The KB WOT Fisheries Programme carried out in 2016

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Summary

Maintaining and developing the expertises needed to execute the Dutch fisheries monitoring and advice statutory obligations is the core of the KB WOT Fisheries programme. As fisheries management and policy needs, and thus the WOT requirements, change over time, the KB WOT programme needs to be flexible to respond to these changes. The KB WOT programme seeks to be inventive and participate in the fisheries science development, while maintaining the core expertises and flexibility. The programme operates within the context of the Common Fisheries Policy (CFP), the EU Marine Strategy Framework Directive (MSFD) and the EU Maritime Policy.

The KB WOT fisheries programme is established annually and positioned around a number of themes. In 2016 17 projects were originally awarded. However, one project could not meet all the original objectives and with the remaining budget a new project was started on the tool development for monitoring catches on board commercial vessels. The 18 projects within the programme were successfully completed. The focus of the programme in 2016 was on research into mapping the seafloor, development of tools and framework for monitoring catches on board commercial vessels, data storage and accessibility and method development for assessment of marine resources. As the basis of the KB WOT Fisheries is maintaining and developing key expertise for the WOT programme, a considerable part of the funds was used for projects that standardise fish ageing, fish and shellfish monitoring and development of fisheries acoustics techniques and expertise. These subjects are essential for ensuring the high quality of fish stock assessments and management.

Of the 18 projects funded in 2016, six were carried out in international collaboration with other institutes in- and outside Europe. These partnerships provide a large amount of added value, since resources and expertise from these other countries contribute to the outcomes of the KB WOT Fisheries programme. Also, a large part of the KB WOT resources is specifically dedicated to international collaboration and exchange of science. This ensures that Wageningen Marine Research researchers remain at the centre of scientific developments and international fisheries research.

The programme was also very productive in terms of publications, presentations and developing new methods or tools for fisheries research. Over 20 international presentations were given at meetings, workshops and symposia, and 24 international and national reports were written. 9 new methods or models were developed, 4 peer reviewed publications published and 1 scientific publication prepared.

Samenvatting

Het onderhouden en ontwikkelen van de kernexpertises, welke nodig zijn voor het uitvoeren van de wettelijke taken van Nederland op het gebied van visserij monitoring en advisering, vormt de basis van het KB WOT Visserij programma. Het is een flexibel programma dat probeert in te spelen op veranderingen in de WOT behoeften, maar ook aanpassingen in het visserij beleid en beheer. Het KB WOT Visserij programma is daarnaast ook innovatief om te kunnen inspelen en deelnemen in wetenschappelijke ontwikkelingen. Het programma wordt uitgevoerd binnen de kaders van de Common Fisheries Policy (CFP), de EU Marine Strategy Framework Directive (MSFD) en de EU Maritime Policy.

Het KB WOT Visserij programma wordt jaarlijks vastgesteld rond een aantal thema's. Het programma van 2016 startte met 14 projecten. Binnen een project was het niet mogelijk om alle geplande activiteiten uit te voeren. Met het vrijgekomen budget een nieuw project gestart waarin een nieuwe tool ontworpen en gemaakt is voor de monitoring van de vangst aan boord van kotters. De 18 projecten zijn verder succesvol uitgevoerd. Het KB WOT programma was in 2016 gericht op onderzoek naar het in kaart brengen van de zeebodem, ontwikkeling van middelen voor het monitoren van vangsten aan boord van commerciële schepen, data opslag en toegankelijkheid en het ontwikkelen van methoden voor bepaling van de grootte van vis- en scheldierbestanden. De kern van het programma is de ontwikkeling en het onderhouden van de kern expertises welke noodzakelijk zijn voor het WOT Visserij programma. Een groot deel van het budget is dan ook besteed aan projecten voor het standaardiseren van leeftijdsbepaling van vis, vis en schelpdier monitoring en de ontwikkeling van visserij akoestische technieken. Dit zijn onderwerpen die essentieel zijn voor het behouden van de hoge kwaliteit van assessments en beheer van visbestanden.

Van de 18 projecten die in 2016 zijn uitgevoerd, zijn er zes uitgevoerd in samenwerking met instituten binnen, maar ook buiten Europa. Door deze samenwerking wordt er extra waarde bijgedragen, in de vorm van kennis en middelen uit deze andere landen, aan de uitkomsten van het KB WOT Visserij programma. Een ander groot deel van het budget van het programma was specifiek ingezet voor internationale samenwerking en uitwisseling van kennis en wetenschap. Dit geeft onderzoekers van Wageningen Marine Research de mogelijkheid in het centrum van wetenschappelijke ontwikkelingen en internationaal visserij onderzoek te blijven.

In 2016 is er ook veel gepubliceerd binnen het KB WOT programma. Meer dan 20 presentaties zijn gepresenteerd tijdens internationale bijeenkomsten, vergaderingen, workshops en symposia. In totaal zijn er 24 internationale en nationale rapporten geschreven en 9 nieuwe methoden of modellen ontwikkeld. Daarnaast zijn er ook nog 4 peer reviewed wetenschappelijke artikelen gepubliceerd en 1 wetenschappelijk manuscript opgezet.

1 Introduction

KennisBasis (KB) WOT Fisheries is established to maintain and develop core expertises that are essential to perform the statutory obligations (WOT) of The Netherlands in fisheries monitoring and advice on fisheries management. Fishing methods and science are changing over time as do policy needs, and thus the statutory tasks are evolving. In order to keep the KB WOT programme sufficient for the evolving tasks, it needs to be proactive while continuing to uphold and progress the core expertises. Through yearly review the multiannual KB WOT Fisheries programme remains flexible to respond to changes and at the same time have distinctly defined objectives and deliverables. The programme operates within the wider Wageningen Research KB programme and is since 2015 embedded within the Wageningen KB theme 'System Earth Management'.

The statutory obligations comprise the advice and tasks needed to carry out the national and European fishery policies. The (future) policy needs originate mainly from the existing and upcoming EU directives, commitments relevant for fisheries for the Common Fisheries Policy (CFP), national freshwater policy, habitats directive, water quality directive and the Marine Strategy Framework Directive (MSFD). Fisheries management and policy require reliable science-based advice. Such advice can be delivered through data and information collection in combination with enhanced understanding of the marine and aquatic (eco)systems. To provide this data and information (international) long-term data collection programmes are in operation.

The core of the KB WOT Fisheries programme is underpinning the key expertises to carry out the WOT tasks. Through this the programme improves the efficiency in the execution of the WOT Fisheries programme. A combination of effective research aimed at present needs of EZ and the EU, together with more strategic research, to anticipate future policy and research needs and developments, creates a programme which is both innovative and supportive. The KB WOT Fisheries budget is utilised to maintain, improve and develop the expertise in the research areas of fisheries dynamics, fish biology, monitoring, marine and freshwater ecology and management systems. An important priority of the programme is to stimulate international exchange of knowledge, method and technique developments and international collaboration. In addition the KB WOT programme tries to be a stimulant for scientific output, to scientists involved in the statutory tasks.

2 The programme in 2016

The evident necessities of the WOT Fisheries programme were the foundation to set the research priorities for the KB WOT Fisheries programme in 2016. The main concern of the programme is to continue and progress the key expertise, essential to carry out the WOT Fisheries responsibilities. Ensued by scientific interchange and the developments and improvements required to carry out present and upcoming WOT tasks. More The strategic initiatives are supported from remaining funds.

Only outstanding and innovative research can deliver the robust science and advice needed to carry out the WOT Fisheries obligations. The results of long-time sampling programmes and provided advice need to be excellent for (inter)national fisheries management. This level of science and quality control can only be achieved with international exchange of knowledge and developments and publication of research in peer reviewed scientific articles. Therefore, a considerable part of the budget of the KB WOT Fisheries programme is allocated for international exchange and collaboration.

2.1 Research themes

The high priority research themes considered for the KB WOT fisheries programme in 2016 were:

1. Evaluating, improving and underpinning the WOT Fisheries programme
2. Maintaining Quality
3. International Exchange
4. DG MARE Tender

2.2 Rationale for the choice of research themes

The provision of information and tools, but also improving current methods and management are essential to evaluate, improve and underpin the WOT Fisheries programme. Also marine and aquatic management and policy are continuously developing. Fish stock management in the EU has recently shifted to management of the fisheries, and now also include actions to regulate fishing effort and reduce discards. Although fisheries impact on the environment has been studied, there is a continued need for further knowledge to support the management of marine and aquatic resources.

For EU data requirements, member states are required to carry out monitoring programmes for single and multiple stock fisheries. At the same time, EU regulations, such as MSFD, require data collection for a number of selected descriptors, ecosystem elements which are sensitive to fishing activities. Marine and fresh water productivity is subject to changes over a range of temporal scales. Recent changes are

being well-documented, but the relative importance of components of an ecosystem can change over time. Interaction of these natural fluctuations with human activities makes the fisheries system dynamic and sometimes unpredictable. This calls for combined integral monitoring programmes. A substantial part of the KB WOT budget is reserved to support these international duties and projects are requested and selected which deal with these specific needs of the WOT fisheries programme. Peer reviewed manuscripts will ensure quality control of the research on these topics.

The KB WOT Fisheries programme main objective is to maintain and develop the key expertises and development of routine techniques, skills and tools needed to carry out the WOT Fisheries tasks. This includes age reading, maturity assessment, stock assessment, acoustic and remote sensing techniques and data collection. Courses, workshops and exchanges, usually coordinated by ICES, are an important part of maintaining and developing these core skills. Exchange of science and techniques on national and international level is an essential component to develop European fisheries science. These workshops and symposia are also the basis for the new innovative tools and methods. It is therefore essential that the staff carrying out the statutory tasks participate in these meetings.

2.3 Projects funded through the KB WOT fisheries programme in 2016

For 2016, scientists were invited to submit proposals to several themes which are selected by the KB WOT management team. The proposals were reviewed and judged for relevance to the WOT statutory tasks, development of relevant new methods and scientific relevance. The projects in the table below were funded in 2016. The annual reports of each project are attached to the end of this report.

BAS No	Title	Project leader	Research Theme	Planned	Realised
KB-24-005-001	Programme Management	Cindy van Damme		€27.236,-	€27.236,-
KB-24-005-002	International Exchange	Cindy van Damme	3. International exchange	€110.000,- ¹	€107.594,-
KB-24-005-003	Fish Ageing	Loes Bolle	2. Maintaining Quality	€47.000,-	€47.000,-
KB-24-005-004	IBTS otolith sampling scheme	Ralf van Hal	1. Ecosystem Approach	€11.880,-	€11.880,-
KB-24-005-005	PELSEL	Niels Hintzen	1. Ecosystem Approach	€13.860,-	€13.860,-
KB-24-005-006	Acoustic methods for trawl surveys	Lorna Teal	1. Ecosystem Approach	€33.660,-	€33.660,-
KB-24-005-007	Ecosystem Acoustics combined with IDMAD	Sascha Fässler	2. Maintaining Quality	€59.496,-	€59.496,-
KB-24-005-008	Remote mussel bed sensing	Karin Troost	2. Maintaining Quality	€41.244,-	€41.244,-
KB-24-005-009	Drone mapping of mussel beds	Karin Troost	2. Maintaining Quality	€40.180,-	€40.180,-
KB-24-005-010	Storage of electronic monitoring data	Edwin van Helmond	2. Maintaining Quality	€46.488,-	€46.488,-
KB-24-005-011	Geostatistics for estimating shellfish biomass	Ingrid Tulp	1. Ecosystem Approach	€29.560,-	€29.560,-
KB-24-005-012	Mackerel Egg Development and Mortality	Cindy van Damme	2. Maintaining Quality	€29.990,-	€29.990,-
KB-24-005-013	Catch sampling on-board pelagic freezer trawlers	Edwin van Helmond	2. Maintaining Quality	€14.660,-	€14.660,-
KB-24-005-014	Discards ashore	Ruben Verkempynck	1. Ecosystem Approach	€34.076,-	€34.076,-
KB-24-005-015	Use of electronic measuring devices	Ruben Verkempynck	2. Maintaining Quality	€14.414,- ¹	€9.414,-
KB-24-005-016	Demographic profile of recreational fisheries	Tessa van der Hammen	1. Ecosystem Approach	€12.256,-	€12.256,-
KB-24-005-017	MARE Co-funding	Sieto Verver	4. DG MARE tender	€22.000,- ¹	€19.406,-
KB-24-005-018	Discard Valves	Piekie Molenaar	1. Ecosystem Approach	€10.000,-	€10.000,-

The total KB WOT budget €588.000,- (excluding WUR charges) was expended in 2016.

