Stichting DLO
Centre for Fisheries Research (CVO)

KB WOT Fisheries 2016 - Maintaining Excellence and Innovation in Fisheries Research

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Summary

The KB WOT Fisheries programme is developed to maintain and advance the expertise needed to carry out the statutory obligations in fisheries monitoring and advice of The Netherlands. The contents of the KB WOT Fisheries programme for 2016 reflects the scientific and societal needs of the WOT fisheries programme. The strength of KB WOT Fisheries lies in the top-down development of the programme while allowing bottom-up input with open calls for projects securing innovation. To avoid missing research priorities, part of the programme also calls for specific projects relevant to WOT and EZ needs. The KB WOT Fisheries programme will fund 16 projects in 2016 which will focus on remote sensing of fish and shell fish in the ecosystem, new methods and tools for surveys and discard and catch sampling. International exchange of new expertise and developments, as well as continuous quality assurance, forms a major part of the programme.

Samenvatting

Het KB WOT programma voor Visserijonderzoek is ontwikkeld om de expertise die nodig is voor de uitvoering van de Nederlandse Wettelijke Onderzoekstaken voor de visserij te onderhouden en ontwikkelen. Het KB WOT programma in 2016 weerspiegelt de onderzoekbehoeften van het WOT visserij programma. Het programma wordt ontwikkeld vanuit een top-down benadering, welke wel bottom-up inbreng vraagt via het indienen van projecten. Om te voorkomen dat dat niet alle kennisbehoeften, die van strategisch belang zijn voor een goede uitvoering van de Wettelijke Onderzoekstaken, beantwoord worden, vraagt het programma om specifieke projectvoorstellen te ontwikkelen. Het KB WOT visserij programma financiert in 2016 16 projecten op het gebied van remote sensing van vis en schelpdieren, nieuwe technieken voor het uitvoeren van surveys en bijvangst en vangstbemonstering. Internationale uitwisseling van kennis en ontwikkelingen in het onderzoek vormt, samen met kwaliteitsborging, een belangrijk onderdeel van het programma.

1   Introduction

Expertise, necessary to carry out the statutory obligations of the Netherlands in fisheries monitoring and advice on fishery management, are developed and maintained in the KennisBasis (KB) WOT Fisheries programme. Because of changes in policy needs and method innovations, the fishery management statutory obligations of the Netherlands are shifting over time. This requires for the KB WOT Fisheries programme to be pro-active in order to respond to these changes. As a result the KB WOT Fisheries program is a flexible multiannual programme which is yearly reviewed, and has clear objectives and deliverables.

The main task of the KB WOT Fisheries programme is underpinning the expertise needed to carry out the statutory tasks. IMARES also holds the maintenance and development of this expertise in its strategy. The expertises in the programme are necessary for the needs of the fisheries research and advice as well as the fisheries Data Collection Framework (DCF), the Common Fisheries Policy (CFP) and the Marine Strategy Framework Directive (MSFD).

The developed KB WOT Fisheries programme is essentially developed in a top-down approach, but it allows for bottom-up input. Each year a call for proposal for projects is announced allowing for bottom-up submission. Areas of research include integrated assessments of the ecosystem (particularly the demersal and benthic communities of the southern North Sea), multispecies and maximum sustainable yield (MSY) considerations in fisheries management, development of acoustic survey practices, plankton survey techniques and fish aging, ecosystem change, remote sensing of the ecosystem, bycatch and discarding of marine organisms and the development of management plans for fisheries. Turning existing standard surveys into more ecosystem monitoring expeditions is also stimulated.
The programme consists of both long term projects (multiannual) and annual projects, which respond to scientific and societal needs. It is an innovative, supportive and exploratory programme which also conforms to the wider Wageningen strategic approach of KennisBasis research. The KB WOT Fisheries programme is embedded in the DLO KB Research Programme System Earth Management (SEM) in the subtheme Marine Resource Management.

The KB WOT programme itself is a collaboration between CVO (Centre for Fisheries Research), IMARES and the Ministry of EZ. The KB WOT Fisheries programme is part of the overarching KB programme carried out by Wageningen UR and is developed together with the ministry of Economic Affairs (EZ). The programme is managed by a delegated programme leader and head of CVO, who review the programme each year, supported by a scientific advisory committee. The programme produces two annual reports, 1) with the results of the previous year and 2) with the programme for the following year.
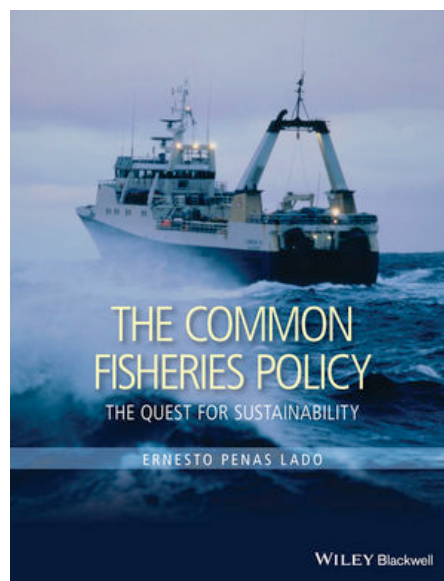
This report describes the framework for the 2016 programme and the proposed research which will be carried out in 2016.

2 The embedding of KB WOT Fisheries

The KB WOT Fisheries programme operates within the Wageningen KB theme 'System Earth Management'. One of the goals of the theme 'System Earth Management' is sustainable use of natural resources and increasing the knowledge on marine resource management. The KB WOT fisheries programme fits into this overarching theme, though it is important to realise that the KB WOT Fisheries programme main objective is to develop and maintain expertise to carry out the statutory tasks.

The KB WOT Fisheries programme covers the statutory tasks needed for national and European fisheries policy. 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) are thus included. On the other hand, long-term data collection programmes require the collection of information and data, while it is also necessary to acquire enhanced understanding of the marine and freshwater environment and ecology. A combination of the data collection with increased understanding of the marine and freshwater system is the basis for delivering strong science-based advice. For these tasks the KB WOT Fisheries programme is developed to react to present needs, while at the same time anticipating on national and European fisheries policies future needs.

