science*
1.11 Maatschappelijke publicaties	
1.12 Andere output	
1.13 Aansluiting op Kennisontwikkeling bij de universiteit	
1.14 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen

** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt

(a) Wetenschappelijk netwerk

Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?

(b) Projectconsortium

Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?

Technical University of Denmark AQUA	Denmark
University of Aalborg	Denmark
Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France
University of Hamburg	Germany
International Council for the Exploration of the Sea (ICES)	International Body
Institute of Marine Research (IMR, Bergen)	Norway
University of Bergen	Norway
AZTI-Tecnalia	Spain
Instituto Español de Oceanografía (Vigo, Cadiz, Madrid)	Spain
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK
Marine Scotland Science (Aberdeen)	UK

(c) Object van onderzoek

(d) Projectresultaat

(e) BO Internationaal

(f) Markt en positionering

(g) Financiering

ALGEMEEN

1.15 Titel	A2 Dynamics and impact of Anchovy in the Northsea (4301900303)
1.16 BAS-nummer 2009	
1.17 BAS-nummer 2010	
1.18 Projectleider	Mark Dickey Collas

1.19 VOORTGANG 2009

1.20 Resultaten (*)	This project specifically targeted the tropho-dynamics of anchovy in the North Sea, which are viewed as an indicator of climate or regime change in the North Sea. This project was carried out by a PhD student based at IMARES and registered with Wageningen University.
	The work has so far determined the diet of North Sea anchovy by stomach content analysis and reconstructed the historical changes of pelagic populations of the North Sea and their sequence and related these to large-scale climatic patterns. These finding have now been submitted in a manuscript to a peer reviewed journal for publication (see below). Substantial progress on two further publications was made in 2009; one comparing the trophic competition between herring, sprat and anchovy and one investigating the environmental changes of the North Sea which are associated with increases in anchovy.
1.21 Afwijking	
1.22 Bijdrage aan KB-thema (*)	**"Influence of changes in the environment on marine ecosystems"** 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 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. The role of ecosystem variability and climate change within the provision of fisheries advice is expected to increase. This has been specifically mentioned as a goal by the International Council of the Exploration of the sea (ICES). There is a need to build up expertise in this field. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications.
1.23 Betekenis ontwikkelde producten en expertise	
1.24 Wetenschappelijke publicaties (*)	*Raab, K., Nagelkerke, L.A.J., Boerée, C., Rijnsdorp, A.D., Temming, A. & Dickey-Collas, M. (submitted). Anchovy Engraulis encrasicolus diet in the North and Baltic Seas. ICES Journal of Marine Science.*
1.25 Maatschappelijke publicaties	
1.26 Andere output	

1.27 Aansluiting op Kennisontwikkeling bij de universiteit	Kristina Raab WUR
1.28 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen
** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

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(a) Wetenschappelijk netwerk *Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?*

The work is being carried out with the University of Hamburg, the Sir Alister Hardy Foundation for Ocean Science and the Spanish and Basque fisheries institutes. It also contributes to the ICES Workshop on Changes in distribution and abundance of clupeiform small fish in relation to climate variability and global change and will feed into the ICES workshop on sardine and anchovy in the North Sea.

(b) Projectconsortium Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?

Wageningen, Animal Sciences Group	The Netherlands
University of Hamburg	Germany
International Council for the Exploration of the Sea (ICES)	International Body
AZTI-Tecnalia	Spain
Instituto Español de Oceanografía (Vigo, Cadiz, Madrid)	Spain
University of Cadiz	Spain
Sir Alister Hardy Foundation for Ocean Science (SAHFOS, Plymouth)	UK

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.29 Titel	A3 The role of climate and fisheries in observed changes in the North Sea demersal ecosystem (4301900311)
1.30 BAS-nummer 2009	
1.31 BAS-nummer 2010	
1.32 Projectleider	R. van Hal

1.33 VOORTGANG 2009

1.34 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* The project looked at the competition between different flatfish species. It appeared that while the growth rates of sole and plaice were decreasing in recent years, the abundance of the non-commercial solenette and scaldfish was increasing. This project investigated for possible linkages between these two features? A modelling approach was used to test whether solenette and scaldfish were affected by increased temperature and whether the decline in growth rate in sole and plaice was caused by an increase in metabolic rate caused by temperature and increased competition for food with the other increasing flatfish.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd A model was used to study how the competition between these groups plays out under different scenarios of harvesting and climate change. It predicts that plaice and solenette will have difficulties persisting together in an equilibrium environment. However the environment is always changing and complex, this thus provides each fish with opportunities to survive. However, even a simple model, as used here, can show that the interaction between the two species is likely to be dynamic. The project delivered a parameterised food web model, applicable in other projects and for further studying of hypothesis on competition between species and an ICES paper.
1.35 Afwijking	
1.36 Bijdrage aan KB-thema (*)	**"Influence of changes in the environment on marine ecosystems"** 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. The role of ecosystem variability and change within the provision of fisheries advice is expected to increase. This has been specifically mentioned as a goal by ICES[1]. In 2006 new activities were started within the WOT 5 kennisbasis programme both in house and by joining initiatives by ICES or the EU 6th framework programme. There is a need to build up expertise in this field, hence the budget allocation for this priority research area is expected to remain similar into the near future. The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications.