¹ Measuring board development at other institutes was slower than expected, hence the project KB-24-005-015 could not be fully executed in 2016. The remaining budget from this project together with the remaining budgets from KB-24-005-002 and KB-24-005-017 were for a new project KB-24-005-018.

3 Highlights of the programme in 2016

Many excellent proposals were submitted to the KB WOT Fisheries call, hence it was again possible to launch a broad programme of outstanding projects. Originally 17 projects were rewarded at the start of 2016. However, one project could not be carried out completely. This project was depending on the developments at other European institutes. These developments went slower than expected and some of the work was therefore postponed to 2017. Also the planned budgets of two other projects were not fully expended. It was thus possible to award and carry out a project on 'Discard valves'. This project was already submitted and reviewed under the initial call, but not funded due to budget limitations.

Under the KB WOT Fisheries programme 18 projects were carried out successfully in 2016. The projects delivered many important and interesting findings. Examples of these projects are 'PELSEL' and 'IBTS otolith sampling scheme'.

3.1 PELSEL (Selectivity in pelagic fisheries)

It is unknown if and how the landing obligation, which has been established in 2015, has affected fisheries behaviour. Especially for assessment working groups it is important to know if a change has occurred that affects the selectivity of the fishing fleet. Advice relies heavily upon estimates of most recent selectivity by the fishing fleet.

At Wageningen Marine Research, a simple and easy to calculate set of spatial indicators (centre of gravity, dispersion (inertia), isotropy (elongation), collocation and spreading area) was defined that would inform about a potential change in selectivity in pelagic fisheries. A set of spatial indicator types were calculated for the acoustic survey on herring and for the Dutch fishing fleet during the same season. Combining the two datasets allowed calculating overlap (global index of collocation). Five years of data were used to test whether the first 4 years differed from the last year (where the landing obligation was in place). Length-frequency distributions from market samples were added and compared over time, in relation to the 4 indicators from above.

The results currently available on the spatial distribution of the fishing fleet and the sampling of their catches does not indicate any change in fishing behaviour that could lead to a substantial change in selectivity which may not be picked up by assessment models. Distribution of catch densities were similar to herring density distributions estimated by the acoustic survey throughout the years investigated (2011-2015), with no marked deviation in 2015. This means that trawlers targeted locations with a similar gravity centre as that of the wider herring population observed by the survey. The different patterns in isotropy values between the two data sets suggests a more narrower spread of trawling locations when compared to the whole herring population, suggesting focus on locations of highest density aggregations. Index of collocation between the two data sets was high over all years, suggesting similar sampling pattern of the fleet that is related to the gravity centre and spread of the population in a constant fashion.

A constantly higher positive area was observed for the survey area when compared to the constantly lower positive area for the trawler data. This simply confirms that more ground was covered with data points in the survey. While the equivalent area for the trawler data was higher (due to lower number of exclusively high density points), that value increased markedly in the last year (2015). This may suggest that the number and spread of catch density values were similar compared to previous years, but catches were proportionally higher. The same could be observed from the spreading area which also takes into account the variation in fish densities, suggesting that a similar variation was observed as in previous years. The Gini index (a measure of heterogeneity of the density distributions) also suggested that the trawler catch density data in 2015 was the most heterogeneous of all years analysed,

Trawl Catches & Survey Center of gravity 2011

Trawl Catches & Survey Center of gravity 2012

Trawl Catches & Survey Center of gravity 2013

Trawl Catches & Survey Center of gravity 2014

Trawl Catches & Survey Center of gravity 2015

Centre of gravity, inertia and isotropy of herring density samples from the acoustic survey (blue; based on NASC) and pelagic trawlers (red; based on catch weight) from 2011-2015.

Observer trips executed on-board the freezer trawlers did not observe any changes in fishing behaviour. Neither were discards observed in 2015 while in previous years a small proportion of the catch (~1-7 % in recent years) was discarded.

3.2 IBTS otolith sampling scheme

The International Bottom Trawl Survey (IBTS) collects otoliths of target fish species to establish the age of individual fish to provide an age-based index, which is used in the assessments. Only a small fraction of the catch is typically analysed for age as this is a costly and time-consuming process. With the otoliths of this fraction of the catch an Age-Length-Key (ALK) is constructed. This ALK is then used to transform the total numbers-at-length, which is collected of the whole catch into numbers-at-age. The ALK for the IBTS is not constructed for the whole survey area, instead multiple ALKs are constructed for smaller spatial units, the so called roundfish areas (RFA). These roundfish areas are based on historic stock structures of some of the target species. In line with that the current IBTS otolith sampling scheme is based on the RFA, while the stratification unit of the survey is a smaller unit, the ICES rectangle which is fished twice by two different countries. The current scheme dictates the collection of a specific number of otoliths per cm- or 0.5 cm-class by country by RFA.

Aanes and Vølstad (2015) found no gain in precision from collecting 10 instead of only 1 otolith per 5-cm length class. While this result obviously depends on species and geographical area tested, it appears promising to conduct an analogous analysis for the IBTS. There is strong evidence to suggest that the number of otoliths per length class sampled in the IBTS could be significantly reduced without any significant loss in precision of the overall estimates being recorded. This would be beneficial as processing the otoliths is costly and time-consuming, but also to reduce the number of experimental animals required.

IBTS Q1 and Q3 data of whiting and herring stored in the DATRAS database were used. We used the full set of samples of a single year and quarter and created a real population of the specific species based on this. From this population we bootstrapped the otoliths according to the original sampling scheme and in a by station-specific sampling scheme varying the number of otoliths taken from length classes. Using the current method of estimating the ALK and a by station modelled ALK the population was reconstructed to estimate the variance created by the different methods.

Overall these analyses show that the current and proposed methods all result in bias in the estimates of numbers-at-age. Furthermore, it is shown that a reduction in the number of otoliths not necessarily results in worse estimates. However, in most cases the current method collecting the most otoliths performs best. The analysis indicates that reducing the amount of otoliths compared to the maximum in the current guidelines is not preferred. Additional work is required on the model used to estimate the ALK by tow.

*Herring
otolith*

3.3 Tools and method development

New and innovative tools were developed in 2016 for the monitoring of catch composition on board commercial fishing vessels. A highly specialized camera and connected software was produced and tested to monitor catch composition during catch processing on board pelagic trawlers. On the demersal trawlers circumstances of catch processing are very different compared to the large pelagic trawlers. Thus the camera is no option and a prototype of discard valves was designed and crafted for catch sampling on board these smaller vessels.

Methods and programming code have been developed using Matlab, Python and (geo)statistical programming packages. For the analyses of ME70 multibeam data Matlab code has been developed to identify 3D images of fish schools and characterising the seabed. Trawl video is a relatively new tool for detecting fish entering the net. In the past the video material needed to be analysed manually. Now Python software has been developed to automate the fish detection in GoPro files.

A geostatistical model has been created, which can be used to estimate densities and biomass of benthic species from the WOT shellfish surveys. A statistical model has the ability to investigate the yearly fluctuations in the number of Dutch recreational fishers, their demographic profile and their reasoning for their flexible participation.

To test the effect of various scenarios of the landing obligation for the estimation of discards several models were build, as well as a framework established on how to best monitor Below Minimum Size discards in the future.

3.4 Standardisation of techniques, data accessibility and quality control

Advances were made in to fish ageing of flatfish (lemon sole, turbot and brill, plaice, dab and sole), pelagic fish (horse mackerel, greater argentine and blue whiting) and cod and whiting. Task-sharing between ILVO (Belgium) and Wageningen Marine Research, in order to increase standardisation and quality of age reading, has been further extended.

Quality control of data collections, storage and data accessibility is important for the statutory tasks. Electronic monitoring is becoming the way to estimate catches on board, but data storage facilities for data from these images is not ready available. Data base facilities and a data protocol have been established for storing electronic monitoring data of catches.

Fish do not keep to artificial borders and therefore monitoring is carried out on an international level. Sampling strategies based on statistically sound sampling procedures in a regional context were investigated. Insights were gained in regional discrepancies regarding the approach of regional sampling and this lead to recommendations to move towards regional sampling schemes.

New techniques were also tested to investigate if drones can be used as a tool for the monitoring of shellfish.

3.5 Recent publications resulting from the KB WOT fisheries programme

Four peer reviewed publication resulted in 2016 which were prepared with the aid of funds from the KB WOT Fisheries programme.

Fässler, S.M.M., Brunel, T., Gastauer, S. and Burggraaf, D. (2015). Acoustic data collected on pelagic fishing vessels throughout an annual cycle: Operational frame work, interpretation of observations, and future perspectives. Fish. Res. 178, 39-46.
<http://dx.doi.org/10.1016/j.fishres.2015.10.020>

Van Denderen, P.D., Rijnsdorp, A.D. and Van Kooten, T. (2016). Using marine reserves to manage impact of bottom trawl fisheries requires consideration of benthic food-web interactions. *Ecological Applications* 26(7), 2302-2310.

De Haan, D., Fosseidengen, J.E., Fjellidal, P.G., Burggraaf, D. and Rijnsdorp, A.D. (2016). Pulse trawl fishing: Characteristics of the electrical stimulation and the effect on behaviour and injuries of Atlantic cod (*Gadus morhua*). *ICES Journal of Marine Science* 73(6), 1557-1569.

Mollet, F.M., Dieckmann, U. and Rijnsdorp, A.D. (2016). Reconstructing the effects of fishing on life-history evolution in North Sea plaice *Pleuronectes platessa*. *Marine Ecology Progress Series* 542, 195-208.

In addition the below manuscripts for submission are in preparation:

2016

Fässler et al. (in prep). Broadband classification of fish species.

2015

Fässler et al. (in prep). Variability in Atlantic mackerel target strength and its effects on acoustic abundance estimates.

Fässler et al. (in prep). Methods for determining in situ target strength.

Fässler et al. (in prep). Spatial analysis methods to combine fishing fleet behaviour and fish biomass from acoustic and VMS information.

Teal et al. (in prep). SPI image analysis software.

Tulp et al. (in prep). Relationships between intertidal benthos and shrimp fisheries in the Wadden Sea and the Dutch coastal zone.

2014

Wolfshaar & Kooten Manuscript (in prep). Undersized bycatch may promote the growth of harvestable fish'.

2013

Fässler et al. (submitted). Pelagic fish in the gateway to the Wadden Sea: abundance and behaviour in relation to the tide.

Damme et al. (in prep). Can the standard IBTS-MIK survey provide reliable data on herring recruitment and spawning locations.

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

Fässler et al. (in prep). Information on pelagic fish stocks around the British Isles derived from acoustic data collected on commercial fishing vessels.

Fässler et al. (in prep). Herring habitat quality from acoustically derived zooplankton abundance in the Northern North Sea.

Fässler et al. (in prep). The distribution of blue whiting west of the British Isles" and "Vertical migration of mesopelagic fish west of the British Isles.

Next to the above peer reviewed manuscripts results of the KB WOT projects were also disseminated in other ways. There were also 24 internal and international reports and 20 presentations from projects, workshops and expert group meetings which were partially financed through KB WOT Fisheries and contribute directly to the development of WOT fisheries monitoring and advice.

ICES (2016) Report of the Working Group on Biological Parameters (WGBIOP), 10-14 October 2016, Monopoli, Italy. ICES CM 2016 /SSGIEON:08

ICES (2016) Report of the Workshop on Age reading of Dab (*Limanda limanda*) (WKARDAB2), 17-20 November 2015, Hamburg, Germany. ICES CM/SSGIEOM:12

ICES (2016) Report of herring exchange 2015

ICES (2016) Report of sole exchange 2015-2016

Working document 'IBTS otolith sampling scheme ' as part of the ICES IBTSWG 2016 report (ICES CM 2016/SSGIEOM:24)

Working document 'Selectivity in pelagic fisheries' as part of the ICES Herring Assessment Working Group 2016 report

Berges et al. (in prep). Acoustic methods for trawl surveys. Wageningen Marine Research report.

Teal et al. (in prep). Geostatistics for estimating shellfish biomass. Wageningen Marine Research report.

Working document 'Mackerel egg development' to the ICES Working Group on Mackerel and Horse mackerel Egg Surveys in 2017.

Verkempynck et al. (in prep). Discards ashore. Wageningen Marine Research report.

Verkempynck et al. (in prep). Descriptions of electronic measuring boards. Wageningen Marine Research report.