To develop reliable science-based advice for fisheries management and policy, it is essential to collect high quality data. These collections need to be executed according to international agreed and developed scientific manuals. Science based on international collaboration and peer-review is the only way to achieve this. This requires for scientists to keep up to date with recent developments across the world, and any new developed techniques and methods to be internationally evaluated. International travel to exchange scientific developments both within and outside the Netherlands forms a major part of the KB WOT Fisheries programme. Also within KB WOT Fisheries projects and statutory task surveys international exchanges of staff are stimulated.

3 International nature of KB WOT Fisheries

International collaboration and exchange of scientific development are vital to accomplish the statutory tasks. The KB WOT Fisheries projects are for the major part carried out in cooperation with (inter)national colleagues. Through these collaborations a large amount of external value is added to the programme, as resources and expertise from other institutes contribute to the KB WOT Fisheries.

The project 'International exchange' within the KB WOT Fisheries programme is devoted specifically for international collaboration, participation in meetings and workshops. This is a yearly recurring project, which ensures IMARES scientists remain at the international centre of research developments in fisheries research. The programme thus strongly encourages exchange of knowledge through peer-reviewed publications, presentations and developing new techniques for fisheries research as well as the exchange of scientists.

Innovation and teamwork. Humpback whales, bubble-net fishing. Photo: Risser.edu.blogs.org.

4 Structure of the KB WOT Fisheries programme

4.1 Management team

The KB WOT Fisheries programme is managed in close collaboration between CVO and IMARES, under responsibility of the Head of CVO (Sieto Verver). The daily management of the programme is delegated to programme leader Cindy van Damme (IMARES) in close cooperation with CVO. Financial support is provided by Rian Schelvis-Smit (IMARES).

4.2 Financing

The WOT Fisheries programme was evaluated in 2015 by the Ministry of EZ and it was agreed to continue to allocate an annual budget to this programme in order to maintain and develop expertise needed to carry out the WOT statutory tasks. The content of the WOT Fisheries and the conditions for expertise development are laid down in a long term agreement (Uitvoeringsovereenkomst) between DLO and the Ministry of EZ. The KB WOT Fisheries expertise programme in 2016 is financed from the research budget earmarked for the KB WOT programme. The available budget in 2016 for KB WOT fisheries is € 588.000,- (ex VAT and excluding WUR charges amounting 11k€ since 2013).

4.3 Reviewing of submitted proposals

The themes for the KB WOT Fisheries programme are decided by the management team of this programme. As certain part of the budget is available to scientists through an open call (within IMARES) for proposals (see section 5.1). The project proposals from IMARES scientists are submitted to the different themes. The management team is supported by a scientific review team to advise which proposals could be granted through the programme. The evaluation criteria are published with the call. The final selection of the projects to be accepted is done by the KB WOT Fisheries management team.

All proposals are reviewed and judged for relevance for the WOT statutory tasks, development of relevant new methods and expertise and scientific relevance. The proposals receive a mark from each reviewer for development of relevant new methods and expertise and scientific relevance. The KB WOT Fisheries management team also mark the proposals for relevance for the WOT statutory tasks. The means of these marks is then used to rank the submitted proposals, ensuring relevance for the WOT programme.

The review team for the KB WOT 2016 proposals consisted of:
- Sieto Verver, head of CVO
- Cindy van Damme, KB WOT Fisheries programme manager, IMARES
- Pauline Kamermans, senior scientist department Delta, IMARES
- Adriaan Rijnsdorp, senior scientist department Fisheries, IMARES
- Ingrid Tulp, senior scientist, department Fish, IMARES

5   The KB WOT fisheries programme for 2016

5.1   Themes

The programme for 2016 has the following themes:

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

The programme is a result of excellent projects which have been submitted to an annual call for proposals. International collaboration, exchange and teamwork are a high priority. Also projects that propose to publish their results in international peer reviewed literature are thought to be important. The four themes are described as follows:

5.1.1   Evaluating, improving and underpinning the WOT Fisheries programme

An open call was put forward in this theme for projects focussing on providing information or tools but also improving current methods and management needed to evaluate, improve and underpin the WOT Fisheries programme.

For sustainable exploitation and protection of marine and fresh water resources reliable science-based advice for fisheries is vital. High quality data collection through integrated monitoring of marine and fresh water biota are essential to address MSFD requirements and ecosystem and marine resource management. Novel and innovative integrated techniques, assessments, models and management strategies need to be developed. Data needs to be collected and analysed according to international agreed and developed scientific protocols. This can only be achieved through science based on (inter)national collaboration and peer-reviewed science. Innovative and exploratory research into integrated assessments of the ecosystem (particularly the demersal and benthic communities of the southern North Sea), multispecies and maximum sustainable yield (MSY) considerations in fisheries management is encouraged.

5.1.2   Maintaining Quality

This was a closed call to specific invited expert leaders in IMARES for projects that maintain the present expertise base and quality control routine techniques and skills. IMARES needs to maintain core competencies to deliver and internationally approved WOT programme. These core competencies include age reading of fish, fish stock assessments, acoustic survey techniques, shellfish surveying, discard monitoring and biological data collection, but also developments of storage of these data. Courses, workshops and exchanges are an important part of maintaining and developing core skills. The choice of areas to receive funding is made by the KB WOT Fisheries programme management team.

5.1.3   International Exchange

Under this theme, budget is reserved to participate and exchange expertise in international research networks (primarily but not only ICES). Funds will be allocated by the KB WOT programme management to participate in meetings and workshops that are considered important for the WOT Fisheries statutory tasks. With this theme KB WOT Fisheries ensures IMARES scientists stay up to date with international developments and participate in the international science developments by presenting IMARES research.

The value of KB WOT Fisheries programme is increased by project financing and technology or expertise transfer from international partners.

5.1.4 DG MARE Tender

DG MARE Tender is an EU project directed at "Strengthening regional cooperation in the area of fisheries data collection". This theme provided the required co-financing for the specific MARE/2014/19 project proposal. This proposal was granted in 2015 and continues in 2016. The project plays a major role in setting up future cooperation of sampling methodologies as well as for the development of new sampling strategies in support of activities under the future data collection framework.