1 International Council of the Exploration of the Sea

1.37 Betekenis ontwikkelde producten en expertise	
1.38 Wetenschappelijke publicaties (*)	Non-refereed paper: *Van Kooten, T., Van der Zon, S., Van Hal, R., Hille Ris Lambers, R., Hintzen, N.T., Rijnsdorp, A.D. (2009). Modelling the competition for food by flatfish species in the North Sea under varying climate regimes and fishing pressures. ICES CM 2009/(F:02).* http://www.ices.dk/products/CMdocs/CM-2009/F/F0209.pdf Internal report: *Van der Zon (2009). Competition analysis of Plaice (Pleuronectes platessa) and Solenette (Buglossidium luteum)in the North Sea. IMARES Rapport 09. 017* Conference oral presentation: T. van Kooten (2009). Modeling the competition for food by flatfish species in the North Sea under different temperature regimes and fishing pressures. Theme session F:02 ICES Annual Science conference 2009 Berlin. External oral presentation: S. van der Zon (2009). Competition analysis of Plaice & Solenette; an internship on model development. Internal presentation at IMARES, IJmuiden and at AFI, Wageningen.
1.39 Maatschappelijke publicaties	
1.40 Andere output	
1.41 Aansluiting op Kennisontwikkeling bij de universiteit	
1.42 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen

** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt
(a) Wetenschappelijk netwerk
(b) Projectconsortium
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.43 Titel	B1 Fisheries-induced adaptive change and fisheries management (4301900307)
1.44 BAS-nummer 2009	
1.45 BAS-nummer 2010	
1.46 Projectleider	A. Rijnsdorp

1.47 VOORTGANG 2009

1.48 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This research project deals with the genetic consequences of exploitation, with particular emphasis on the evolutionary effects of fishing. North Sea plaice and sole are the model organisms studied. In empirical studies the problem of inferring on genetic changes from phenotypic observations lies in the disentangling of the phenotypic plasticity caused by environmental variations from the potential genetic change. This is at least partly achieved by constructing norms of reaction that accounting for this environmental variation. Because the life history traits like growth, maturation and reproductive investment are correlated due to tradeoffs on the individual level, a method was developed that fits an energy allocation model to individual growth trajectories, obtained by the back-calculation otoliths. This method provides estimates of the mechanistic life history tradeoffs and imposed selection differentials and allows for novel techniques of disentangling phenotypic plasticity from potentially genetic changes.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd The results suggest that maturation genetically shifted to occur earlier, whereas the changes in growth and the increase in reproductive investment might also be due to environmental factors other than fishing mortality. Eco-genetic models include the inheritance of traits determining the observed phenotype and environmental factors that may affect the evolutionary fitness optimum (frequency-dependent selection) and are therefore a powerful tool to study fisheries induced evolution. Such a model was constructed to explore the evolutionary causes of sexual size dimorphism in the case of flatfish. The hypothesis that males are smaller than females because of the energy loss in behavioural reproductive investments has to be rejected in an evolutionary perspective. The results show that males are smaller because less reproductive investment is sufficient to be successful. It also showed that many males are now becoming sexually mature at sizes where they are usually discarded by the fishing fleet. The model is fitted to the estimated evolution of plaice and the evolutionary impact of different management scenarios is assessed. The so called maximum sustainable yield MSY and the corresponding maximal fishing mortality FMSY evolve with the population life history and occur both at lower levels after a while (and are thus not sustainable). By a dome-shaped exploitation pattern being protective for larger fish the evolutionary trends could be reversed and so the negative evolutionary

	impact. However, the evolutionary impact trades off against the short term loss in yield: by protecting the large fish the evolutionary impact is minimized but the instantaneous yield is decreased too – the optimal strategy for a given time horizon is somewhere in between.

1.49 Afwijking	
1.50 Bijdrage aan KB-thema (*)	**"Impact of the fishery on the ecosystem"** Priority Area B deals with the human impact on the ecosystem, in particular what society now views as the undesirable side effects of fishing. IMARES, in recent years, has developed a significant amount of knowledge in this area. However there is still a need for further knowledge to assist managers. In 2009, 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 must be 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. Some resources, if available, will be made available for contra financing to EU projects (matching funding). The research will also contribute to the scientific status of IMARES and to our quality control through peer reviewed publications. The KBWOT programme gained added value (through the FINE project and the Marie-Curie Research and Training Network FishACE).
1.51 Betekenis ontwikkelde producten en expertise	This project also allows IMARES to maintain itself as a world leader in this area, it has resulted in 2 Science papers and through the addition of EU framework funding.
1.52 Wetenschappelijke publicaties (*)	Two peer reviewed papers were published from this project and one is submitted, plus a PhD thesis was submitted. *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.* *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. doi:10.1016/j.seares.2009.07.003* *Brunel, T., Ernande, B, Mollet, FM, Rijnsdorp AD. 0000. Coupling non-linear mixed statistical models and dynamic energy allocation models to determine the onset of maturation and related energy allocation parameters from somatic growth data. Oecologia submitted.* *Mollet 2010. Adaptation and fisheries-induced adaptive change in North Sea flatfish. PhD thesis Wageningen Universiteit. Planned date of the defense May 7, 2010.*
1.53 Maatschappelijke publicaties	
1.54 Andere output	
1.55 Aansluiting op Kennisontwikkeling bij de universiteit	FM. Mollet WUR
1.56 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen

** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt

(a) Wetenschappelijk netwerk Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?