The FishPi project, STRENGTHENING REGIONAL Co-OPERATION IN FISHERIES DATA COLLECTION, Report to the European Commission in Fulfilment of Grant Award: EU MARE/2014/19. June 2016

ICES (2016). Report of the Data and Information Group (DIG). ICES CM 2016/SCICOM:02

ICES (2016). Interim Report of the Working Group on Integrative Physical-Biological and Ecosystem Modelling (WGIPEM). ICES CM 2016/SSGIEA:01

ICES (2016). Interim Report of the Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES). ICES CM 2016/SSGEPI:17

ICES (2016). Report of the Working Group on Fishing Technology and Fish Behaviour (WGFTFB). ICES CM 2016/SSGIEOM:22

ICES (2016). Final Report of the Working Group on Fisheries Acoustics, Science and Technology (WGFAST). ICES CM 2016/SSGIEOM:21

ICES (2016). Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR). ICES CM 2016/SSGIEOM:27

ICES (2016). Interim Report of the Working Group on Crangon Fisheries and Life History (WGCRAN). ICES CM 2016/SSGEPD:07

ICES (2016). Report of the Workshop on Growth-increment Chronologies in Marine Fish: climate-ecosystem interactions in the North Atlantic 2 (WKGIC2). ICES CM 2016/SSGIEOM:18

ICES (2016). Interim Report of the Benthos Ecology Working Group (BEWG). ICES CM 2016/SSGEPD:04;

ICES (2016). Final Report of the Working Group on Target Classification (WGTC). ICES CM 2016/SSGIEOM:23

ICES (2016). Report of the Workshop to plan an integrated monitoring Programme in the North Sea in Q3 (WKPIMP). ICES CM 2016/SSGIEOM:11

The true inner beauty of fish. ©Adam Summers

4 International partnership and collaboration

Management of the fish stocks and fisheries is by its character international, since fish do not stick to man-made placed boundaries. It is therefore embedded in the European fisheries policies. The result of this is that many of the statutory obligations are carried out in partnership with international research institutes. Monitoring at sea, sampling of catches, method and tool development, the analyses of data, fish stock or ecosystem assessments and provision of advice are all carried out in international context. Thus, international collaboration is the basis for the core expertise that are essential to maintain the high standards of the WOT tasks.

Of the 18 projects undertaken in 2016 , 6 were in collaboration with scientists from institutes in Europe and outside Europe. This resulted in added value in the form of resources and expertise from other countries to the KB WOT Fisheries programme. One recurring project is specifically dedicated to international exchange of knowledge and scientists. This project made it possible for Wageningen Marine Research colleagues to participate in studies of ecosystem modelling, effects of climate change, fisheries induced evolution, integrated monitoring, improving survey, acoustic and fishing technologies and benthic and ichthyoplankton monitoring.

Over 20 international presentations were given at working groups and symposia. Through the KB WOT Fisheries programme Wageningen Marine Research scientists joined forces with scientists from institutes from all over the world, including: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Norway, Portugal, Russia, Spain, Sweden, United Kingdom, United States of America, Austria, Italy, Greece, Australia, Greenland and the Faroe Islands.

5 Conclusion

In 2016 the KB WOT Fisheries programme was very productive and innovative. Unfortunately one project could only carry out part of the original objectives, because international developments were not as quick as expected. However, the 18 projects carried out in 2016 were successful and produced interesting and useful results and developments, from maintaining quality in collecting biological samples, fish ageing, shellfish, acoustic and discard sampling, data storage and improving fish stock assessments to more strategic research in fisheries acoustics, electronic monitoring and seafloor mapping. Especially the development of tools such as a camera and discard valves has improved the monitoring of commercial catches. Through the considerable international collaboration and participation in international meetings, workshops and symposia, a large amount of added value was also supplemented to the programme in 2016.

The budget of the KB WOT Fisheries programme in 2016 was used to:

- Exchange and developed knowledge and methods and cooperate with (inter)national colleagues.
- Develop new innovative tools to monitor catches on board commercial vessels
- Ensure data storage and accessibility
- Maintain and develop expertise needed for the WOT Fisheries programme.
- Develop new methods and ideas to provide better understanding and improve efficiency in carrying out WOT Fisheries tasks.
- Stimulate dissemination of results in (peer-reviewed) publications and on (inter)national fora.

Quality assurance

CVO utilises an ISO 9001:2008 certified quality management system (certificate number: 187378CC1-2015-AQ-NLD-RvA). This certificate is valid until 15 September 2018. The certification was issued by DNV GL Business Assurance B.V

Signature

CVO report number: 17.007
Project number: 4311300016

Approved by: Ing. S.W. Verver
Head WOT, Centre for Fisheries Research

Signature:

Date: March 2017

Annex 1. Annual Reports of KB WOT Fisheries Projects 2016

Title	1. Program management
Number	4311300016
Project leader	Cindy van Damme
Other researchers in WUR	Rian Schelvis and Sieto Verver
Researchers outside WUR	None
BAPS number	KB-24-005-001
Budget	€27.236,-
Goals of project	To manage and develop the KBWOT Fisheries theme.
Target group for research	Ministry of EZ. Close links to the KB programme. The new KB programme is currently under development.

PROGRESS 2016

Results	<p>Main results: The KB WOT fisheries programme contained 17 different projects in three different themes. One project for co-funding of an EU project finished half the year. Less co-funding was needed for this project than estimated. It was therefore possible to start a new project after summer. The projects were carried out successfully.</p> <p>Products: A report with the results from the 2015 KB WOT Fisheries programme and a report with the planned programme for 2016.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	The programme has maintained and developed expertise to underpin the statutory task of the Netherlands in fisheries research.
Science publications	A Wageningen Marine Research symposium was organised on 19 January 2016 where all projects presented their results of the KB WOT projects carried out in 2015 to other Wageningen Marine Research scientists and representatives of the Ministry of EZ.
General publications	<p>Damme and Verver, 2016. The KB WOT Fisheries Programme carried out in 2015. CVO report: 16.007.</p> <p>Damme and Verver, 2016. KB WOT Fisheries 2016 - Maintaining Excellence and Innovation in Fisheries Research. CVO report: 16.002.</p>
Other outputs	KB WOT mini-symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	The review by EZ found that the programme was forward looking, viewed high quality innovative science as important and yet maintained the direction considered important by EZ. Thus the KBWOT programme appears to utilise the expertise available to DLO on fisheries and look to the future research needs of society. See utility of the developed products and expertise.
Describe collaboration with any partners outside WUR (national)	Close links through ICES, the EU STECF, PICES and FAO. Plus a network of marine researchers in Universities across Europe and North America.

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Non scientific partners	Fisheries managers and research coordinators in EZ.
Summary and Conclusions of Project	This project manages the KB WOT fisheries programme within the WUR KB 24 theme 'System Earth Management'. It has produced a report with the results of the programme in 2015 and a report with the proposed programme for 2016. Within the KB WOT Fisheries programme 18 projects in four different themes (1. Evaluating, improving and underpinning the WOT Fisheries programme; 2. Maintaining Quality; 3. International Exchange and 4. DG MARE tender) were granted. Projects are carried out successfully.
Dutch summary and conclusions	Dit project beheert het KB WOT visserij programma binnen het WUR KB 24 thema 'System Earth Management'. Er zijn twee rapporten gepubliceerd, met de resultaten van het programma uit 2015 en het geplande programma voor 2016. Binnen het KB WOT Visserij programma zijn er in 2016 in totaal 18 projecten toegekend in vier verschillende thema's (1. Evaluating, improving and underpinning the WOT Fisheries programme; 2. Maintaining Quality; 3. International Exchange en 4. DG MARE tender). De projecten zijn succesvol uitgevoerd.

INTERNATIONAL

Was the project part of an international network?	The management of the KB WOT fisheries programme is a national project. However, in preparing the planning of the yearly programme international collaboration is a major topic.
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	One project was co-funding for an EU-project for DG Mare.
How much funding came from these sources?	€442,591,-
How did the project position Wageningen Marine Research internationally?	The programme places Wageningen Marine Research in a strong position in fisheries and marine science.

Title	2. International Exchange
Number	4311300017
Project leader	Cindy van Damme
Other researchers in WUR	Ingeborg de Boois, Adriaan Rijnsdorp, Loes Bolle. Johan Craeymeersch, Thomas Brunel, Karen van de Wolfshaar, Ben Scoulding, Pieke Molenaar, Lorna Teal, Ingrid Tulp and Niels Hintzen.
Researchers outside WUR	None
BAPS number	KB-24-005-002
Budget	€107.594,-
Goals of project	To fund participation in international science networks and ICES meetings.
Target group for research	International science networks and ICES.

PROGRESS 2016

Results	<p>Main results:</p> <p>Wageningen Marine Research active participation and contribution to 18 international workshops and study groups on fisheries, fish ecology, stakeholder involvement, evolutionary effects of fishing, development of new survey methods and age reading organised by ICES. This brought in added value and technology transfer to the Netherlands. Wageningen Marine Research personnel participated in the following networks and ICES groups:</p> <p>Data and Information Group (DIG), Working Group on Integrative Physical-biological and Ecosystem Modelling (WGIPEM), Working Group on Fisheries-Induced Evolution (WGEVO), Workshop on the Value of Coastal Habitats for Exploited Species (WGVHES), Working Group on Fishing Technology and Fish (WGFTFB), Working Group on Electrical Trawling (WGELECTRA), Working Group on Fisheries Acoustics and Technology (WGFAST), Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR), Working Group on Cod and Plaice egg surveys in the North Sea (WEGGS2), Working Group on Crangon Fisheries and Life History (WGCRAN), Report of the Working Group on Working Group on Biological Parameters (WGBIOP), Workshop on Growth-increment Chronologies in Marine Fish: climate-ecosystem interactions in the North Atlantic 2 (WKGIC2), Benthos Ecology Working Group (BEWG), Working Group on Atlantic Fish Larvae and Eggs Surveys (WGALES), Working Group on Target Classification (WGTC), Workshop to plan an integrated monitoring programme in the North Sea in Q3 (WKPIMP), Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN) and ICES/PICES Workshop on Phase 1: Modelling Effects of Climate Change on Fish and Fisheries (WKSICCME1).</p> <p>Products:</p> <p>Report of the Data and Information Group (DIG). ICES CM 2016/SCICOM:02; Wageningen Marine Research nota Report of the ICES Data and Information Group meeting 2016, 16.IMA0537.IB.mw; Interim Report of the Working Group on Integrative Physical-Biological and Ecosystem Modelling (WGIPEM). ICES CM 2016/SSGIEA:01; Wageningen Marine Research nota Report of the meeting of the Working Group on Integration of Physical and Ecological Models (WGIPEM), 16.IMA0535-KvdW-lcs; Interim Report of the Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES). ICES CM 2016/SSGEPI:17;</p>
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	Wageningen Marine Research nota Report of the Working Group on the Value of Coastal Habitat for Exploited Species (WGVHES), 16.IMA0535-KvdW-lcs; Report of the Working Group on Fishing Technology and Fish Behaviour (WGFTFB). ICES CM 2016/SSGIEOM:22; Final Report of the Working Group on Fisheries Acoustics, Science and Technology (WGFAST). ICES CM 2016/SSGIEOM:21; Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR). ICES CM 2016/SSGIEOM:27; Wageningen Marine Research nota Verslag van de meeting van de ICES Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR) in 2016, 16.IMA0326.IdB.mw; Interim Report of the Working Group on Crangon Fisheries and Life History (WGCRAN). ICES CM 2016/SSGEPD:07; Report of the Working Group on Biological Parameters (WGBIOP). ICES CM 2016/SSGIEOM:08; Report of the Workshop on Growth-increment Chronologies in Marine Fish: climate-ecosystem interactions in the North Atlantic 2 (WKGIC2). ICES CM 2016/SSGIEOM:18; Interim Report of the Benthos Ecology Working Group (BEWG). ICES CM 2016/SSGEPD:04; Wageningen Marine Research nota Report of the meeting of BEWG, 9-13 May 2016, Instituto Português do Mar e da Atmosfera (IPMA), Lisbon, Portugal, 16.IMA0555.JC.mw; Final Report of the Working Group on Target Classification (WGTC). ICES CM 2016/SSGIEOM:23; Report of the Workshop to plan an integrated monitoring Programme in the North Sea in Q3 (WKPIMP). ICES CM 2016/SSGIEOM:11; Wageningen Marine Research nota Report of the workshop to plan an integrated monitoring programme in the North Sea in Q3 (WKPIMP), 16.IMA0540.IB.mw.
Did the work follow plans (science or financial)?	Yes, meetings were selected and attendance was planned.
Developed expertise	The developed expertise underpins Wageningen Marine Research research in technical measures, acoustic, fish identification, fish ecology, stock assessment methods, ageing and maturity determination in fish, pulse trawl, evolutionary effects of fishing, data provision, biodiversity and stock structure.
Science publications	Each group has produced a report which is published on the ICES website: http://www.ices.dk/community/groups/Pages/default.aspx
General publications	Besides the ICES reports, a Wageningen Marine Research nota is published after each meeting with the main findings of the meeting and results that are of importance for Wageningen Marine Research and the ministry of EZ.
Other outputs	
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Products and expertise central to the development and research of fisheries in the Netherlands.
Describe collaboration with any partners outside WUR (national)	Mostly across the North Atlantic marine science community but now also with FAO and with scientists from countries involved in PICES (Japan, Korea, China) and scientists from Australia.