5.2   Proposals granted

In total, 41 proposals were submitted to the KB WOT 2016 call (see annex 1). Based on the evaluation described in section 4.3, the following 16 projects were granted.

Proposal no	Theme	Title	Project leader	Agreed finance[1]
2	2	Fish Ageing	L. Bolle	€ 47.000
8	1	IBTS otolith sampling scheme	R. van Hal	€ 11.880
9	1	PELSEL	N. Hintzen	€ 13.860
10	1	Acoustic methods for trawl surveys	L. Teal	€ 33.660
12	3	International exchange	C. van Damme	€ 110.000
13	2	Ecosystem Acoustics	S. Fässler	€ 59.496
15	2	"Remote mussel bed sensing"	K. Troost	€ 41.244
17	1	"Drone mapping of mussel beds"	K. Troost	€ 40.180
19		Programme management	C. van Damme	€ 27.236
23	2	Storage of electronic monitoring data	E. van Helmond	€ 46.488
26	1	Geostatistics for estimating shellfish biomass	I. Tulp	€ 29.560
27	2	Mackerel Egg Development and Mortality	C. van Damme	€ 29.990
29	1	Catch sampling on-board pelagic freezer trawlers	E. van Helmond	€ 14.660
37	1	Discards ashore	R. Verkempynck	€ 34.076
38	1	Use of electronic measuring devices	R. Verkempynck	€ 14.414
41	1	Demographic profile of recreational fisheries	T. vd Hammen	€ 12.256
		MARE Co-funding	S. Verver	€ 22.000
		Total		€ 588.000[2]

Many of the other proposals were also of good quality and of direct relevance, but could not be granted because of limited resources.

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[1] Amounts are excluding VAT.

[2] The total budget thus being €588,000,-. Which when combined with the WUR charges fulfils the budget of €599.000,-.

6   Conclusion

The KB WOT Fisheries programme will fund 16 projects in 2016. This year the KB WOT fisheries programme is balanced with remote sensing (fish and shell fish acoustics) in the ecosystem, utilising new tools such as drones. Also new techniques and methods for surveying, monitoring and assessment are investigated. Data storage of routine sampling is to be improved. Discards and catch sampling form a substantial part of the programme. Exchanging of knowledge and techniques with international scientists is also an important part of the programme. The 2016 projects will in the future increase the ability of the WOT programme to ensure that fisheries advice is responsive to ecological change.

7   Quality assurance

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

Throwing the cast-net from shallow waters, 19th century drawing

Signature

CVO Report: 16.002
Project number: 4311300016

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

Signature:

Date: September 2016

Annex 1. The Proposals submitted to the call KB WOT Fisheries 2016

Approved proposal 😊   Not approved proposal 😞

Project 1 😞	Species ID test
Project leader	Martin de Graaf
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	The main stakeholder (the angling organisation 'Sportvisserij Nederland') raised concern about the capabilities of the participants of the survey to correctly identify their catch to species level and the possible impact on the accuracy of the catch estimate. EZ acknowledged the potential for bias and financed in 2014 the development of an online ID test. Question: Are the participants of the Diary Survey able to correctly identify their catch to species level, and what are the possible consequences of incorrect identification for catch estimates?
Objective(s) of the project	To quantify the extend of incorrect species identification by recreational fishers and quantify (correction factors) the impact of incorrect species identification on catch estimates.
Expertise needed	Insight in the impact of incorrect species identification for catch estimates.
Expertise developed	Improved catch estimates (possible correction factors) for recreational fisheries. This will also be interesting for other countries, which struggle with the same questions.
Relevance for WOT	Improvement of the accuracy of catch estimates for listed species. The online ID test can also be used as an additional tool to test taxonomic skills of staff not able to attend the annual species test in IJmuiden.
Why should this be funded by KB WOT?	Improve the accuracy of recreational catch estimates for species such as cod, seabass, eel and salmon.
What other potential funding sources have been considered?	At present we are discussing the option for a financial contribution (10K) with Sportvisserij Nederland.
International objective of research	The question about species identification was also raised at WGRFS to quantify the potential impact of "incorrect identification" of target species on catch estimates would be a first step to improve the survey.
Work plan	
Broad description of the project including expected results	**Online ID test:** The online ID test will be distributed to the 2500 participants of the 2016 logbook survey. The online test will enable us to quantify the incorrect identification of species and develop (if needed) correction factors. **Field ID test:** The field test part of the project is *optional* and will only be conducted if a suitable student is available. The taxonomic capabilities of recreational fishers will be tested in the field during brief interviews.
Approach and time schedule	**Online ID test:** All participants will receive the online ID test at the start (April 2016) of the 2016-2017 logbook Survey. **Field ID test:** Twenty field days are planned to conduct marine species ID test in the summer of 2016.
Output/deliverables	
Dissemination of	The aim is to publish the findings of the study as a "short note" in a peer

findings being addressed	reviewed journal. The results will be presented at WGRFS.
Utility of the developed products and expertise	Results will be shared with the WGRFS) in June 2016
What are the potential risks to the project's success?	The online ID test has already been developed and is ready to be used, little risk is expected. The field ID test is "additional" and dependent on the availability of a suitable student with high level fish species ID skills.
Project organisation	
Involvement IMARES (names and expertise)	Martin de Graaf (PM, design, reporting) Tessa van der Hammen (design, analysis, reporting)
Is the appropriate capacity available?	YES
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	Jaap Quak Sportvisserij Nederland (design) Lisanne van Thiel (TNS NIPO; conduct online ID test)
Relevance	
What is the market/ target audience	EU, EZ, Sportvisserij Nederland
Economical relevance	The value of the total recreational fishery in the Netherlands is ~350 million. Recreational fishers catch a significant proportion (15-40%) of the total annual landings of seabass, cod and eel.
Social relevance	The stocks of species such as cod, seabass and eel are critical and accurate catch estimates are essential for the management.
Scientific relevance	Insight into the potential impact of incorrect species identification of catch estimates of recreational fishers will be a first.
Relevance to ministry EZ	Accurate catch estimates are essential for the management and regulation of stocks that are under threat.
Summary (UK)	Accurate catch estimates are essential for the management and regulation of stocks (e.g. cod, seabass, and eel) that are under threat. Recreational fishers catch a significant proportion (15-40%) of the total annual landings of critical species such as seabass, cod and eel. The main stakeholder (Sportvisserij Nederland) raised concern about the capabilities of the 2500 participants of the logbook survey to correctly identify their catch to species level and the possible impact on the accuracy of the catch estimate. EZ acknowledged the potential for bias in catch estimates and financed in 2014 the development of an online ID test. The aim of the current proposal is to quantify the incorrect identification of species and develop (if needed) correction factors.
Samenvatting (NL)	Nauwkeurige schattingen van de vangsten door de recreatieve visserij zijn essentieel voor het beheer en de regulering van de visbestanden (kabeljauw, zeebaars, aal) waar het niet goed mee gaat. Recreatieve vissers vangen een aanzienlijk deel (15-40 %) van de jaarlijkse commerciële vangsten van soorten zoals zeebaars, kabeljauw en aal. Na de publicatie van de 2010 en 2012 vangstschattingen door de recreatieve vissers, uitte de belangrijkste stakeholder (Sportvisserij Nederland) bezorgdheid over de kennis van de 2500 deelnemers van de logboek survey om hun vangst correct te identificeren op soort niveau, en de mogelijke impact op de