(b) Projectconsortium *Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?*

Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France
Heinrich-Heine Universität Düsseldorf	Germany
University of Reykjavik	Iceland
University of Bari	Italy
Institute of Marine Research (IMR, Bergen)	Norway
University of Bergen	Norway
AZTI-Tecnalia	Spain
University of Stockholm	Sweden

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.57 Titel	B2 Is there a reason for slippage (4301900304)
1.58 BAS-nummer 2009	
1.59 BAS-nummer 2010	
1.60 Projectleider	H. van Overzee

1.61 VOORTGANG 2009

1.62 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* Pelagic fisheries target schooling fish. This generally leads to catches with a low diversity of species and sizes. During the normal procedure of processing catch onboard, unwanted fish are removed from the conveyer belt where the catch is sorted and flushed over board. This practice is called “discarding”. Besides the discards that are sorted by the crew sometimes part of or the total catch is discarded before the catch has been sorted, an incident that is usually referred to as “slippage”. Relatively large amounts of catch are released from the cooling tanks (tank slippage) or straight from the net (net slippage). Fish do not normally survive the catch and sorting procedure. Incidents of slippage have not been frequently observed (in 2003-2007: 4%-5% of the sampled hauls). However, it does appear to be an important component in the annual discard estimates of the Dutch pelagic fleet (fishing in European waters); it represented 17%-40% of the total discard estimations in 2003-2007. At present the species composition and length frequency of “slipped” catch is unknown. This study considered data from the sampling programme for the period 2006—2008 (36 fishing trips).
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd During the sampled trips slippage occurred in approximately ~5% of the hauls. For the majority of the slippage incidents, the observers could determine why slippage occurred and the dominant reason was the lack of pre-processing room on board. Further analysis showed that slippage is more likely to occur when the catch (corrected for volume of ship) is high. This again supports the idea that the probability of slippage is higher when there is lack of pre-processing room. The probability of slippage seems to be constant over the different years but it does vary between months, target species and ship.
1.63 Afwijking	
1.64 Bijdrage aan KB-thema (*)	*Noem (1) kennisvraag uit het KB programma waaraan wordt gewerkt (zie het bijgaande visiedocument)* Priority Area B deals with the human impact on the ecosystem, in particular what society now views as the undesirable side effects of fishing. Wageningen IMARES, in recent years, has developed a significant amount of

	knowledge in this area. However there is still a need for further knowledge to assist managers. EU legislation has obliged Member States to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Resources from kennisbasis must be 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 Wageningen IMARES and to our quality control through peer reviewed publications. *en (2) – bij de afsluiting van een project – welke bijdrage geleverd is aan de beantwoording daarvan.* This project has given us a better understanding on discarding practices onboard pelagic freezer trawlers.
1.65 Betekenis ontwikkelde producten en expertise	
1.66 Wetenschappelijke publicaties (*)	Helmond, A.T.M. & H.M.J. van Overzee, 2010. Can pelagic freezer trawlers reduce discarding? Working Document for the ICES Herring Assessment Working Group.
1.67 Maatschappelijke publicaties	
1.68 Andere output	This research has lead in a request for the attendance of the symposium Making the most of fisheries information (FDI).
1.69 Aansluiting op Kennisontwikkeling bij de universiteit	None
1.70 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen

** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

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(a) Wetenschappelijk netwerk No

(b) Projectconsortium No
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.71 Titel	B3 Plaice and cod eggs in the North Sea (4301900305)
1.72 BAS-nummer 2009	B3
1.73 BAS-nummer 2010	
1.74 Projectleider	C van Damme

1.75 VOORTGANG 2009

1.76 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* There are many methods for monitoring the impact of fisheries of fish stocks. These include the "standard" approaches such as stock assessments but increasingly survey only methods are being developed as often the assumptions in stock assessments are broken and catch independent methods are preferable. IMARES has been core to a group of European institutes that are developing egg methods to monitor and assessment fish stocks. These survey based approaches do not rely on catch or ageing data, but use the abundance of planktonic fish eggs combined with estimates of fecundity and sex ratio to determine the size of the spawning stock biomass.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd In 2009, an international survey of cod and plaice eggs took place. The Dutch participation consisted of the egg identification and staging in the herring larvae surveys in December 2008 and January 2009 in the English Channel and the Southern North Sea. The small contribution from KBWOT was small relative to the large contribution from WOT, or the expenditure of the other institutes, but the rewards to KBWOT were great. These data from all institutes will now be used in 2010 to re-estimate the biomass of plaice and cod in the North Sea. The strength of this approach is its unique ability to provide high density spatial information about the distribution of active spawning components of fish. These data are in the process of being written up and will be published in the primary literature in late 2010.
1.77 Afwijking	Alleen als beoogde en gerealiseerde output flink uit de pas lopen, met (mogelijke) verklaring
1.78 Bijdrage aan KB-thema (*)	Priority Area B deals with the human impact on the ecosystem, in particular what society now views as the undesirable side effects of fishing. Wageningen IMARES, in recent years, has developed a significant amount of knowledge in this area. However there is still a need for further knowledge to assist managers. EU legislation has obliged Member States to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Resources from kennisbasis must be 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 Wageningen IMARES and to our quality control through peer reviewed publications.
1.79 Betekenis ontwikkelde producten en expertise	
1.80 Wetenschappelijke publicaties (*)	
1.81 Maatschappelijke publicaties	