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Non scientific partners	None
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<p>Summary and Conclusions of Project</p>	<p>Wageningen Marine Research active participation and contribution to 18 ICES lead workshops and study groups on fisheries, fish ecology, stakeholder involvement, evolutionary effects of fishing, development of new survey methods and age reading. This brought in added value and technology transfer to the Netherlands. Wageningen Marine Research personnel participated in the following networks and ICES groups:</p> <p>Data and Information Group (DIG), Working Group on Integrative Physical-biological and Ecosystem Modelling (WGIPEM), Working Group on Fisheries-Induced Evolution (WGEVO), Workshop on the Value of Coastal Habitats for Exploited Species (WGVHES), Working Group on Fishing Technology and Fish (WGFTFB), Working Group on Electrical Trawling (WGELECTRA), Working Group on Fisheries Acoustics and Technology (WGFAST), Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR), Working Group on Cod and Plaice egg surveys in the North Sea (WGEGBS2), Working Group on Crangon Fisheries and Life History (WGCRAN), Report of the Working Group on Working Group on Biological Parameters (WGBIOP), Workshop on Growth-increment Chronologies in Marine Fish: climate-ecosystem interactions in the North Atlantic 2 (WKGIC2), Benthos Ecology Working Group (BEWG), Working Group on Atlantic Fish Larvae and Eggs Surveys (WGALES), Working Group on Target Classification (WGTC), Workshop to plan an integrated monitoring programme in the North Sea in Q3 (WKPIMP), Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN) and ICES/PICES Workshop on Phase 1: Modelling Effects of Climate Change on Fish and Fisheries (WKSICCME1).</p>
<p>Dutch summary and conclusions</p>	<p>Wageningen Marine Research actieve deelname en bijdrage aan 18 ICES workshops en studiegroepen over de visserij, vis ecologie, belanghebbenden betrokkenheid, evolutionaire effecten van de visserij, de ontwikkeling van nieuwe onderzoeksmethoden en leeftijd aflezen. Dit bracht toegevoegde waarde en de overdracht van kennis en technologie naar Nederland.</p> <p>Personeel van Wageningen Marine Research heeft in 2016 deelgenomen aan onderstaande netwerken en ICES groepen:</p> <p>Data and Information Group (DIG), Working Group on Integrative Physical-biological and Ecosystem Modelling (WGIPEM), Working Group on Fisheries-Induced Evolution (WGEVO), Workshop on the Value of Coastal Habitats for Exploited Species (WGVHES), Working Group on Fishing Technology and Fish (WGFTFB), Working Group on Electrical Trawling (WGELECTRA), Working Group on Fisheries Acoustics and Technology (WGFAST), Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR), Working Group on Cod and Plaice egg surveys in the North Sea (WGEGBS2), Working Group on Crangon Fisheries and Life History (WGCRAN), Report of the Working Group on Working Group on Biological Parameters (WGBIOP), Workshop on Growth-increment Chronologies in Marine Fish: climate-ecosystem interactions in the North Atlantic 2 (WKGIC2), Benthos Ecology Working Group (BEWG), Working Group on Atlantic Fish Larvae and Eggs Surveys (WGALES), Working Group on Target Classification (WGTC), Workshop to plan an integrated monitoring programme in the North Sea in Q3 (WKPIMP), Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN) and ICES/PICES Workshop on Phase 1: Modelling Effects of Climate Change on Fish and Fisheries (WKSICCME1).</p>

INTERNATIONAL

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

Title	3. Fish Ageing
Number	4311300018
Project leader	Loes Bolle
Other researchers in WUR	Peter v.d. Kamp, Ineke Pennock, André Dijkman, Jan Beintema, Marcel de Vries, Peter Groot, Kees Groeneveld, Betty van Os, Thomas Pasterkamp, Norie v.d. Meeren, Ruben Hoek, Erika Koelemij, Maadjieda Tjon-Atsoi
Researchers outside WUR	None
BAPS number	KB-24-005-003
Budget	€47.000,-
Goals of project	Maintaining quality of age determinations.
Target group for research	This is of great relevance for WOT as age data collected during market-, survey- and discard sampling are used in age-based stock assessments.

PROGRESS 2016

Results	<p>Main results:</p> <ul style="list-style-type: none"> • International calibration: draft report of sole exchange (coordination by Wageningen Marine Research), report of dab exchange and dab workshop completed (coordination by Wageningen Marine Research & TI); initiation of turbot and brill exchange (coordination by Wageningen Marine Research); initiation of lemon sole exchange (coordination by Wageningen Marine Research & CEFAS); participation in blue whiting exchange (2 readers); participation in sprat exchange (2 readers) • Education: Training of new age readers for blue whiting (problematic), horse mackerel (completed), lemon sole (continued), greater argentine (completed), cod (completed), plaice (almost completed), sole (just started, 2 trainees). • Task-sharing: cooperation between ILVO & Wageningen Marine Research w.r.t. whiting ageing consolidated • "Masterplan": onset of an evaluation of the ageing procedures at Wageningen Marine Research and colleague institutes to explore the scope for improvement of both quality and efficiency <p>Products: Results of international calibration exercises are documented in reports and summarised in the annual ICES WGBIOP report (see general publications).</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	Maintenance of key expertise fish ageing.
Science publications	None
General publications	<p>ICES (2016) Report of the Working Group on Biological Parameters (WGBIOP), 10-14 October 2016, Monopoli, Italy. ICES CM 2016 /SSGIEON:08</p> <p>ICES (2016) Report of the Workshop on Age reading of Dab (Limanda limanda) (WKARDAB2), 17-20 November 2015, Hamburg, Germany. ICES CM/SSGIEOM:12</p> <p>Report of herring exchange 2015</p> <p>Report of sole exchange 2015-2016</p>
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects –

	mini symposium.
Any links to Wageningen University projects?	No
What is relevant for EZ fisheries or ecosystem management?	Almost all stock assessment models are age structured.
Describe collaboration with any partners outside WUR (national)	No national collaborations outside WUR.

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

INTERNATIONAL

Was the project part of an international network?	Yes. An international fish ageing network is established through the ICES Working Group on Biological Parameters (WGBIOP).
Who were the international partners?	Research institutes throughout Europe, that are involved in fish ageing (e.g. ILVO in Belgium, IFREMER in France, DTU Aqua in Denmark, TI in Germany, IMR in Norway, CEFAS and AFBI in the UK, The Marine Institute in Ireland).
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Fish ageing performance contributes to the standing of Wageningen Marine Research within international (ICES) network. International coordination and calibration of fish ageing contributes to the quality of ICES work (e.g. stock assessments).

Title	4. IBTS otolith sampling scheme
Number	4311300019
Project leader	Ralf van Hal
Other researchers in WUR	None
Researchers outside WUR	None
BAPS number	KB-24-005-004
Budget	€11.880,-
Goals of project	Provide a statistical sound IBTS otolith collection scheme, improving the data quality of the survey.
Target group for research	It will be part of the IBTSWG 2016 report and will be disseminated to the relevant assessment and survey groups.

PROGRESS 2016

Results	<p>Main results:</p> <p>In contrast to the preliminary analyses in 2015, which suggested that a reduction in otoliths could be sufficient to estimate the Age-at-Length Keys (ALK), the current extended analysis does not fully support this reduction. The current data collected on a Round-fish scale (unfortunately while proposed, not all countries collected data by station) are not suitable as they lack spatial information present in a Station-Specific sampling. Hampering estimations of the ALK incorporating spatial aspects which is needed to justify the reduction in otoliths. Therefore, the proposed Station-specific sampling with a higher number of otoliths per length class is required to continue to facilitate further analysis. Currently, this will not reduce the amount of otoliths collected.</p> <p>Products:</p> <p>Working document as part of the IBTSWG 2016 report.</p> <p>R-codes for the spatial analysis on otolith sampling.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	Amount of otoliths needed to estimate Age-at-Length Keys. Reducing the current amount of otoliths will increase the uncertainty.
Science publications	None
General publications	Working document in the IBTSWG 2016 report.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Improving data quality of WOT survey data.
Describe collaboration with any partners outside WUR (national)	A number of participants in the IBTS participated in the discussion around this work and reviewed the working document.

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Non scientific partners	None
Summary and Conclusions of Project	The International Bottom Trawl Survey (IBTS) collects otoliths of fish for the determination of Age-at-Length Keys (ALK). The current sampling scheme is under debate due to high number of otoliths required and recent studies have shown improved statistical techniques requiring smaller number of otoliths for estimating the ALK. Prior to this project it was proposed to collect the otoliths by station rather than large spatial areas, this would allow incorporation of spatial aspects in the estimation of the ALK. Unfortunately, not all countries followed this approach making the current data unsuitable for the incorporation of spatial aspects required for reducing the number of otoliths. Without the inclusion of spatial aspects the analysis based on bootstrapping a reduced number of otoliths from the whole fish population comparing it with the current method, showed that a reduction in number of otoliths would increase the uncertainty in estimating the ALK. Therefore, a reduction in otoliths cannot be proposed at this moment. It is however proposed to continue the station-specific sampling without reducing the number of otoliths. The station-specific sampling would allow redoing the analysis incorporating spatial aspects next year. This project provided the codes for doing the analysis within the timeframe of the regular IBTS working group.
Dutch summary and conclusions	De International Bottom Trawl Survey (IBTS) verzamelt otolieten van vis om leeftijd-lengte sleutels (ALK) te bepalen. Het huidige schema staat ter discussie vanwege de hoge aantallen otolieten die verzameld moeten worden, terwijl recente studies statistische technieken laten zien die de ALK kunnen bepalen met een beperkter aantal otolieten. Voorafgaand aan dit onderzoek is verzocht om de otolieten per station te verzamelen i.p.v. van per groter ruimtelijk gebied. Dit zou het mogelijk moeten maken om ruimtelijke verschillen in de bepaling van de ALK mee te nemen. Helaas heeft niet ieder land zijn methode aangepast, waardoor ruimtelijke verschillen niet konden worden meegenomen. Zonder het meenemen van ruimtelijke verschillen in de analyse, hebben analyses waarbij via bootstrapping kleinere aantallen otolieten uit de gehele populatie werden genomen, laten zien dat de onzekerheid toeneemt in het bepalen van de ALK ten opzichte van de huidige methode. Daarom kan een vermindering van het aantal te verzamelen otolieten op dit moment niet worden voorgesteld. Wel is er voorgesteld om de otolieten nu echt per station te verzamelen, waardoor ruimtelijke aspecten volgend jaar wel meegenomen kunnen worden in de analyse. Dit project heeft de codes opgeleverd om de analyses volgend jaar binnen het tijdsbestek van de reguliere IBTS werkgroep uit te voeren.

INTERNATIONAL

Was the project part of an international network?	Yes
Who were the international partners?	Participants in the IBTSWG.
Has the project been associated with international	No

funding sources (EU, DGIS etc.) or research programmes?	
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	It strengthens Wageningen Marine Research's role in (re-)designing marine monitoring.

Title	5. PELSEL
Number	4311300020
Project leader	Niels Hintzen
Other researchers in WUR	Sascha Fässler
Researchers outside WUR	
BAPS number	KB-24-005-005
Budget	€13.860,-
Goals of project	Develop simple and easy to calculate indicators that inform about a potential change in selectivity in pelagic fisheries.
Target group for research	Recipients of advice (EZ, industry, NGOs, EC).