juistheid van de vangstschattingen. EZ erkende het potentiele probleem en financierde in 2014 de ontwikkeling van een online ID -test. Het doel van het huidige voorstel is om de verkeerde identificatie van soorten te kwantificeren en hiervoor correctie factoren te ontwikkelen (indien nodig).

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	160	15.840
CAT IV	122	80	9.760
CAT V	143		
CAT VI	172		
Total Personnel			25.600
Material costs			
Facilities			
Specific costs	Online fish ID test 2500 people: 10.000		
Travel costs			250
Project equipment			250
Other material costs	750 (10 charter boat trips)		
Total Material costs			
Total project budget needed			36.890
Financing through other resources	10.000 (possibly by Sportvisserij Nederland)		
Finance needed from KB WOT	36.890 (or 26.890 if Sportvisserij NL contributes 10K)		

Project 2 ☺	Fish Ageing
Project leader	Loes Bolle
Theme	2. Maintaining Quality
Motivation and Project aims	
Problem definition	Age reading is a key expertise in fisheries research. Maintaining this key expertise requires training, exercise, international calibration, quality assurance and quality control. The WOT (and other) projects, in which age determinations are carried out, do not fund these quality maintenance issues. Therefore KB WOT funding is required.
Objective(s) of the project	Maintaining quality of age determinations
Expertise needed	(1) Coordinators with international contacts in the field of fish aging (2) Experienced age readers
Expertise developed	Fish ageing
Relevance for WOT	This is of great relevance for WOT as market, survey and discard data are used for age-based assessments
Why should this be funded by KB WOT?	IMARES needs to maintain its expertise in fish ageing to deliver an internationally approved WOT programme. However, activities crucial for the maintenance of this expertise are not covered by WOT funding and have therefore been funded by KB-WOT since 2004.
What other potential funding sources have been considered?	WOT programme
International objective of research	Improve/maintain quality of age data used in international stock assessment working groups
Work plan	
Broad description of the project including expected results	The following 3 activities are essential for maintenance of the key expertise fish ageing: (1) Training of new age readers. This is urgently needed to enable replacement of several experienced readers who are nearing retirement. Furthermore, we aim at 2 age readers per species to ensure continuity and to avoid any delays in supplying age data. (2) International calibrations. WGBIOP calls for international workshops and exchanges when considered necessary. Participation in these international calibration exercises is important for maintaining quality in fish ageing. The European laboratories take turns in organising the workshops and exchanges. (3) Development and implementation of national and international QA and QC.
Approach and time schedule	(1) Training: Throughout year. Experienced readers train new readers. Progress is pushed and tested by coordinators. (2) International calibrations: Throughout year. We only participate in workshops and exchanges for species/stocks that are relevant for NL. Specific for 2016: - Finalisation of sole exchange (coordination by NL) - Turbot and brill exchanges (coordination by NL) - Blue whiting exchange

	- Norway pout exchange
	- Haddock exchange
	- Whiting workshop Lowestoft
	- Sprat workshop Ireland or Denmark
	(3) Specific goal for 2016: update manual
Output/deliverables	(1) ICES reports of workshops
	(2) Reports of exchanges
	(3) Update of IMARES manual (Handboek Leeftijdsbepalingen)
Dissemination of findings being addressed	All reports of international exchanges and workshops are disseminated through WGBIOP and the ICES website
Utility of the developed products and expertise	Almost all population dynamic research carried by IMARES, whether for scientific publications or for fisheries management advice, is age structured. Hence maintenance of the expertise fish ageing is of great importance to IMARES.
What are the potential risks to the project's success?	Insufficient prioritisation within the institute
Project organisation	
Involvement IMARES (names and expertise)	Loes Bolle & Ineke Pennock - Coordinators. Jan Beintema, Peter Groot, Kees Groeneveld, Thomas Pasterkamp, André Dijkman, Marcel de Vries, Betty van Os – Experts (for specific species). André Dijkman, Marcel de Vries, Betty van Os, Norie van der Meeren, Margreth Roling – Trainees (for specific species).
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Age readers and age reading coordinators from laboratories throughout Europe
Relevance	
What is the market/ target audience	Relevant for all projects involving fish ageing
Economical relevance	Sound fisheries advice
Social relevance	Sound fisheries advice
Scientific relevance	Age structured research (population dynamics, growth studies, etc.)
Relevance to ministry EZ	Almost all stock assessment models are age structured
Summary (UK)	The key expertise fish ageing is of crucial importance for all age-structured population dynamic research, such as stock assessments for management advice. Maintenance of this key expertise is achieved by training, exercise, international calibration, quality assurance and quality control.
Samenvatting (NL)	De kernexpertise leeftijdsbepalingen van vissen is van essentieel belang voor leeftijds-gestructureerd populatie dynamisch onderzoek, zoals de toestandsbeoordelingen van visbestanden en daarmee de visserijadviezen. Onderhoud van deze kernexpertise wordt bewerkstelligd door training, oefening, internationale kalibratie, kwaliteitsborging en kwaliteitscontroles.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58	16	928
CAT II	79	368	29.072
CAT III	99	140	13.860
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			43.860
Material costs			
Facilities			
Specific costs			
Travel costs			2.000
Project equipment			
Other material costs			1.140
Total Material costs			3.140
Total project budget needed			47.000
Financing through other resources			
Finance needed from KB WOT			47.000