1.82 Andere output	
1.83 Aansluiting op Kennisontwikkeling bij de universiteit	
1.84 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen
** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

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(a) Wetenschappelijk netwerk *Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?*
Participating countries were Scotland, Denmark, Germany, France and the Netherlands.

(b) Projectconsortium *Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?*

Institute/Organisation	**Country**
University of Amsterdam	The Netherlands
Technical University of Denmark AQUA	Denmark
Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France
University of Hamburg	Germany
International Council for the Exploration of the Sea (ICES)	International Body
Institute of Marine Research (IMR, Bergen)	Norway
University of Bergen	Norway
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK
Marine Scotland Science (Aberdeen)	UK
University of Aberdeen	UK

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.85 Titel	B4 Biodiversity and population development of benthic invertebrates in the Dutch coastal zone (4301900313)
1.86 BAS-nummer 2009	*B4*
1.87 BAS-nummer 2010	
1.88 Projectleider	J. Jansen

1.89 VOORTGANG 2009

1.90 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* Annual shellfish surveys are conducted to obtain stock assessments for commercial bivalve species, such as mussels, cockles and razorshell clams. Samples are taken using large dredge samples (15m^2) or hydraulic dredge samples (30m^2) at a stratified grid. In total 3500 to 4000 sampling stations are visited each year, since 1992. Along with the target species, a diversity of benthic invertebrates and fish is sampled. While in the early days of these surveys these discards were ignored, an increasing number of species were identified, counted, weighted and recorded, each year. By now, the fast majority of species in our samples end up in our database. This data on the biodiversity and population dynamics of benthic mega fauna has been accumulating for several years.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd This project funded the creation of an overview of the area and species studied, the report is now in preparation. We reported when and where they were registered / ignored and made remarks on their catchability in our dredges (fishing efficiency). The project will also allow the construction of spatial maps of species distribution in the Dutch coastal zone.
1.91 Afwijking	Alleen als beoogde en gerealiseerde output flink uit de pas lopen, met (mogelijke) verklaring
1.92 Bijdrage aan KB-thema (*)	Priority Area B deals with the human impact on the ecosystem, in particular what society now views as the undesirable side effects of fishing. Wageningen IMARES, in recent years, has developed a significant amount of knowledge in this area. However there is still a need for further knowledge to assist managers. EU legislation has obliged Member States to establish a programme to monitor a number of elements in the ecosystem which are sensitive to fishing. Resources from kennisbasis must be 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 Wageningen IMARES and to our quality control through peer reviewed publications.
1.93 Betekenis ontwikkelde producten en expertise	
1.94 Wetenschappelijke publicaties (*)	
1.95 Maatschappelijke publicaties	
1.96 Andere output	
1.97 Aansluiting op Kennisontwikkeling bij de universiteit	

1.98	Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen
** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt
(a) Wetenschappelijk netwerk
(b) Projectconsortium
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.99 Titel	C1 Improving Glass eel sampling (4301900309)
1.100 BAS-nummer 2009	C1
1.101 BAS-nummer 2010	
1.102 Projectleider	H. Heessen