PROGRESS 2016

Results	<p>Main results:</p> <p>Six indicators were developed to inform about a potential change in selectivity:</p> <ol style="list-style-type: none"> 1) Centre of gravity of the fishing fleet 2) Dispersion of the fishing fleet 3) Isotropy of the fishing fleet 4) Co-location of fishing fleet and survey fleet 5) Area occupation of the fishing fleet 6) Size frequency distribution of market samples <p>The results currently available on the spatial distribution of the fishing fleet and the sampling of their catches does not indicate any change in fishing behaviour that could lead to a substantial change in selectivity which may not be picked up by assessment models.</p> <p>Products:</p> <p>A working document to the Herring Assessment Working Group (HAWG) 2016 where the landing obligation was dealt with as a separate Term of Reference. The results from this study were the backbone to answer this ToR of HAWG.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	Expertise in studying potential displacement of a fishing fleet. The methods developed are relevant for commercial partners as well as they indicate to what extent they are able to find the schooling fish they target.
Science publications	None
General publications	In HAWG 2016 report and as a Working Document to HAWG 2016.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	One of WOTs primary tasks is to provide reliable advice on fish stock species. Being able to detect changes in selection of the fishery and incorporating this information in advice is essential in providing reliable advice. Furthermore, HAWG has specifically addressed a ToR to this topic: <i>Examine where possible the effects</i>

	<i>of the landing obligation on - distribution of the fishing fleet</i> -.Providing reliable and stable advice is core to the WOT programme. This project targets the potential problems that may rise under the landing obligation, with a direct relation to sustainable exploitation of fish species.
Describe collaboration with any partners outside WUR (national)	None

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Non scientific partners	None
Summary and Conclusions of Project	Methods have been developed to study if a fishing fleet started to fish in markedly different locations than the years before, because of the new legislation (the landing obligation). If this would be the case, likely stock assessment methods that are used to provide advice on quota on fish stocks needed to get adjusted. In total 6 indicators were developed to investigate if the fishing fleet moved. None of the indicators suggested a shifting fishing fleet however.
Dutch summary and conclusions	In deze studie zijn methodes ontwikkeld om te bepalen of een visserijvloot op een significant andere locatie zijn gaan vissen dan de jaren daarvoor. Dit is relevant i.v.m. de aanlandplicht die recent als nieuwe wetgeving is ingevoerd. Als dit het geval zou zijn, betekend dit dat er extra zorgvuldig met de bestandschattingen omgesprongen moet worden omdat de visserij een andere selectiviteit erop na kan houden (wat van invloed is op de bestandschatting). In totaal zijn er 6 methodieken ontwikkeld. Geen van deze gaven aanwijzingen voor een verandering in de verspreiding van de visserijvloot.

INTERNATIONAL

Was the project part of an international network?	Yes, the ICES herring assessment working group.
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	We combined high-level acoustic expertise with fleet behaviour and assessment interpretation, which is at the cutting edge of two fields Wageningen Marine Research wants to be strong at: acoustics and stock assessments.

Title	6. Acoustic methods for trawl surveys
Number	4311300021
Project leader	Lorna Teal
Other researchers in WUR	Benoît Berges, Sascha Fässler and Bram Couperus
Researchers outside WUR	None
BAPS number	KB-24-005-006
Budget	€33.660,-
Goals of project	To develop survey methods for combining trawl and acoustic data collection, analytical techniques for ME70 bathymetric data and statistical methods for linking different types of data in space.
Target group for research	ICES survey community, Scientists, EZ and RWS.

PROGRESS 2016

Results

Main results:

Using multibeam measurements together with validated models from the literature, the type of seafloor and associated parameters (e.g. grain size, density) can be estimated. In this project, this method has been implemented in the form of MATLAB scripts. These have been used to process a data set collected using the ME70 echosounder in fishery mode during the HERAS survey (summer 2016). Results take the form of a map displaying the types of seafloor across the whole acoustic survey. In the future, this method will be improved and applied to new multibeam echosounder data sets in order to provide a better understanding of the marine ecosystem.

Products: Tools (Matlab code) developed for analysing multibeam data and characterising the seabed. This would allow such data to be collated easily during any surveys and has the potential to be put directly into the database. The method is described in a report.

Did the work follow plans (science or financial)?	<p>The work plan deviated somewhat from the original idea, mainly because we were too optimistic about the time needed to analyse the bathymetric multibeam data. We had identified this as a risk in the project proposal and this became a reality. Also Ben Scoulding who was supposed to be carrying out much of the project left Wageningen Marine Research and we had to wait until a replacement was found to continue the project.</p> <p>We decided to invest the time to develop the proper methods for analysing ME70 bathymetric data and characterising the seabed (a very novel technique). The next step was to link this data with the biological data collated on board the survey but we were not able to carry out this next step. We also suffered from some technical issues with the data collection on board and the disappearance of the license for the CARIS software which would have allowed the data to be mapped. The license is held by RWS but we were not able to track it down. The budget was followed as planned.</p>
Developed expertise	New expertise in analysing ME70 bathymetric data.
Science publications	None
General publications	Report on methods and the developed MATLAB code.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Enhanced performance of scientific trawl surveys.
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	<p>Multibeam echosounders are strong active acoustic instruments that can image a fan shape sector beneath the ship's hull (water column and seafloor). Of interest in this study is the directional information of the acoustic response from the seafloor. Using these measurements together with validated models from the literature [1], the type of seafloor and associated parameters (e.g. grain size, density) can be estimated. In this project, this method has been implemented in the form of MATLAB scripts. These have been used to process a data set collected using the ME70 echosounder in fishery mode during the herring acoustic survey (HERAS) in summer 2016. Results take the form of a map displaying the types of seafloor across the whole acoustic survey. In the future, this method will be improved and applied to new multibeam echosounder data sets in order to provide a better understanding of the marine ecosystem.</p> <p>[1] APL-UW. (1994). High frequency ocean environmental acoustic model handbook. In Applied Physics Laboratory Technical Report. University of Washington, Washington, USA.</p>
Dutch summary and conclusions	Multibeam echoloden zijn sterke actieve akoestische instrumenten welke een waaivormig beeld geven (van de waterkolom en bodem) onder het schip. In dit

	<p>project is gekeken naar de richting van waaruit het geluid terug komt. Deze metingen in combinatie met gevalideerde modellen uit de literatuur [1] geven de mogelijkheid om het type zeebodem en geassocieerde parameters (o.a. korrelgrootte en dichtheid) vast te stellen. In dit project is deze methode gebruikt in de vorm van een MATLAB code. Deze code is gebruikt om een dataset die verzameld is tijdens de zomer 2016 haring akoestische survey (HERAS), te analyseren. De dataset was verzameld met het ME70 echolood in visserij mode. Het resultaat is een kaart welke de bodemtypes tijdens de volledige akoestische survey laat zien. De methode zal in de toekomst uitgebreid worden en kan gebruikt worden om een beter inzicht te krijgen in het marine ecosysteem.</p> <p>[1] APL-UW. (1994). High frequency ocean environmental acoustic model handbook. In Applied Physics Laboratory Technical Report. University of Washington, Washington, USA.</p>
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INTERNATIONAL

Was the project part of an international network?	None
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Characterising seabed from multibeam data is very novel technique.

Title	7. Ecosystem Acoustics combined with IDMAD
Number	4311300022
Project leader	Sascha Fässler
Other researchers in WUR	Bram Couperus, Ben Scoulding, Benoît Berges, Dirk Burggraaf, Dick de Haan, Erwin Winter and Ben Griffioen.
Researchers outside WUR	Hans Slabbekoorn (Leiden University), Karen de Jong (University of Cologne) and several scientists from IFREMER (France) and IMR (Norway).
BAPS number	KB-24-005-007
Budget	€59.496,-
Goals of project	Maintenance and expansion of hydroacoustic work and expertise within Wageningen Marine Research and integration of newest technology in monitoring tasks.
Target group for research	Pelagic ecosystem monitoring scientists.

PROGRESS 2016

Results	<p>Main results: Attended workshops and meetings (ICES WGTC, WGFAST, NL Bioacoustic Day).</p> <p>Products:</p> <ul style="list-style-type: none"> • MATLAB scripts for analysing ME70 multibeam data (3D school extraction) • Python software development of the GoPro file scanning software to automatically detect fish events on the trawl video
Did the work follow plans (science or financial)?	Yes
Developed expertise	Python image processing software development and MATLAB ME70 data analysis.
Science publications	<p>Draft paper on broadband classification.</p> <p>Published paper: Fässler, S.M.M., Brunel, T., Gastauer, S., Burggraaf, D. 2015. Acoustic data collected on pelagic fishing vessels throughout an annual cycle: Operational frame work, interpretation of observations, and future perspectives. Fish. Res. http://dx.doi.org/10.1016/j.fishres.2015.10.020.</p>
General publications	Report with description and manual for the MATLAB code.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Guarantee quality of pelagic monitoring work for the WOT tasks.
Describe collaboration with any partners outside WUR (national)	Organisation of the NL Bioacoustic Day with Leiden University.

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	Ecosystem Acoustics is a multiannual project that aims to maintain and further develop hydroacoustic monitoring techniques, thereby applying the general concept of 'Marine Ecosystem Acoustics' (Godø et al. 2014; http://tinyurl.com/pxwvf6s). In the process of moving towards integrated ecosystem monitoring there is a need for consistent and efficient characterisation of different ecosystem components.
Dutch summary and conclusions	Ecosystem Acoustics is een meerjarig project dat fundamenteel is gericht op handhaving en ontwikkeling van akoestische onderzoeks-technieken, waardoor het algemene concept van 'Marine Ecosystem Acoustics' (http://tinyurl.com/pxwvf6s) wordt toegepast. In het streven naar geïntegreerde eco-systeem monitoring is er een behoefte aan een consistente en efficiënte karakterisatie van verschillende ecosysteem componenten.

INTERNATIONAL

Was the project part of an international network?	Collaboration with IFREMER (multibeam acoustics) and IMR (broadband acoustics).
Who were the international partners?	IFREMER (France) and IMR (Norway).
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	This project maintained and developed the Wageningen Marine Research active acoustics profile on a national and international level, by further developing pelagic ecosystem monitoring technologies.

Title	8. Remote mussel bed sensing
Number	4311300023
Project leader	Karin Troost
Other researchers in WUR	Douwe van den Ende (Wageningen Marine Research), Sander Mûcher and Henk Kramer (Wageningen Environmental Research)
Researchers outside WUR	None
BAPS number	KB-24-005-008
Budget	€26.476,-
Goals of project	Earlier studies (Davaasuren <i>et al.</i> 2013 (KBWOT); Nieuwhof <i>et al.</i> 2014) show the high potential of satellite images. We wanted to build further on this knowledge and create mussel and oyster bed maps using high resolution multispectral and radar (SAR) images that have recently become available. By comparing this map with the contours mapped in the field we identified circumstances (e.g. cover by algae, low densities) and areas (e.g. soft vs. hard substrate) where satellite data give reliable results.
Target group for research	Ministry of EZ, fisheries and nature policy makers (Natura 2000).

PROGRESS 2016

Results	<p>Main results: A classification of intertidal beds from satellite images was made and a first comparison with field data and knowledge is currently carried out.</p> <p>Products: A map based on satellite images that can be used in the WOT survey was made and will be part of the report that will be finished in 2018.</p>
Did the work follow plans (science or financial)?	There was a delay because the work was planned after the analysis work for KB WOT project 9. Drone mapping of mussel beds was carried out. Project 9 was delayed, and also Sander Mûcher went on sabbatical in 2016.
Developed expertise	Still under development: how to use satellite images as a tool in mussel bed research.
Science publications	None
General publications	Wageningen Marine Research report will be published in 2018 together with the results of the 2017 follow-up project.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	The technique developed may and will also be used in other coastal areas, e.g. to map shellfish beds in Oosterschelde and Westerschelde estuaries, and it may be used as a method to map beds of sand mason worms <i>Lanice conchilega</i> .
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	<p>Suitable satellite images (SPOT6 satellite, taken during low tide in daytime without cloud cover) were segmented and classified using different methods standard in vegetation research. The obtained maps are then compared to field data of the same year: mapped contours of mussel and oyster beds in the Wadden Sea (WOT shellfish). Also, additional reference points were recorded during the WOT survey with the aim of improving the classification. The comparison shows what type of beds and in what type of environment beds are recognised and under what circumstances they are not, and also what further field observations would be needed to further improve the classification. Conclusions will be in the report that will be finished in February. As a preliminary conclusion it can be stated that not all bed types can probably be detected. It is important to identify under what circumstances beds can and cannot be detected.</p>
Dutch summary and conclusions	<p>Geschikte satellietbeelden (SPOT6, genomen tijdens laagwater overdag en zonder bewolking) zijn gesegmenteerd en geclassificeerd volgens verschillende analyse methoden die algemeen gebruikt worden in vegetatie onderzoek. De resulterende kaarten worden vergeleken met veldgegevens uit hetzelfde jaar: de gekarteerde contouren van mosselbanken en oesterbanken in de Waddenzee (WOT schelpdieren). Aanvullend zijn tijdens de WOT survey referentiepunten geregistreerd met als doel de classificatie te verbeteren. De vergelijking laat zien onder welke omstandigheden banken wel en niet gedetecteerd kunnen worden, en welke aanvullende veldwaarnemingen er nodig zijn om de classificatie te verbeteren. Conclusies worden getrokken in het rapport dat in februari wordt opgeleverd, maar voorlopig kan wel geconcludeerd worden dat waarschijnlijk niet alle banken gedetecteerd zullen kunnen worden. Het is daarom belangrijk om te identificeren onder welke omstandigheden automatische detectie wel en niet mogelijk is.</p>

INTERNATIONAL

Was the project part of an international network?	No
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Wageningen Marine Research remains in the forefront in applying remote sensing techniques in monitoring and research.