Project 3 🙁	Invasive fish species in Dutch waters
Project leader	Karen van de Wolfshaar
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	Invasive freshwater goby species have spread through the river system and may pose potentially predation pressure on native fish.
Problem definition	Invasive fish species have increased in numbers in Dutch waters.
Objective(s) of the project	Scientific publication of temporal and spatial spread of invasive freshwater goby species, in the national waters and their potential predation pressure on native fish.
Expertise needed	Geo-statistics is a method developed to deal specifically with spatial (georeferenced) data. Spatial indices can be used to describe /characterise the properties of spatial distributions and changes over time. Whilst commonly applied statistics struggle with spatial correlation in the data, geo-statistics specifically models these spatial patterns, also avoiding usual problems encountered with high abundances of zeros.
Expertise developed	Geo-statistics within IMARES
Relevance for WOT	Up to date overview of the spread of invasive fish species and their potential predation pressure on (commercial) native stock.
Why should this be funded by KB WOT?	There are no recent publications on the spread and development of the populations of invasive fish species from the Donau in Dutch waters, nor is there insight into their potential as fish predator and threat for commercial species.
What other potential funding sources have been considered?	None
International objective of research	Data on the spread and population size of invasive fish species from upstream, including their relevance for commercial fish species
Work plan	
Broad description of the project including expected results	The national fresh water monitoring allows for long term analyses of the invasion process in terms of spatial and temporal spread of fish species originating from the Donau in the Dutch river system. Current reports suggest that the number of gobies is high. Especially the species which grow to larger sizes may affect the (commercial) native fish species negatively through predation. An analyses on spread and population size in time and space will provide information on whether or not these invasives pose a small, medium or large problem to recruitment of native fish species. Potential predation pressure can be calculated based on the size-distributions of the different species and their feeding guilds. The aim of this project is to analyse the invasion of Donau species in the national waters and quantify their possible predation pressure on native fish species. The results will be published in an peer reviewed international journal.
Approach and time schedule	We will start in August after Lorna's maternity leave and after the data analysis for the Fresh water report, thereby enabling a head start of the analysis with the pre-prepared data to make most of the time available.
Output/deliverables	Scientific publication
Dissemination of findings being addressed	A peer reviewed article and possibly an article in a Dutch journal for the national public.

Utility of the developed products and expertise	Peer reviewed paper on the invasion and possible thread of the invasive fish species and the use and development of novel geo-statistical methods.
What are the potential risks to the project's success?	Time for the publication process
Project organisation	
Involvement IMARES (names and expertise)	Lorna Teal (geo-statistics and writing), Karen van de Wolfshaar (writing)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Pierre Petitgas (available for advice on geo-statistics if needed)
Relevance	
What is the market/ target audience	EZ-RWS, fisheries managers, advisors, science
Economical relevance	Hindcast and timely status of invasive freshwater fish species from the Donau and their potential threat to commercial native fish species.
Social relevance	Information on the invasion process and the consequences of invasive species for other fish.
Scientific relevance	Publication of invasion process and predation pressure of invasives.
Relevance to ministry EZ	Hindcast and timely status of invasive freshwater fish species from the Donau and their potential thread to commercial native fish species.
Summary (UK)	This project aims at peer reviewed publication of the temporal and spatial aspects of invasive fish species in the Dutch national waters and the potential thread to commercial native fish species.
Samenvatting (NL)	Het doel van dit project is het bestuderen van de invasie, in tijd en ruimte, van vissoorten uit de Donau in de rijks wateren en de potentiele predatiedruk op commerciële, inheemse vissoorten.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	200	19.800
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			19.800
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			19.800
Financing through other resources			
Finance needed from KB WOT			19.800

Project 4 😞	Trend analyses of commercial fresh water fish
Project leader	Karen van de Wolfshaar
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	Scientific publication of trend analyses from fresh water monitoring data, which is currently published in a Dutch report, will aid our analysis through the peer review process and present the findings to a broad public.
Problem definition	
Objective(s) of the project	Scientific publication of the trend analyses of the commercial fresh water fish stocks.
Expertise needed	Statistics
Expertise developed	Statistics
Relevance for WOT	Peer review of analyses done
Why should this be funded by KB WOT?	The data and their analyses of freshwater systems have until now only been published in a Dutch report but lacks international scrutiny and appreciation.
What other potential funding sources have been considered?	None
International objective of research	Data on our delta are of interest for an international public, from neighbouring countries to other delta regions around the world
Work plan	
Broad description of the project including expected results	The 'Rijks wateren' fresh water monitoring allows for long term trend analyses at different locations in the river system. The trends for commercial fish species are annually published in reports. However, international and scientific scrutiny of methods used and the results published is currently lacking. The aim of this project is to revisit, and if necessary adjust, the methods and publish in an peer reviewed international journal
Approach and time schedule	We will start the method revision and analysis in May coinciding with data analysis for the Fresh water report, thereby enabling a head start of the analysis to make most of the time available and optimizing both the report as well as the scientific public.
Output/deliverables	Scientific publications
Dissemination of findings being addressed	A peer reviewed article and possibly dissemination in a national journal
Utility of the developed products and expertise	Peer reviewed and scrutinized methods for the trend analyses as published for EZ-RWS use.
What are the potential risks to the project's success?	Time for the publication process
Project organisation	
Involvement IMARES (names and expertise)	Nicola Tien (statistics and writing), Pepijn de Vries (statistics and writing), Karen van de Wolfshaar (writing), Ingeborg de Boois (data)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties	If necessary Leo Soldaat (CBS) can be contacted for statistical assistance

outside WUR (names and expertise)	
Relevance	
What is the market/ target audience	EZ-RWS, fisheries managers, advisors, science
Economical relevance	State of the art methods for commercially important fresh water species that aid management
Social relevance	State of the art methods for commercially important fresh water species that aid management
Scientific relevance	Publication of trends analysis in our delta
Relevance to ministry EZ	Peer reviewed methods for analysis and reporting
Summary (UK)	This project aims at peer reviewed methods and analysis of the commercially important fresh water fish stocks, through a publication in a scientific journal with a peer review process.
Samenvatting (NL)	Het doel van dit project is de methode van trend analyse zoals gebruikt voor commerciële zoetwater vissen, zoals gebruikt in de rapportage richting EZ en RWS, kritisch door te laten lichten door de wetenschappelijke gemeenschap, middels peer review.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	200	19.800
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			19.800
Financing through other resources			
Finance needed from KB WOT			19.800