1.103VOORTGANG 2009

1.104 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* The management and exploitation of eel in Dutch waters was a dominant issue in 2009 for LNV. Much of the science underpinning the advice on the status of the stock of eel is very strong. However due to the current low abundance of glass eel, the traditional survey technique does not operate well as catches are too low to describe accurately changes in population dynamics. The variability in the survey series has become too high as the likelihood of catching a glass eel is low. Catching two individuals rather than one will give an apparent increase of 100% in the population and thus a sample size of 2, could be inferred into a doubling of the population size. An alternative sampling method is needed that results in increased catch rates, even in years when recruitment is very low.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd Four types of alternative sampling gear were tested in the field in March and April 2009, near the location in Den Oever that has been used in glass eel monitoring since 1938, the longest continuous monitoring time series for glass eel that exists. The four types of sampling gear were based on combinations of different approaches: the use of a siphon, the use of a fresh water stream into salt water to attract larvae, the use of a light source to attract larvae, different water pumps. Of the four different types of traps only the traps that used light to attract the larvae resulted in catches. The light traps were then tested near the surface and deeper in the water. The deeper traps resulted in slightly larger catches than the traps near the surface. These results will be taken forward to further develop and quantify the catchability of the light traps.
1.105 Afwijking	Alleen als beoogde en gerealiseerde output flink uit de pas lopen, met (mogelijke) verklaring
1.106 Bijdrage aan KB-thema (*)	*Noem (1) kennisvraag uit het KB programma waaraan wordt gewerkt (zie het bijgaande visiedocument) en (2) – bij de afsluiting van een project – welke bijdrage geleverd is aan de beantwoording daarvan.* **Changing fishery management** 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. In the legal framework formulation 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 and now the potential of results based management. The Kennisbasis WOT resources are 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 also contributes to the scientific status of Wageningen IMARES and to our quality control through peer reviewed publications.
1.107 Betekenis ontwikkelde producten en expertise	Aan welke strategische doelen van de business unit/centrum, SG en WUR draagt uw resultaat bij? ** Improving glass eel sampling is essential to remain a key player in the field of marine and freshwater applied research.
	Voor welk beleidsthema van LNV is uw onderzoek relevant? (zie bijlage *Grote Maatschappelijke vraagstukken in LNV-domein)* - Conservation and rebuilding nature /natural values - Conservation of biodiversity
	Voor welke markt is uw product of expertise relevant; op welke markt zou u zich in de toekomst actief willen positioneren?** Improving glass eel sampling is specifically relevant to play a key role in fisheries management and in nature conservation.
1.108 Wetenschappelijke publicaties (*)	Report: *T.B. Leijzer, H.J.A. Dijkman Dulkes, J.W. van der Heul & J.A. van Willigen (2009). Het ontwikkelen van een glasaalval ten behoeve van monitoring. IMARES Rapport C069/09*
1.109 Maatschappelijke publicaties	None.
1.110 Andere output	None
1.111 Aansluiting op Kennisontwikkeling bij de universiteit	None
1.112 Doorstroom naar BO-onderzoek en praktijk	The revised monitoring is not yet fully developed to be applied as standard monitoring system.

* = voor projecten van WOT-units ligt het accent op deze elementen
** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt

(a) Wetenschappelijk netwerk No.
(b) Projectconsortium No
(c) Object van onderzoek Yes. Management of European eel is an international problem.
(d) Projectresultaat If our newly developed monitoring of glass eel works properly the results will be very useful to be applied in other EU copuntries.
(e) BO Internationaal

(f) Markt en positionering	Results will be specifically interesting for other institutes/universities involved in eel-research.
(g) Financiering	

ALGEMEEN

1.113 Titel	C2 Approach to invasive species (4301900312)
1.114 BAS-nummer 2009	C2
1.115 BAS-nummer 2010	*Indien dit afwijkt van het BAS-nummer in 2009 (zie ook bovenstaande tabel)*
1.116 Projectleider	R. Hille Ris Lambers

1.117VOORTGANG 2009

1.118 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* The establishment of the "team invasieve exoten" bij LNV, and the inclusion of non-indigenous species in the descriptives for good environmental status (GES) in the Marine Strategy Framework Directive indicates that there is a growing concern with the impacts of invasion of non-native species. Within IMARES, knowledge on invasive species is fragmented across locations and departments.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd This project brought together experts from across IMARES to discuss opportunities, strategies and provision of advice for invasive species research within IMARES. The project initiated an informal network of researchers concerned with and interested in invasive species. It also lead to an IMARES document demonstrating the need for coordination of invasive species research, and exploring scientific, advisory and market challenges in the future. The project recommended that further coordination on the provision of advice on invasive species and on the science of the introduction and decline of their populations.
1.119 Afwijking	
1.120 Bijdrage aan KB-thema (*)	Changing fishery management 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 legal framework formulation the obligation for biological and economic data collection of fish and fisheries data by the Member States is 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 and now the potential of results based management. The Kennisbasis WOT resources are 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 also contributes to the scientific status of Wageningen IMARES and to our quality control through peer reviewed publications.
1.121 Betekenis ontwikkelde producten en expertise	
1.122 Wetenschappelijke publicaties (*)	
1.123 Maatschappelijke publicaties	
1.124 Andere output	

1.125 Aansluiting op Kennisontwikkeling bij de universiteit	
1.126 Doorstroom naar BO-onderzoek en praktijk	

* = voor projecten van WOT-units ligt het accent op deze elementen
** = in ieder geval bij afsluiting van een (meerjarig) project, voor meerjarige projecten ook voor 2009 in verband met de go/no-go voor 2010

INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt

(a) Wetenschappelijk netwerk Nee
(b) Projectconsortium Nee
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.127 Titel	C3 Reproductive biology and management in marine fish (FRESH) (4301900302)
1.128 BAS-nummer 2009	C3
1.129 BAS-nummer 2010	
1.130 Projectleider	M. Dickey-Collas

1.131 VOORTGANG 2009

1.132 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* Fresh (www.fresh-cost.org) is an EU network that funds travel and small science projects for the introduction of more knowledge of fish reproduction into the fisheries advice and the management. The Netherlands is a core member of this Cost Action (www.cost.esf.org). The group is tasked developing novel and innovative methods for managers that account for biology. KBWOT provides funding for scientist in IMARES to participate and give their time to the projects and techniques being developed by FRESH. This collaboration is not strictly co-financing but the expertise being provided by KBWOT and the facilities and travel being provide by the EU cost action FRESH.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd In 2009 this project pushed our understanding of plaice, herring and horse mackerel fecundity and maturity forward. It provided the stimulus for an analysis of the impact of stock structure recruitment (Brunel in press). Some of 2009 was spent planning for the 2010 egg production method workshop which will take place in March 2010 which has both ICES and FRESH support.
1.133 Afwijking	
1.134 Bijdrage aan KB-thema (*)	Changing fishery management 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 legal framework formulation the obligation for biological and economic data collection of fish and fisheries data by the Member States is 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 and now the potential of results based management. The Kennisbasis WOT resources are 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 also contributes to the scientific status of Wageningen IMARES and to our quality control through peer reviewed publications.