Title	9. Drone mapping of mussel beds
Number	4311300024
Project leader	Karin Troost
Other researchers in WUR	Sander Glorius and Douwe van den Ende (Wageningen Marine Research) and Sander Mûcher, Henk Kramer and Jappe Franke (Wageningen Environmental Research).
Researchers outside WUR	None
BAPS number	KB-24-005-009
Budget	€30.680,-
Goals of project	The objective is to test whether UAV's can be used to map or study the development of mussel and oyster beds, and what the research possibilities are for obtaining more detailed information such as composition and elevation of the bed. We also wanted to explore future possibilities of using UAV's under less restricted laws (e.g. licences, flight distance allowed).
Target group for research	The goal is to benefit the ministry of EZ through increased efficiency of the WOT monitoring and scientist and project leaders through exploring the potential of UAV's.

PROGRESS 2016

Results	<p>Main results: Two field campaigns were carried out which resulted in images obtained with different cameras to further test analysis techniques. We gained experience in the (im-)possibilities in field work with UAV's on mussel beds. First results of different classification approaches were obtained.</p> <p>Products: The report will be finished in 2018 and will also contain an analysis of requirements, costs and legislation involved in UAV research.</p>
Did the work follow plans (science or financial)?	A delay occurred because of adverse weather conditions on planned field campaign days. Because field work was delayed, analyses and report were delayed as well and could not be finished in 2016.
Developed expertise	Application of UAV in mussel bed research: potential applications, required licenses, legal aspects, costs, etc.
Science publications	None
General publications	Wageningen Marine Research report will be published in 2018 together with the results of the 2017 follow-up project.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Potentially, UAV research may enhance efficiency in mussel bed research and/or may open new research possibilities to be able to gain more insight in (factors determining) dynamics of mussel and oyster beds.
Describe collaboration with any partners outside	None

WUR (national)	
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SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	Using UAVs, recordings were made using a common digital camera and a hyperspectral camera of two intertidal beds: a mussel bed in the Wadden Sea and an oyster bed in the Oosterschelde Bay. As a references detailed images were recorded inside the beds using a hand-held digital camera. Of these images 3D models were made. Until now the UAV work has given us a lot of insights in possibilities and impossibilities in UAV research on mussel beds. For instance, weather conditions quickly proved to be strongly limiting. First analyses were carried out and a first classification is currently being done. The bed-covering images made so far already show a high potential for research purposes, but for implementation specifically in WOT monitoring the classifications will need to deliver usable results as well.
Dutch summary and conclusions	Van twee banken zijn opnamen gemaakt met UAVs: een mosselbank in de Waddenzee en een oesterbank in de Oosterschelde. Opnamen zijn gemaakt met een gewone digitale camera en met een hyperspectrale camera. Als referentie zijn in het veld detailopnamen gemaakt met hand-held digitale camera's uit welke beelden 3D modellen zijn gemaakt. Tot nu toe heeft het onderzoek veel inzicht opgeleverd in mogelijkheden en moeilijkheden in toepassing van UAVs. Zo bleek al meteen het weer een sterk beperkende factor te zijn. Eerste analyses zijn uitgevoerd en een eerste classificatie wordt momenteel uitgevoerd. Alleen al de gebiedsdekkende fotobeelden leveren potentieel zeer geschikt onderzoeksmateriaal maar voor een toepassing specifiek binnen het WOT werk zal een automatische classificatie ook bruikbare resultaten op moeten leveren.

INTERNATIONAL

Was the project part of an international network?	No
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Wageningen Marine Research keeps in the forefront in applying remote sensing techniques in monitoring and research.

Title	10. Storage of electronic monitoring data
Number	4311300025
Project leader	Edwin van Helmond
Other researchers in WUR	Bram Couperus and Daniel Benden
Researchers outside WUR	None
BAPS number	KB-24-005-010
Budget	€46.488,-
Goals of project	Develop facilities to store EM data in a secure environment.
Target group for research	Video-based monitoring, or electronic monitoring (EM) is increasingly being used in fisheries research, improved facilities to conduct research will, eventually, be beneficial for fisheries management and control of (EU) regulations.

PROGRESS 2016

Results	<p>Main results: Data base facilities for storing EM data have been developed. Video-based monitoring, also known as electronic monitoring (EM) is increasingly being used in fisheries research. Improved data collection on commercial fisheries be beneficial for fisheries management and control of (EU) regulations. This innovative way of sampling generates a new kind of data. Facilities to store this type of data in a secure data base environment are now available.</p> <p>Products: A database with protocol for storing EM data.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	EM and database storage expertise.
Science publications	None
General publications	Data base facilities and a data protocol.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	In the context of the landings obligations, EM is developing and becoming an important tool to monitor commercial fishing activities in the future.
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	Storage of electronic monitoring data is becoming increasingly important in current fisheries research. EM analysis software generates annotations that describe catch data and sensor data that describe fishing activity, both data sources are a new type data for which no data base facilities are available for secure storage. Within this project data transfer and storage facilities are developed in the Wageningen Marine Research data base environment. Both data sources can be securely imported and stored.
Dutch summary and conclusions	Opslag van data verkregen d.m.v. "elektronische monitoring" wordt steeds belangrijker in visserijonderzoek. De data gegenereerd door deze innovatieve manier van monitoren is anders dan de standaard onderzoekgegevens. Om deze gegevens op een veilige en gestructureerde manier op te kunnen verwerken en op te slaan zijn vernieuwingen en aanpassingen nodig. In dit project zijn de benodigde aanpassingen in de data base van Wageningen Marine Research ontwikkeld, zodat data afkomstig van EM verwerkt en opgeslagen kunnen worden.

INTERNATIONAL

Was the project part of an international network?	No
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Improved position internationally as one of the few research institutes with EM experience and the expertise to use EM in fisheries research. Wageningen Marine Research will maintain its leading role in innovating techniques to improve monitoring of commercial fisheries.

Title	11. Geostatistics for estimating shellfish biomass
Number	4311300026
Project leader	Ingrid Tulp
Other researchers in WUR	Lorna Teal and Johan Craeymeersch
Researchers outside WUR	None
BAPS number	KB-24-005-011
Budget	€29.560,-
Goals of project	To develop the use of geostatistics for estimating densities and biomass of benthic species from the Dutch WOT shellfish survey. Compare the robustness of this method with the one used so far.
Target group for research	Ministry of EZ, scientific world, ICES and fisheries organisations.

PROGRESS 2016

Results	<p>Main results: Several geostatistical models were used to estimate benthic biomass for two species. Due to the setup of the survey with different strata developing the method was quite time consuming and took more time than expected and is still not finished. Also the main researcher in the project was on maternity leave for a large part of the year.</p> <p>Products: The report is not finished yet due to the developments above. It will be finished in the 1st quarter of 2017</p>
Did the work follow plans (science or financial)?	The work was carried out much later than originally planned because of maternity leave.
Developed expertise	Application of geostatistics in shellfish surveys to be used in stock assessment.
Science publications	None
General publications	Wageningen Marine Research report to be finished 1st quarter 2017.
Other outputs	None
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	The proposed approach takes spatial processes into account and will improve biomass estimates in surveys.
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	The WOT shellfish survey is carried out annually to estimate abundances of key shellfish species. The survey is performed with a stratified grid design where higher sampling density reflects expected higher abundances. Estimates of total abundances are usually based on averages of swept areas. In this project we developed an alternative geostatistical method taking variation caused by depth into account. We infer biomass based on this method and compare it to the previous estimate.
Dutch summary and conclusions	Jaarlijks wordt het schelpdierbestand langs de NL kust gemonitord en hieruit wordt een berekening gedaan van de totale schelpdierbiomassa. Dit gebeurt aan de hand van een simpele manier waarbij dichtheden vermenigvuldigd met oppervlakte een totale biomassa opleveren. Hierbij wordt echter geen rekening gehouden met de ruimtelijke verdeling. Met behulp van geostatistiek hebben we in dit project co-variabelen als diepte meegenomen om dichtheden te schatten in de gebieden tussen de monsterpunten en zo tot een beter onderbouwde schatting van het totale schelpdierbestand te komen.

INTERNATIONAL

Was the project part of an international network?	No
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Not yet, but we hope to also publish these results in a peer reviewed scientific paper.

Title	12. Mackerel Egg Development and Mortality
Number	4311300027
Project leader	Cindy van Damme
Other researchers in WUR	Ewout Blom and Ineke Pennock.
Researchers outside WUR	Richard Nash (IMR, Norway), Liam Fullbrook (volunteer Ireland) and Aneta Zagorska (volunteer The Netherlands).
BAPS number	KB-24-005-012
Budget	€29.990,-
Goals of project	Gain egg development equations for different temperatures for all egg development stages without a delay between fertilization and start experiment. To include all egg stages in the estimation of mackerel total egg production.
Target group for research	Mackerel egg survey participants, ICES WGMEGS, ICES WGWIDE and fisheries managers.

PROGRESS 2016

Results	<p>Main results:</p> <p>Two experiments were carried out on board the RV Tridens. For each experiment mackerel egg development was followed at 5 different water temperatures: 8, 10, 12, 14 and 16 °C. For both experiments fish were collected in the northern Bay of Biscay. Eggs were stripped from gonads and artificially fertilized. In April water temperature was cooler compared to June. As a result the eggs in both experiments seem to be acclimatised to different temperatures and this has an effect on the egg development.</p> <p>So far one standard egg development equation has been used to estimate daily egg production but mackerel spawning is spread over a large area and time and hence a temperature range. But if eggs are acclimatised to different temperatures one single egg development equation for all spawning stocks (or within a spawning stock) is not the best way to calculate daily egg production. Currently the last samples and data are being analysed and results will be written up in an internal report and a manuscript in Q1 of 2017.</p> <p>With the results from these experiments we will have egg development equations for all development stages and we will be able to also use the later egg stages from the survey samples to estimate daily egg production, instead of only using the early stage eggs.</p> <p>Products:</p> <p>Internal report and manuscript in Q1 2017.</p>
Did the work follow plans (science or financial)?	Yes, experiments were carried out during the surveys in April and June. However, due to problems with staffing the analyses of the samples from the experiments were only carried out in Q4.
Developed expertise	Egg development equations for eggs acclimatised to different temperatures. Equations for all egg development stages. Improved method for estimation daily egg production for western mackerel.
Science publications	Manuscript for peer reviewed journal to be finalised in 1 st quarter 2017.
General publications	Wageningen Marine Research report in 1 st quarter 2017.
Other outputs	Presentation at KB WOT Fisheries mini-symposium in January 2017 and at ICES WGMEGS in April 2017.
Any links to	None

Wageningen University projects?	
What is relevant for EZ fisheries or ecosystem management?	Mackerel is an important commercial species and high costs are involved in the conduction of the mackerel egg surveys. The results will improve the output of the mackerel egg surveys.
Describe collaboration with any partners outside WUR (national)	Aneta Zagorska is a volunteer who is helping with the analyses of the samples from the experiments.

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	Mackerel SSB is assessed from an egg survey. To estimate SSB from egg survey samples reliable egg development equations are vital to estimate daily egg production from the eggs in the samples. In two separate experiments carried out, during the April and June egg surveys in the northern Bay of Biscay. Adult mackerel were collected from the same area but the water temperatures that the adults were collected from differed in April and June. Experiments were carried out at 5 different temperatures: 8, 10, 12, 14 and 16°C. Preliminary results show that eggs seem to be acclimatised to temperature that they are spawned. This has implications for estimation of daily egg production. Results will be presented at ICES WGMEGS in April 2017. WGMEGS is the working group which coordinates the mackerel egg survey. Results will be published in an internal report and a manuscript in 1 st quarter 2017.
Dutch summary and conclusions	Makreel SSB wordt bepaald van een eisurvey. Om SSB te bepalen van eisurvey monsters zijn betrouwbare ei-ontwikkel formules noodzakelijk om de dagelijkse eiproductie van de eieren in de monsters te berekenen. Tijdens de makreeleisurveys in de noordelijke Golf van Biskaje in april en juni, zijn twee aparte experimenten uitgevoerd. Volwassen makreel is bemonsterd in hetzelfde gebied, maar de watertemperatuur in april en juni was verschillend. Beide experimenten zijn uitgevoerd bij 5 verschillende temperaturen: 8, 10, 12, 14 en 16°C. Voorlopige resultaten laten zien dat eieren geacclimatiseerd zijn aan de temperatuur waar ze gepaaid zijn. Dit heeft gevolgen voor de ontwikkeling van de eieren, maar ook voor de berekening van de dagelijkse eiproductie. Resultaten van dit project zullen worden gepresenteerd aan de ICES WGMEGS in april 2017. WGMEGS is de coördinerende groep voor de makreel eisurveys. Resultaten zullen ook worden gepubliceerd in een intern rapport en opgeschreven in een manuscript in 1 ^e kwartaal van 2017.