Project 5	Discard data quality
Project leader	Pieke Molenaar
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	The IMARES discard monitoring program has been and is criticized by the some people in the Dutch fisheries fleet. This criticism is mainly focused on the discard quantities that follow through a possible biased estimation of the total catch. The current approach of estimating total catch and deriving discard quantities certainly has its flaws but can be solved by measuring the amount (€) of discards. For instance, in the past IMARES sea-going observers have used discard valves. But these valves turned out to be inapplicable on all vessels in the Dutch fisheries fleet and their use was described as labour intensive. The problem is very apparent when the current discard monitoring protocol is applied on fisheries with small discard rates (e.g. twin trawling for plaice, fly shooters, …). On these trips it may happen that a negative amount (€) of discards is estimated whereas the observer has collected a discard sample. This is due to the estimation of the total catch being lower than the weighed landings. To avoid this there is a need for an accurate measurement of either the total catch or the total amount (€) of discards. A redesigned discard valve system is considered to be highly appropriate.
Objective(s) of the project	i) Improve discard data quality using a measuring device for discards. ii) Redesign the discard valves to make them portable and user friendly to ensure applicability on (all) demersal vessels of the Dutch fleet.
Expertise needed	Technical expertise on developing an user friendly accurate device
Expertise developed	Discard valve system for measuring discard that is applicable to all vessels
Relevance for WOT	High improvement of discard data quality
Why should this be funded by KB WOT?	It is highly relevant for the WOT demersal discard programs, either for self-sampling and observer trips
What other potential funding sources have been considered?	None, apart from project budget, but these are limited. If the first prototype seems promising, additional funding will be searched in other project budgets and general IMARES budget, for further development and purchase of multiple devices
International objective of research	i) Accurate discard data can improve stock assessments, selectivity experiments and provide more precise discard quantities for policy advising under the landing obligation ii) Sharing of discard valve system with other fisheries research institutions
Work plan	
Broad description of the project including expected results	At first, the project team will develop the technical details and necessities that a discard valve system should have. Also existing examples (e.g. Tridens system) will be evaluated and taken into account. This will results in a first design. After the design will be presented to possible companies with a background in marine engineering. Together the design will be fine-tuned and a prototype will be developed. The prototype will be tested in the IMARES lab and on board of a commercial vessel. Evaluation and calibration. If needed fine-tuning and re-development. If successful a second prototype will be produced and the final design will be presented.

Approach and time schedule	Jan-Mar: Evaluate and redesign existing labour intensive discard valves, define specifications, Apr-Jul: develop prototype with external company, Aug-Oct: test prototype in the lab and on a vessel, evaluate and develop a better version if necessary
Output/deliverables	i) (At least) two useful prototypes of above described discard valves ii) a manuscript of the development and design of the system for submittal in scientific journal
Dissemination of findings being addressed	i) Article in "Visserijnieuws" informing industry of innovative discard valve system ii) Presentation at ICES WGFTFB/FAO iii) Manuscript submittal to scientific journal.
Utility of the developed products and expertise	High; every year there are trips with negative amount (€)s of discards due to underestimations of the total catch. These trips are a waste of money and effort. This can be compensated through a discard valve system. This expertise would strengthen IMARES as a leading expert in discard research.
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Pieke Molenaar, Ruben Verkempynck, Michiel Dammers, Bob van Marlen, Kees Groeneveld, Thomas Pasterkamp, Dirk Burggraaf, Dick de Haan
Is the appropriate capacity available?	On board observers and researchers that will use this device are present. The expertise to design a device will be found in and outside IMARES.
Involvement parties within WUR (names and expertise)	Wageningen UR Food & Biobased Research Institute; Rick van de Zedde
Involvement parties outside WUR (names and expertise)	Van Wijk installaties en constructies BV, Maaskant shipyards, Marelec, DMG
Relevance	
What is the market/ target audience	Scientific discard monitoring at IMARES and international. This device may even be deployed for use in the discard self-sampling programs.
Economical relevance	Accurate discard measurements resulting in more efficient monitoring
Social relevance	i) Less stress for observers, no need for difficult total catch estimations ii) Improved trust from industry in IMARES results
Scientific relevance	Improving discard data quality, developing expertise in discard monitoring
Relevance to ministry EZ	High with the impeding landings obligation
Summary (UK)	This project aims to develop a discard valve system that can be used to measure more accurate discard amount (€)s on board. It solves the problem of negative discard estimates when total catches are badly estimated. The development of such a system will follow a design process based on existing examples and practical expertise. The deliverables would result in a more efficient discard monitoring. Results will be disseminated in the scientific community and in the fishing industry.
Samenvatting (NL)	Dit project heeft als doel een discard kleppen systeem te ontwikkelen dat kan gebruikt worden om precieze discard metingen uit te voeren aan boord. Het lost het probleem van negatieve discardschattingen op die gemaakt worden door een slechte schatting van de totale vangst. De ontwikkeling van een dergelijk system is gebaseerd op bestaande voorbeelden en praktische

	kennis van zaken. De resultaten leveren een betere discard monitoring op.		