1.135 Betekenis ontwikkelde producten en expertise	
1.136 Wetenschappelijke publicaties (*)	*Damme, van CJG, Dickey-Collas, M, Rijnsdorp AD & Kjesbu, OS (2009). Fecundity, atresia and spawning strategies of Atlantic herring (Clupea harengus). Can J Fish Aquat Sci. 66: 2130-2141.* *Damme van CJG, Bolle LJ, Fox, CJ, Fossum, P, Kraus, G, Munk, P, Rohlf, N, Witthames P & Dickey-Collas, M (2009). A reanalysis of North Sea plaice spawning-stock biomass using the annual egg production method. ICES J Mar Sci. 66: 1999–2011.* *Brunel, T. 2010. Age-structure dependent recruitment: a meta-analysis applied to Northeast Atlantic fish stocks. – ICES Journal of Marine Science, 67: 000-000.*
1.137 Maatschappelijke publicaties	
1.138 Andere output	
1.139 Aansluiting op Kennisontwikkeling bij de universiteit	
1.140 Doorstroom naar BO-onderzoek en praktijk	

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(a) Wetenschappelijk netwerk — Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?

(b) Projectconsortium — Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?

Technical University of Denmark AQUA	Denmark
Hellenic Centre for Marine Research	Greece
Marine Research Institute	Iceland
Northwest Atlantic Fisheries Organisation (NAFO)	International Body
Marine Institute (MI Galway)	Ireland
Sea Fisheries Institute/Morski Instytut Rybacki	Poland
Instituto Português de Investigação	Portugal

das Pescas e do Mar	
AZTI-Tecnalia	Spain
Consejo superior de investigaciones cientificas (Vigo)	Spain
Instituto Español de Oceanografía (Vigo, Cadiz, Madrid)	Spain
University of Cadiz	Spain
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK
Marine Scotland Science (Aberdeen)	UK
University of Aberdeen	UK
University of Liverpool	UK
NOAA Fisheries - National Marine Fisheries Service	USA

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.141 Titel	C4 Does accounting for variation in natural mortality matter? (4301900310)
1.142 BAS-nummer 2009	C4
1.143 BAS-nummer 2010	
1.144 Projectleider	N. Hintzen

1.145VOORTGANG 2009

1.146 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This project was designed to quantify how sensitive populations are to incorrectly accounting for natural mortality. This is a new area of research for IMARES and it is cutting edge in that very little international research effort has been given to this issue. The project provides information for our understanding of natural mortality, its relevance and sensitivity of our advice to assumptions about mortality in general.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd The project developed a size structured population model, based on the life-history of North Sea herring. It was specifically structured to be utilised for both advice and scientific understanding of population dynamics. The model used automated bifurcation analyses which are innovative to IMARES. The project encompassed a literature study to design the model structure, based on three different life stages of North Sea Herring in three spatially distinct spatial areas. The size structured model was designed and tested with diagnostics. It was important to ensure that the model captured realistic population dynamics. Effort was also given to the presentation of model outputs and communication of results. Initial results from the model show that natural mortality on the adult life stages is more likely to impact on stock collapse than the juvenile life stages. Within the near future the boundary conditions of the model, i.e. what are the characteristics of the environment the life stages live in, should be better approximated. It is also planned to analyse the different aspects of the model, like the change in lifetime reproductive output under different juvenile and adult mortality rates. A side benefit of the project is that the developed model can now be used the environment department of IMARES to study the importance and sensitivity of contaminants on population dynamics. A manuscript is in preparation to be given at the ICES annual science meeting in September 2010.
1.147 Afwijking	
1.148 Bijdrage aan KB-thema (*)	Changing fishery management 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 legal framework formulation the obligation for biological and economic data collection of fish and fisheries data by the Member States is 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 and now the potential of results based management. The Kennisbasis WOT resources are 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 also contributes to the scientific status of Wageningen IMARES and to our quality control through peer reviewed publications.
1.149 Betekenis ontwikkelde producten en expertise	
1.150 Wetenschappelijke publicaties (*)	
1.151 Maatschappelijke publicaties	
1.152 Andere output	
1.153 Aansluiting op Kennisontwikkeling bij de universiteit	
1.154 Doorstroom naar BO-onderzoek en praktijk	

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INTERNATIONAAL

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(a) Wetenschappelijk netwerk Nee
(b) Projectconsortium Nee
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.155 Titel	D1 KB WOT programme leadership (4301900301)
1.156 BAS-nummer 2009	D1
1.157 BAS-nummer 2010	
1.158 Projectleider	M. Dickey-Collas