INTERNATIONAL

Was the project part of an international network?	ICES WGMEGS and WGALES
Who were the international partners?	Richard Nash (IMR, Norway) has provided the experimental setup. He had experience with egg development experiments for other species and has supported us with advice how to setup and carry out the mackerel egg experiments. Liam Fullbrook (Ireland) helped carrying out the experiment and collecting samples during the survey.
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	The egg development equation is of vital importance to estimate the daily egg production needed to estimate mackerel SSB from the egg survey samples. An accurate egg development equation is needed for different temperatures as eggs seems to acclimatise to the temperature they were spawned. This will improve the mackerel SSB estimate.

Title	13. Catch sampling on-board pelagic freezer trawlers
Number	4311300028
Project leader	Edwin van Helmond
Other researchers in WUR	Daniel Benden and Dirk Burggraaf
Researchers outside WUR	None
BAPS number	KB-24-005-013
Budget	€14.660,-
Goals of project	The aim of this study is to develop an alternative method to sample catches on board pelagic freezer trawlers.
Target group for research	Ministry of EZ.

PROGRESS 2016

Results	<p>Main results: Because of the landings obligation sampling methodologies have to change from discard sampling programmes to catch sampling programmes. Innovative sampling strategies were tested to facilitate this process. Within the pelagic fishery catch is transported over a processing belt where it is automatically sorted into different lanes, i.e. market size categories. To get a representative view of the unsorted total catch a sample should be taken before this sorting process. However, due to technical modifications on board the vessels it is becoming increasingly difficult and dangerous for the observers to take unsorted catch samples on board pelagic trawlers (e.g. increasingly difficult to reach conveyer belts, collecting unsorted catch from hoppers and buffers in renewed catch sorting devices is difficult).</p> <p>An alternative, improved method to sample catches on board freezer trawlers has been developed using an in-house developed camera. The camera has been tested during surveys and on board commercial vessels.</p> <p>Products: A specialized camera to monitor catch composition on board commercial fishing vessels.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	Monitoring technology.
Science publications	None
General publications	Specialized camera and software.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Fisheries management will eventually benefit from improved and innovative monitoring techniques of commercial fisheries.
Describe	None

collaboration with any partners outside WUR (national)	
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SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	A computer controlled digital camera was developed. This camera enables observers to take pictures from the unsorted catch during transport over the conveyer belt to the sorting machine. These pictures provide a digital 'snap-shot' of catch compositions. A series of pictures , e.g. 50 – 100 snap shots, during the total duration of catch processing, will provide an accurate estimate of the catch composition. Compared to the current protocol, where observers sample only one or two baskets of fish from the total catch, digital snap shots provide a higher sampling density, and therefore, a more representative sample of the catch. In addition, the risks of taking digital pictures with a camera that can be controlled by a laptop from a distance, will be considerably less, than taking a physical catch samples from a fast running conveyer belt.
Dutch summary and conclusions	De invoering van de aanlandplicht zal gevolgen hebben voor de bestaande monitoringsprogramma's aan boord van commerciële visserij schepen. Bestaande monitoringsmethoden zullen moeten worden aangepast. Er zal een transitie moeten plaatsvinden van discardmonitoringsprogramma's naar vangstmonitoringsprogramma's. Om dit te bewerkstelligen is een studie uitgevoerd waarbij cameratechnologie wordt gebruikt om de vangstsamenstelling op commerciële schepen te kunnen bepalen. D.m.v. deze technologie kan gemakkelijker en veiliger een representatief monster van de vangst genomen worden.

INTERNATIONAL

Was the project part of an international network?	No
Who were the international partners?	None
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Wageningen Marine Research will maintain its leading role in innovating techniques to improve monitoring of commercial fisheries.

Title	14. Discards ashore
Number	4311300029
Project leader	Ruben Verkempynck
Other researchers in WUR	Chun Chen, Edwin van Helmond and Marcel Machiels
Researchers outside WUR	None
BAPS number	KB-24-005-014
Budget	€34.076,-
Goals of project	Inform the community (scientific, policy, and industry) about expected unwanted catches under different scenarios. And develop a monitoring design for unwanted landings that is statistically and practically solid.
Target group for research	Industry, policy-makers and ICES WGCATCH.

PROGRESS 2016

Results	<p>Main results:</p> <p>An overview of expected discards that will be brought ashore were estimated and compiled in a flexible tool, so that different scenarios can be visually presented. The outcomes of the different scenarios are mainly driven by data of the discard monitoring from the years 2013-2015. At the same time a framework for monitoring the discards that have to be brought ashore (BMS - Below Minimum Size discards) was set up. The framework holds a close relationship with the current market sampling.</p> <p>Products:</p> <p>Discards estimations under several scenarios of the landing obligation and a framework for monitoring of BMS discards.</p>
Did the work follow plans (science or financial)?	Yes, work plans were produced in the beginning of the year. However, due to problems with staffing the analyses were only carried out in Q3 and 4.
Developed expertise	Discard monitoring design.
Science publications	Manuscript for peer reviewed journal to be finalised in 2 nd quarter of 2017.
General publications	Wageningen Marine Research report in 1 st quarter of 2017.
Other outputs	Presentation at KB WOT Fisheries mini-symposium in January 2017 and at ICES WGCATCH in 2017
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Under the landing obligation several species will need to be landed as BMS discards in the harbours. Without a solid monitoring programme valuable biological information on the catches will be lost.
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	Under the landing obligation part of the catch that was previously discarded is now brought ashore. Sampling of these BMS (Below Minimum Size) landings should be carried out according to statistically sound methods, assuring unbiased results. In order to design a sampling framework estimates of expected BMS landings were produced. A flexible tool was made so that estimations of discards per species under different scenarios of the landing obligation can be calculated. Based on this estimations a theoretical sampling framework for monitoring the BMS under the Landing Obligation was designed. This sampling framework holds the same methodology as the current market sampling because it is expected that this BMS fraction of the catch will also be landed in the fish auctions.
Dutch summary and conclusions	Onder de aanlandplicht moet een deel van de vangst die eerder werd overboord gegooit nu aan de wal gebracht worden. Bemonstering van deze BMS (onder Minimum Size) landingen dient volgens statistisch verantwoorde methoden worden uitgevoerd, dit verzekerd unbiased resultaten. Om een kader voor het bemonsteren van deze BMS fractie van de vangst werden schattingen van de verwachte BMS aanvoer geproduceerd. Deze schattingen zijn vervolgens in een flexibele tool bewerkt om zo schattingen van de teruggooi per soort onder verschillende scenario's van de aanlandplicht te produceren. Op basis van deze schattingen is het theoretische kader voor de bemonstering van de BMS fractie onder de aanlandplicht ontworpen. Dit kader voor de bemonstering heeft dezelfde methode als de huidige markt bemonstering, omdat de verwachting is dat deze BMS fractie van de vangst ook zal worden aangevoerd in de visafslagen.

INTERNATIONAL

Was the project part of an international network?	ICES WGCATCH
Who were the international partners?	Members of the ICES WGCATCH.
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Wageningen Marine Research is one of the forerunners in the field of sampling design of demersal fisheries.

Title	15. Use of electronic measuring devices
Number	4311300030
Project leader	Ruben Verkempynck
Other researchers in WUR	Michiel Dammers, Pieke Molenaar and Bram Couperus.
Researchers outside WUR	None
BAPS number	KB-24-005-015
Budget	€9.414,-
Goals of project	To investigate the latest possibilities of Electronic Measuring Devices (EMDs) from other research institutions and how they can be used at Wageningen Marine Research.
Target group for research	Sea-going observers and other catch handlers and Wageningen Marine Research project leaders of projects where fish is measured.

PROGRESS 2016

Results	<p>Main results:</p> <p>There are many electronic measuring boards that are being applied in the other research institutions. During the project two applications were visited: the “old” German measuring system, and the Belgian system. Both systems are described in our report. A visit to the “new” German system could not be realised in 2016, but will be carried out in 1st quarter 2017. The newer systems that are being developed hold much potential for implementation in our work.</p> <p>Products:</p> <p>A report with descriptions of measuring boards with high potential for our work.</p>
Did the work follow plans (science or financial)?	Yes, plans were made and contacts were established. But, during the year, it became clear that some boards were not ready yet. This meant that fieldwork could not be fixed and some fieldtrips had to be postponed.
Developed expertise	Electronic monitoring and sampling accuracy.
Science publications	None
General publications	Wageningen Marine Research report.
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Data quality of WOT monitoring will be better guaranteed.
Describe collaboration with any partners outside WUR (national)	<p>Thünen institute for sea fisheries (Germany): they currently operate a traditional measuring board and are developing a newer system.</p> <p>ILVO (Belgium): they have developed a newer system.</p>

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	There are many electronic measuring boards that are being used in the other research institutions at the moment. Some systems have been in use for many years, others have been criticised over time and are being reviewed, new systems are being developed. Very few research institutions do not use electronic measuring boards for their activities. During the project two applications were tested: the "old" German measuring system, and, the newly developed Belgian system. Both systems are described in our report. A visit to the new German system could not be realised in 2016. The newer systems that are being developed hold much potential for implementation in the work of Wageningen Marine Research.
Dutch summary and conclusions	Er zijn vele elektronische meetborden die momenteel in de andere onderzoeksinstellingen worden gebruikt. Sommige systemen worden reeds vele jaren succesvol gebruikt, andere systemen zijn bekritiseerd tijd en werden ondertussen negatief beoordeeld, waardoor nieuwe systemen worden ontwikkeld. Zeer weinig onderzoeksinstellingen maken geen gebruik maken van elektronische meetborden voor hun activiteiten. Tijdens het project zijn twee applicaties getest: het "oudere" Duitse meetsysteem, en het nieuw ontwikkelde Belgische systeem. Beide systemen worden beschreven in ons rapport. Een bezoek van het nieuwe Duitse systeem kon in 2016 niet worden gerealiseerd De nieuwere systemen die worden ontwikkeld hebben veel potentieel voor het werk van Wageningen Marien Research.

INTERNATIONAL

Was the project part of an international network?	Not yet, an ICES workshop will be held in 2017 following our efforts.
Who were the international partners?	Thünen Institute for Sea Fisheries (Germany) and ILVO (Belgium).
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Good partner in developing electronic measuring board technology.

Title	16. Demographic profile of recreational fisheries
Number	4311300031
Project leader	Tessa van der Hammen
Other researchers in WUR	Chun Chen and Martin de Graaf
Researchers outside WUR	Jeremy Lyle (Tasmania).
BAPS number	KB-24-005-016
Budget	€12.256,-
Goals of project	Get insight in the yearly fluctuations between the number of Dutch recreational fishers, their demographic profile and their decision making of entering and leaving the sector. The estimation of the catches is now based on a two year survey and we assume that the number of fishers does not change between one year and the next. However, there are indications that the number of recreational fishers is slowly declining over the years since 2009. If this trend is indeed significantly declining, the estimation of the intermediate year will be an overestimation. We plan to provide catch estimates of the intermediate year based on the corrected estimation of the number of recreational fishers.
Target group for research	EU, EZ, Sportvisserij Nederland, stock assessors, ICES WGRFS and scientists.

PROGRESS 2016

Results	<p>Main results: We developed a statistical model (mixed binomial model). We found that the number of anglers are declining significantly over the years. Further we found that the probability of participation depends on age, family size, gender, but also on education level. Also we found that low avid anglers (that do fish only few times a year) are more likely to drop out the sector than high avid fishers.</p> <p>Products: We produced a statistical model. This model can be used to estimate changes in participation rate based on the demographics in the Netherlands. However, the yearly decrease is not completely explained by demographics, so the reason for the decline in participation cannot totally be explained by demographics.</p>
Did the work follow plans (science or financial)?	Yes
Developed expertise	Knowledge in the recreational fisheries database and in the demographic profile of recreational fishers.
Science publications	We are working on a manuscript
General publications	
Other outputs	Statistical model. Presentation for the Wageningen Marine Research KB WOT results 2016 projects –mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Accurate catch estimates are essential for the management and regulation of stocks that are under threat. Obligation to report catch estimates with high precision.