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	60	4.740
CAT III	99	160	15.840
CAT IV	122	8	976
CAT V	143		
CAT VI	172		
Total Personnel			21.556
Material costs			
Facilities			5.000
Specific costs			
Travel costs			
Project equipment			20.000
Other material costs			1.000
Total Material costs			
Total project budget needed			47.556
Financing through other resources		See statement under other potential funding	
Finance needed from KB WOT			47.556

Project 6 ☹	Improving species discrimination using multibeam acoustic data (IDMAD)
Project leader	Ben Scoulding
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Fish schools on echograms offer a range of descriptive features which can be used to classify species or groups. Traditionally, the identification of acoustically detected fish schools during surveys has been dependent on a combination of biological sampling and (subjective) inspection of acoustic data by experts. However, it is often very difficult to distinguish between fish species with similar acoustic properties. This can lead to the incorrect allocation of acoustic energy sampled during surveys and consequently affect accuracy of abundance estimates. Therefore supplementary sources of information are required to help improve discrimination. When acoustic data is coupled with the morphological properties of fish schools and their geographical distribution it can improve discrimination success rates. Previously such information was only available as 2D echograms, however with recently acquired new quantitative multibeam echosounder (MBES) technology we are now able to visualise schools in 3D. To date no study has investigated the 3D structure of three key pelagic species (herring, sprat and Norway pout), which are commonly encountered during North Sea acoustic surveys. Using multibeam data we can better characterise schools and improve species classification. Discriminant function analysis can then be developed to help distinguish between species. These additional sources of information will be particularly useful in mixed species assemblages. It also allows us to study the behaviour and interaction of these species, which is an important step towards ecosystem based surveys and management.
Objective(s) of the project	Investigate the shape, size and position of 'ground-truthed' (i.e. verified by trawl sampling) schools for herring, sprat and Norway pout using the ME70 MBES.
Expertise needed	1) Fisheries acoustics 2) Basic statistical skills; familiar with various programming languages
Expertise developed	Knowledge to analyse 3-dimensional ME70 MBES data, which is currently not available in the Netherlands.
Relevance for WOT	Improve discrimination between pelagic species and inform ecosystem monitoring.
Why should this be funded by KB WOT?	This study will lead to improved discrimination between important pelagic species in the North Sea.
What other potential funding sources have been considered?	None
International objective of research	Discrimination tools developed during the project can form a basis to be used by other scientists participating on international acoustic surveys.
Work plan	
Broad description of the project including expected results	Measure the shape, size, density and location of fish schools with the ME70 MBES. As different species are expected to have different school morphology and display unique schooling behaviours, this information will go towards improving species discrimination and eventually survey accuracy.
Approach and time schedule	February: Analyse ME70 MBES data collected in 2015. March - July: Collect and analyse ME70 MBES data during the blue whiting

	and herring acoustic surveys. August: Add findings to existing discrimination algorithms. September – December: write paper
Output/deliverables	Submission of a scientific paper to a peer reviewed journal. Results presented to WGIPS & WGFAST.
Dissemination of findings being addressed	Working group for international pelagic surveys (WGIPS) ICES manual for international pelagic surveys Scientific paper
Utility of the developed products and expertise	This work will be important for ICES coordinated acoustic surveys. It will help scientists to discriminate between acoustically similar fish species. It will develop multibeam expertise not currently available in the Netherlands and build towards more sophisticated discrimination tools.
What are the potential risks to success?	The project is dependent on collecting sufficient 'ground-truthed' (verified by trawl hauls) ME70 MBES data for successful discrimination.
Project organisation	
Involvement IMARES (names and expertise)	Ben Scoulding; Sascha Fassler; Bram Couperus (fisheries acoustics, programming)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	Not outside IMARES
Involvement parties outside WUR (names and expertise)	Ifremer (MBES technology & data processing)
Relevance	
What is the market/ target audience	WOT, WGIPS, acoustic scientists, fishing industry
Economical relevance	Improved confidence in analysis of acoustic data which leads to a more accurate estimate of biomass, which will affect assessment results.
Social relevance	Good monitoring guarantees GES and sustainable resource exploitation (MSFD, CFP).
Scientific relevance	Eases the process of acoustic data processing & analysis. Characterises schooling behaviour of commercially important pelagic fish species.
Relevance to ministry EZ	Better performance of scientific acoustic surveys.
Summary (UK)	Acoustic techniques can deliver a wide range of descriptive features which can be used to improve species discrimination. However, often these features are ignored during echo trace scrutiny. The ME70 MBES gives a 3D-view of fish schools and detailed analysis of these data may not only improve species identification and discrimination but also give insights in to their behaviour and interactions which are important for ecosystem surveys and management.
Samenvatting (NL)	Akoestische technieken kunnen een breed scala van kenmerken beschrijven die kunnen worden gebruikt om de soortherkenning te verbeteren. Echter, vaak wordt tijdens analyse geen gebruik gemaakt van deze mogelijkheid. De ME70 multibeam echolood geeft een 3D-weergave van vis scholen. Gedetailleerde analyse van deze scholen zal niet alleen de identificatie en discriminatie van soorten verbeteren, maar ook kunnen inzicht geven in hun gedrag en interacties die belangrijk zijn voor ecosysteem surveys en de ecosysteem benadering in het management.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	200	19.800
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			19.800
Financing through other resources			
Finance needed from KB WOT			19.800

Project 7 🙁	IBTS exchange
Project leader	Ralf van Hal
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Lack of gear expertise in the current IBTS team
Objective(s) of the project	Main objective is increasing the gear expertise of the IMARES net-expert, second objective is increasing the (gear) expertise of the IBTS project and cruise leader.
Expertise needed	
Expertise developed	Better knowledge of the GOV-gear and a better knowledge of international differences in on-board practices during the IBTS.
Relevance for WOT	A more experienced IBTS team that has enough knowledge to participate in the ongoing discussions on changing survey gear and survey design
Why should this be funded by KB WOT?	Discussions are ongoing on changing survey gear and survey design of the IBTS which might have large implications for the data collection and survey cost. While the relatively new team is lacking knowledge to oversee the potential implications.
What other potential funding sources have been considered?	An obvious other funding source would be WOT Surveys, but there is no budget foreseen to work on this topic.
International objective of research	A more experienced IBTS team that has enough knowledge to participate in the ongoing international discussions on changing survey gear and survey design
Work plan	
Broad description of the project including expected results	A recent overview of GOV-gear used in the IBTS showed international differences. The Scottish gear technologist leading this is concerned about the differences and states that there is no international IBTS as the gears are so different that combining the data is erroneous. Therefore a roadmap for changing the survey gear was proposed. The IMARES gear-expert is familiar with this type of gear from the fisheries side but not from the survey perspective and downplays the differences as having no effect or being irrelevant. This different opinions make it very difficult for the cruise leader (relying on the gear expert) to be involved in the international gear discussions and to formulate a Dutch viewpoint in this. Furthermore, the knowledge of the IMARES gear-expert was not sufficient enough to answer a some Scottish questions related to the Dutch set up. This lead to an invitation of the Scottish to participate in their Q1 survey (lead by the gear technologist) and exchange knowledge while seeing the survey at work.
Approach and time schedule	The gear knowledge of the IBTS project leader and cruise leader has to be increased as in many of the discussions with the international colleagues it is clear that he has a different view on the practises on board than most others (more tows a day with less people, possibilities to collect additional data while most others have not, no issues with swapping rectangle). Therefore it is seen as a good investment to organise an exchange for the cruise leader. Preferred a staff exchange would be organised, however there is no possibility to exchange staff in Q1 as the Dutch survey will take place on the English vessel, while the exchange of the gear-expert is urgent.