1.159VOORTGANG 2009

1.160 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This project provided the resources to manage the KB WOT programme through 2009.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd The overall coordination costs were less than 3% of the total KB WOT programme. The coordination involved setting up and reporting of the programme, calling for project bids, attending KB meetings at Wageningen and discussing the results with LNV. Planning for a 2010 review of KBWOT also took place.
1.161 Afwijking	
1.162 Bijdrage aan KB-thema (*)	**Maintenance and international exchange of key WOT expertise** Further, kennisbasis resources have been 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 usually coordinated by ICES. These study groups also produce new ideas, innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.
1.163 Betekenis ontwikkelde producten en expertise	
1.164 Wetenschappelijke publicaties (*)	
1.165 Maatschappelijke publicaties	
1.166 Andere output	
1.167 Aansluiting op Kennisontwikkeling bij de universiteit	
1.168 Doorstroom naar BO-onderzoek en praktijk	

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INTERNATIONAAL

Het Ministerie van LNV vraagt ons om de internationaliseringsdimensie in de kennisbasis expliciet te maken. De internationaliseringsdimensie kan vanuit een aantal invalshoeken worden beschreven, waarvan één of meer van toepassing kunnen zijn. Hieronder zijn die uitgewerkt

(a) Wetenschappelijk netwerk Nee
(b) Projectconsortium Nee
(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.169 Titel	D2 Quality and maintenance of expertise in fish ageing (4301900308)
1.170 BAS-nummer 2009	D2
1.171 BAS-nummer 2010	
1.172 Projectleider	L. Bolle

1.173VOORTGANG 2009

1.174 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This project supports and underpins a core technique for fisheries science and the provision of fisheries advice, namely the determination of the age of fish. Thus it is considered core to the work of KB WOT. This technique is commonly referred to as "fish ageing". Much of the work is carried out under the auspices of both ICES and the EU and is monitored by an ICES and EU Planning Group on Commercial Catch, Discards and Biological Sampling (ICES CM 2009\ACOM:39). The Netherlands has major international commitments under the data collection regulation of the EU to carry out fish ageing on its main fisheries. This project is used to support and maintain the core competency of determining the age of fish. Almost all stock assessments carried out by IMARES rely on robust age data.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd In 2009 the following new age readers were trained: 2 new readers for blue whiting, 2 new readers bream and roach, 1 new reader for turbot and brill, 1 new reader for horse mackerel and 1 new reader for gadoids. This project also funded participation in the following workshops. These workshops are vital for maintaining quality control of input data for international fisheries: Cod workshop (Denmark), Turbot workshop (Belgium), Blue whiting otolith, sole exchange follow up. To maintain the quality, additional work on the Internal QA procedures was also carried out.
1.175 Afwijking	
1.176 Bijdrage aan KB-thema (*)	**Maintenance and international exchange of key WOT expertise** Further, kennisbasis resources have been 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 usually coordinated by ICES. These study groups also produce new ideas, innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.
1.177 Betekenis ontwikkelde producten en expertise	
1.178 Wetenschappelijke publicaties (*)	
1.179 Maatschappelijke publicaties	
1.180 Andere output	
1.181 Aansluiting op Kennisontwikkeling bij	

de universiteit	
1.182 Doorstroom naar BO-onderzoek en praktijk	

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(a) Wetenschappelijk netwerk — Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?

(b) Projectconsortium — Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?

NIOZ, Texel, The Netherlands	The Netherlands
Institute for Agricultural and Fisheries Research	Belgium
Technical University of Denmark AQUA	Denmark
Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France
Marine Research Institute	Iceland
University of Reykjavik	Iceland
International Council for the Exploration of the Sea (ICES)	International Body
Marine Institute (MI Galway)	Ireland
Institute of Marine Research (IMR, Bergen)	Norway
Instituto Português de Investigação das Pescas e do Mar	Portugal
Sea Fisheries Institute/Morski Instytut Rybacki	Poland
AZTI-Tecnalia	Spain
Consejo superior de investigaciones cientificas (Vigo)	Spain
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.183 Titel	D3 International exchange (ICES WG and SGs) (4301900314)
1.184 BAS-nummer 2009	*D3*
1.185 BAS-nummer 2010	*Indien dit afwijkt van het BAS-nummer in 2009 (zie ook bovenstaande tabel)*
1.186 Projectleider	M. Dickey-Collas

1.187VOORTGANG 2009

1.188 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This project covered active participation by IMARES staff of the core groups under the International Council for the Exploration of the Sea that are relevant to the WOT programme, but are not part of the direct statutory commitments.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd The groups are: **PGEGGS** Working Group on Planning Egg Surveys www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=79 **SGFIAC** Study Group on Fisheries Induced Adaptive Change www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=203 **SGHERWAY** Study Group on the evaluation of assessment and management strategies of the western herring stocks www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=259 **SGHIST** Study Group on the History of Fish and Fisheries www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=269 **WGCRAN** Working Group on Crangon Fisheries and Life History www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=178 **WGDIM** Working Group on Data and Information Management www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=217 **WGFAST** Working Group on Fisheries Acoustic Science and Technology www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=141 **WGFE** Working Group on Fish Ecology www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=179 **WGFS** Working Group on Fisheries Systems www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=158 **WGMG** Working Group on Methods www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=159 **WGPBI** Working Group on Modelling Physical Biological Interactions www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=145 **WGSAM** Working group on Multispecies assessment methods www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=193 **WGFTFB** ICES-FAO Working Group on Fishing Technology and Fish Behaviour www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=137