Describe collaboration with any partners outside WUR (national)	Angler organisation (Sportvisserij NL).
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SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	We used a statistical model to explain fluctuations in participation rates of recreational fishers over the years. The results are that the probability of participation decreases with age, increases with family size, decreases with education level and depends on gender (many more men than women). We also found that low avid anglers (that do fish only few times a year) are more likely to drop out the sector than high avid fishers. These findings can be useful to estimate the participation rate without actually doing a survey. However, we also found yearly differences that cannot be explained by demographics.
Dutch summary and conclusions	We hebben een statistisch model ontwikkeld die de schommelingen in de participatie in de recreatieve visserij door de jaren kan verklaren. De kans op deelname in de recreatieve visserij neemt af met leeftijd, neemt toe met de grootte van het gezin, neemt af met opleidingsniveau en is afhankelijk van geslacht (veel meer mannen dan vrouwen). We vonden ook dat weinig fanatieke vissers (die slechts enkele malen per jaar vissen) een grotere kans hebben om te stoppen dan fanatieke vissers. Deze bevindingen kunnen gebruikt worden om de deelname te schatten zonder het doen van een enquête. Toch vonden we ook jaarlijkse verschillen die niet kunnen worden verklaard door de demografie.

INTERNATIONAL

Was the project part of an international network?	The results will be presented at ICES WGRFS. Discussion with J. Lyle (Tasmania) is ongoing.
Who were the international partners?	J. Lyle (university of Tasmania) and members of WGRFS.
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	The Dutch recreational programme is advanced compared to other European countries, but Australia and the USA have more progressed programmes.

Title	17. MARE Co-funding
Number	4311100006
Project leader	Sieto Verver
Other researchers in WUR	Edwin van Helmond and Chun Chen.
Researchers outside WUR	Consortium of over 40 experts from 13 scientific institutes in 12 countries.
BAPS number	KB-24-005-017
Budget	€19.406,-
Goals of project	Strengthening regional cooperation through optimisation of fisheries data collection in the light of future DCF obligations.
Target group for research	EU CFP

PROGRESS 2016

Results	<p>Main results: Considerable improvements can be made by adopting regional designs, by which we mean the adoption of a common metric used for stratification (such as port size or fleet segments etc.), though with the nation being retained as a level of stratification within the overall design. Such designs would potentially provide unbiased and more precise estimates than the coordinated national data collection schemes operating at present.</p> <p>Products: Interim reports and final report. The FishPi project, STRENGTHENING REGIONAL CoOPERATION IN FISHERIES DATA COLLECTION, Report to the European Commission in Fulfilment of Grant Award: EU MARE/2014/19. June 2016.</p>
Did the work follow plans (science or financial)?	Yes, based on grant application.
Developed expertise	Sampling strategies based on statistically sound sampling procedures in a regional context. Insights in regional discrepancies regarding the approach of regional sampling and the opinions to move towards regional sampling schemes.
Science publications	Not yet
General publications	Project reports
Other outputs	Interim reports of work packages and case studies.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	Development of statistically sound sampling procedures in support of the Common Fisheries Policy by EU Data Collection Regulation.
Describe collaboration with any partners outside WUR (national)	No national partners, international collaboration solely.

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	None
Summary and Conclusions of Project	<p>This project has trialled the way sampling designs would be developed in a regional setting and showed that collaboration and consultation is required at face to face meetings through regional groups that focus on a particular group of fisheries. The project was the first step in this process and one of the main outcomes is the framework to take the process forward; developing data formats, data sharing agreements and easily accessible software for data sharing, checking and analysis, and for the simulation testing of sampling designs. These designs are predicated on common data collection protocols and the use of the appropriate statistical estimators; the implementation of such designs would thus require the adoption of the standard survey sampling techniques and the use of common sampling and estimation routines by the sampling institutions.</p> <p>The main findings of four commercial fishery case studies were that considerable improvements can be made by adopting regional designs, by which we mean the adoption of a common metric used for stratification (such as port size or fleet segments etc.), though with the nation being retained as a level of stratification within the overall design. Such designs would potentially provide unbiased and more precise estimates than the coordinated national data collection schemes operating at present.</p> <p>The main issues found in the operation of national sampling designs at present is the incomplete sampling coverage of the regional population, and that the allocation of sampling effort unilaterally at national level does not represent the best use of the available resource.</p> <p>A major remit of the project was to develop guidelines to evaluate the quality of data at national and regional levels using shared tools. To that end an R library has been developed and made available on a public access website (https://github.com/ldbk/fishPifct).</p>
Dutch summary and conclusions	<p>Dit project heeft onderzocht hoe bemonsteringsprogramma's ontwikkeld worden in een regionale zetting en heeft aangetoond dat samenwerking en overleg tijdens face to face bijeenkomsten, van regionale groepen welke een bepaalde visserij vertegenwoordigen, noodzakelijk zijn. Dit project was een eerste stap in dit proces en een van de belangrijkste producten was een framework om dit proces te ontwikkelen; ontwikkelen van data formats, overeenkomsten voor het delen van data en toegankelijke software voor het delen van data, data controle en analyse, en voor simuleren en testen van bemonsteringsprogramma's. Deze programma's zijn gebaseerd op de huidige data verzamelingsprotocollen en het gebruik van de juiste statistische voorspellers; voor het implementeren van deze programma's is het noodzakelijk dat standaard monitoringstechnieken en standaard bemonsteringen en schattingen door de monitorende instituten omarmd worden.</p> <p>De belangrijkste resultaten van 4 commerciële visserij case studies waren dat het implementeren van regionale programma's verbeterd kan worden, dit betekend dat het omarmen van een standaard schaal voor stratificatie (bijvoorbeeld havengrootte of vlootsegmenten etc.), maar met het behoud van natie als stratificatie van het totale programma. Zulke programma's leveren mogelijk minder bevooroordeelde data en preciezere schattingen dan de huidige gecoördineerde nationale bemonsteringsprogramma's.</p> <p>De belangrijkste kwesties in de uitvoering van huidige nationale monitoringsprogramma's zijn de onvolledige bemonsteringsdekking van de</p>

	<p>regionale populatie, en dat de toewijzing van eenzijdige monitoring op nationaal niveau niet zorgt voor het meest optimale gebruik van beschikbare middelen. Een belangrijk onderdeel van dit project was de ontwikkeling van richtlijnen om een kwaliteitscontrole van data op regionaal en nationaal niveau uit voeren. Voor dit doek is er een R bibliotheek ontwikkeld en beschikbaar gemaakt op een publiek toegankelijke website (https://github.com/ldbk/fishPifct).</p>
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INTERNATIONAL

Was the project part of an international network?	Yes
Who were the international partners?	AZTI, CEFAS, DTU Aqua, HCMR, ICES, IEO, IFREMER, ILVO, IMR, IPMA, IRD, MASTS, MCC, MI, MSS, SLU, TI-SF and USTAN.
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	EU Grant MARE/2014/19
How much funding came from these sources?	€442.591,-
How did the project position Wageningen Marine Research internationally?	As a key player in sampling statistics and analysis as well as initiator/developer of new techniques.

Title	18. Discard Valves
Number	4311300032
Project leader	Pieke Molenaar
Other researchers in WUR	Michiel Dammers and Ruben Verkempynck
Researchers outside WUR	None
BAPS number	KB-24-005-018
Budget	€10.000,-
Goals of project	Improve discard data quality using a measuring device for discards. Design, develop and test automatic discard valves to make them portable and user friendly to ensure applicability on (all) commercial demersal vessels of the Dutch fleet.
Target group for research	Scientific discard monitoring at Wageningen Marine Research and international institutes. This device may even be deployed for use in the discard self-sampling programs on commercial vessels. Even applicable in commercial operations when actual discard amounts have to be registered in the logbooks under the landing obligation.

PROGRESS 2016

Results	<p>Main results: The design properties, conditions and dimensions have been developed. With those an actual prototype has been developed for testing.</p> <p>Products: Design of prototype and actual prototype for testing under commercial conditions.</p>
Did the work follow plans (science or financial)?	The design was decided and is now being made in a prototype to test the proof of concept. By the end of 2016 the prototype has been delivered.
Developed expertise	On board automatic discard monitoring tool for scientific and commercial applications. After testing this prototype, possibly fishermen and other scientific institutes might be interested in purchasing such a tool themselves.
Science publications	Poster presentation at International Fisheries Observer and Monitoring Conference (IFOMC).
General publications	None
Other outputs	Presentation for the Wageningen Marine Research KB WOT results 2016 projects – mini symposium.
Any links to Wageningen University projects?	None
What is relevant for EZ fisheries or ecosystem management?	High relevance with the impending landings obligation. This device enables accurate discard (weight & species) measurements for scientific and commercial applications.
Describe collaboration with any partners outside WUR (national)	None

SAMENVATTING VOOR KENNIS ONLINE

Non scientific partners	Developed in collaboration with Dammers VOF technisch advies.
Summary and Conclusions of Project	<p>High catch volumes in the Dutch demersal fisheries often result in high discard rates. For the biggest beam trawl vessels discard rates can reach up to 75%. These rates are exceptionally high and in the 'danger zone' where small uncertainties in the total catch estimation have a disproportionately large effect on raised discard quantities.</p> <p>Due to high discard quantities and automated catch processing, quantifying discard quantities is complex and labour intensive. Therefore total catch is estimated and weighed landings are subtracted to estimate discards. Some examples for quantifying total catch on commercial vessels are:</p> <ul style="list-style-type: none"> • Best visual estimation of total catch (from observer and captain) • Measure volume total catch in hopper • Counting number of rotations of sorting belt • Measuring weight of total catch in cod end • Sort a sample of the catch <p>We have identified a number of factors and conditions that can greatly impact the raised estimate of catch and discards from the haul level. For example: visual estimates are highly inaccurate, total catch volume can be difficult to measure, and weight of total catch can be influenced by large quantities of sand and water. To increase accuracy of catch and discard estimates there is an urgent need for a device to measure all discards on commercial vessels in an effective and cost efficient way.</p> <p>Discard valves are conceptually designed for fully automatic accurately weighing all discards quantities falling through the discarding shaft, this is done by two independent valves and a load cell measuring device. Several specifications are identified for successful application:</p> <ul style="list-style-type: none"> • Adaptable to most commercial vessels • Automatic measuring of weight • No obstruction in commercial catch processing • Mobile and easy to handle • Stainless steel and electronical design
Dutch summary and conclusions	<p>Grote vangsten in de Nederlandse bodemvisserij resulteren vaak in hoge bijvangst aantallen. Voor de grootste boomkorschepen kan de bijvangst oplopen tot 75% van de vangst. Deze aantallen zijn extreem hoog en in de 'gevaarzone' waar kleine onzekerheden een disproportioneel groot effect hebben op de totale bijvangst hoeveelheden.</p> <p>Deze grote bijvangsten en de automatische verwerking van de vangst maken het complex en arbeidsintensief om de bijvangst te monitoren. De huidige methode om bijvangst te schatten is door de totale vangst te schatten en daar de aangelande vis vanaf te trekken. Voorbeelden van methoden voor het schatten van de totale vangst aan boord van schepen zijn:</p> <ul style="list-style-type: none"> • Visuele schatting van de totale vangst (door schipper en waarnemer) • Meten van het totale volume vangst in de hopper • Tellen van het aantal rotaties van de sorteerband • Meten van de totale vangst in de kuil • Uitzoeken van een subsample van de vangst <p>Een zijn een groot aantal factoren en omstandigheden welke grote invloed hebben op de geschatte vangst en bijvangst. Bijvoorbeeld: Visuele schattingen zijn zeer</p>

	<p>onnauwkeurig, het totale vangstvolume is moeilijk te meten en het gewicht van de totale vangst kan beïnvloed worden door grote hoeveelheden zand en water. Om de nauwkeurigheid van de vangst- en bijvangstschatting te verhogen is er grote behoefte aan een instrument, dat alle bijvangst aan boord van een commercieel schip op een effectieve en goedkope manier kan meten.</p> <p>Voor een volledige automatische weging van de bijvangst zijn er bijvangst-kleppen ontworpen. Alle bijvangst valt door een schacht door middel van twee aparte kleppen en een lading weegschaal. Specificaties voor succesvolle discardkleppen zijn:</p> <ul style="list-style-type: none"> • Aanpasbaar voor de meeste commerciële schepen • Automatisch wegen • Mag geen obstructie vormen voor de vangstverwerking • Mobiel en handzaam • Roestvrij staal en elektronisch ontwerp
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INTERNATIONAL

Was the project part of an international network?	Yes
Who were the international partners?	International Fisheries Observer and Monitoring Conference (IFOMC) and Work Group on Fishing Technology and Fish Behaviour and FAO
Has the project been associated with international funding sources (EU, DGIS etc.) or research programmes?	No
How much funding came from these sources?	
How did the project position Wageningen Marine Research internationally?	Wageningen Marine Research is a forerunner in this field of science.