	WGOOFE Working group on Operational Oceanography for Fisheries and Environment www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=322 **WKAREA** Workshop on Age Reading of European and American Eel www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=370 **WKBLUR** Workshop on Blue Whiting Recruitment www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=334 **WKECHOSCRU** PGNAPES Scrutiny of Echograms Workshop www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=332 **WKMHMES** Workshop on Mackerel and Horse mackerel egg staging and identification www.ices.dk/workinggroups/ViewWorkingGroup.aspx?ID=182
1.189 Afwijking	
1.190 Bijdrage aan KB-thema (*)	**Maintenance and international exchange of key WOT expertise** Further, kennisbasis resources have been 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 usually coordinated by ICES. These study groups also produce new ideas, innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.
1.191 Betekenis ontwikkelde producten en expertise	
1.192 Wetenschappelijke publicaties (*)	
1.193 Maatschappelijke publicaties	
1.194 Andere output	
1.195 Aansluiting op Kennisontwikkeling bij de universiteit	
1.196 Doorstroom naar BO-onderzoek en praktijk	

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(a) Wetenschappelijk netwerk — Werk je samen met buitenlandse onderzoeksgroepen en zo ja welke? Wat is hun rol in het project?
Ja

(b) Projectconsortium — Voer je het project samen uit met buitenlandse partners – wetenschappelijk, publiek en/of privaat?

Institute for Agricultural and Fisheries Research	Belgium
International Institute for Applied Systems Analysis (IIASA, Laxenburg)	Austria
Department of Fisheries and Oceans (DFO, St Johns)	Canada
Technical University of Denmark AQUA	Denmark
University of Aalborg	Denmark
Institut français de recherche pour l'exploitation de la mer (IFREMER, Nantes, Port en Bessin)	France
University of Hamburg	Germany
Marine Research Institute	Iceland
University of Reykjavik	Iceland
International Council for the Exploration of the Sea (ICES)	International Body
Marine Institute (MI Galway)	Ireland
Institute of Marine Research (IMR, Bergen)	Norway
University of Bergen	Norway
Instituto Português de Investigação das Pescas e do Mar	Portugal
Sea Fisheries Institute/Morski Instytut Rybacki	Poland
AZTI-Tecnalia	Spain
Consejo superior de investigaciones cientificas (Vigo)	Spain
Instituto Español de Oceanografía (Vigo, Cadiz, Madrid)	Spain
University of Cadiz	Spain
University of Stockholm	Sweden
Centre for Environment, Fisheries & Aquaculture Science (CEFAS, Lowestoft)	UK
Marine Scotland Science (Aberdeen)	UK
Sir Alister Hardy Foundation for Ocean Science (SAHFOS, Plymouth)	UK
University of Aberdeen	UK
University of Liverpool	UK
NOAA Fisheries - National Marine Fisheries Service	USA

(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering

ALGEMEEN

1.197 Titel	D4 Maintaining and improving quality in acoustic surveys (4301900306)
1.198 BAS-nummer 2009	D4
1.199 BAS-nummer 2010	
1.200 Projectleider	F. van Beek

1.201 VOORTGANG 2009

1.202 Resultaten (*)	*Geplande activiteiten, deliverables en milestones* This project improves the quality assurance in the acoustic survey methods used for the WOT work and to develop expertise. It allows collaborative initiatives with acoustic researchers in other centres of excellence.
	Uitgevoerde activiteiten, gerealiseerde deliverables in 2009 en (bij afsluiting van een meerjarig project) gedurende de hele looptijd The project summarised into one location all the improvements in quality assurance in recent years and lists all protocols currently used within IMARES acoustic surveys. It developed a framework to ensure that protocols are regularly updated and staff are educated and trained in the appropriate methods for acoustic surveys in IMARES.
1.203 Afwijking	
1.204 Bijdrage aan KB-thema (*)	**Maintenance and international exchange of key WOT expertise** Further, kennisbasis resources have been 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 usually coordinated by ICES. These study groups also produce new ideas, innovative products and methods, thus it is crucial that those working for WOT remain active in these fora.
1.205 Betekenis ontwikkelde producten en expertise	
1.206 Wetenschappelijke publicaties (*)	
1.207 Maatschappelijke publicaties	
1.208 Andere output	
1.209 Aansluiting op Kennisontwikkeling bij de universiteit	
1.210 Doorstroom naar BO-onderzoek en praktijk	

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(a) Wetenschappelijk netwerk Nee
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(c) Object van onderzoek
(d) Projectresultaat
(e) BO Internationaal
(f) Markt en positionering
(g) Financiering