Output/deliverables	This proposal includes funding for the gear-expert to participate on the Scottish survey. Furthermore it includes funding for the cruise leader to organise an exchange in Q3 when a the foreign colleague could join on the Dutch BTS.
Dissemination of findings being addressed	Q1 gear-expert joins the Scottish survey, and reports prior to the IBTSWG 2016. The cruise leader organises an exchange in Q3 and reports afterwards.
Utility of the developed products and expertise	The participation on board of the Scottish vessel or other vessel, resulting in report highlighting gear issues and differences in survey practice.
What are the potential risks to the project's success?	Reporting to IMARES survey group and the IBTSWG.
Project organisation	Strengthening the Dutch position in the international discussion related to the IBTS gear and survey design.
Involvement IMARES (names and expertise)	Inability to arrange the actual participation or the exchange.
Is the appropriate capacity available?	
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	Ralf van Hal (IBTS project leader and cruise leader), Thomas Pasterkamp (gear-expert), Ingeborg de Boois (BTS project leader)
Relevance	Yes
What is the market/ target audience	
Economical relevance	Rob Kynoch (Marine Scotland)
Social relevance	IBTSWG
Scientific relevance	
Relevance to ministry EZ	Improving the expertise of the Dutch survey team, and with that the Dutch position in the international discussions related to changes in survey design, which is likely to influencing the data collection for the assessment but also has financial consequences.
Summary (UK)	To improve the knowledge of the IMARES gear-expert, he should join the Scottish IBTS Q1 which is led by the gear-technologist leading the discussions on comparing and possibly changing the whole gear design of the IBTS GOV-gear. For the IMARES cruise leader it's preferred to increase his knowledge of the international practises on board during the IBTS to improve his position in the international discussions. This will be organised via a staff-exchange with the Dutch BTS.
Samenvatting (NL)	Om de kennis van de IMARES tuigen expert te vergroten kan hij deelnemen aan de Schotse IBTS in het eerste kwartaal, die wordt geleid door de Schotse tuigtechnicus die de internationale discussie leidt over het mogelijk veranderen van het gebruikte tuig in de IBTS. Daarnaast is het wenselijk dat de IBTS reis- en projectleider kennis kan nemen van de manier waarop aan boord van andere schepen de survey wordt uitgevoerd. Dit versterkt zijn positie in de internationale discussies en daarmee de positie van IMARES en Nederland. Dit zal georganiseerd worden via een uitwisseling van personeel met de BTS.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	175	13.825
CAT III	99	32	3.168
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			16.993
Material costs			
Facilities			
Specific costs			
Travel costs			1.000
Project equipment			
Other material costs			
Total Material costs			1.000
Total project budget needed			17.993
Financing through other resources			
Finance needed from KB WOT			17.993

Project 8	IBTS otolith sampling scheme
Project leader	Ralf van Hal
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Budgets and treating survey fish as test animals started a discussion on the power of the IBTS otolith sampling scheme. No sound statistical proof exists for this scheme, raising questions about the validity and efficiency of this scheme. This projects aims to provide a statistical sound otolith sampling scheme, as side aims reduce the number of test animals, free time to collect additional data, and possibly reduce costs.
Objective(s) of the project	Provide a statistical sound IBTS otolith collection scheme, improving the data quality of the survey.
Expertise needed	Survey expertise, statistical expertise, assessment expertise
Expertise developed	Protocol to optimise otoliths sampling schemes on all surveys
Relevance for WOT	Improving the data quality of a WOT survey
Why should this be funded by KB WOT?	It is part of the evaluation and improving of the current WOT survey program and data quality.
What other potential funding sources have been considered?	None
International objective of research	It is relevant for the international collection of fish data, it will affect the international data quality and with that the quality of the assessments.
Work plan	
Broad description of the project including expected results	Recent publications showed, for cod, that otolith sampling from a length-stratified subsample of one fish per 5 cm bin (10 fish total) per haul is sufficient and nearly as efficient in providing the ALK as a random subsample of 20 fish. Such a stratification could reduce the number of otoliths to be sampled, the time needed on board (available for additional data collection), and the number of test animals and the costs of processing these otoliths. Besides that, collecting the otoliths by haul could improve the data quality compared to the current Round fish area scheme, as it was shown that regional differences in age length keys (ALKs) exists. Quick-and-dirty statistical analysis during the IBTSWG 2015 (Ralf van Hal) showed that changing to a station-specific sampling scheme and 5-cm-based otolith sampling resulted in a reduction of one third to even half of the current otoliths, still estimating the ALK with a similar accuracy, potentially improving data quality as spatial aspects might be incorporated in the calculations. The analysis was limited to a small number of the target species and was too crude to use the outcomes to change the current sampling scheme. This project will extend on these analysis, providing statistical support for otolith sampling scheme, and will investigate possible influences on the assessments. Age reading uncertainty and difference therein between species will be taken into account. The results will lead to advice on how to adjust the current IBTS otolith sampling scheme and how to set up otolith sampling schemes for surveys in general.
Approach and time schedule	Extend the IBTSWG 2015 analysis, write a working document and preliminary advice in advance of the IBTSWG 2016 end of March. The advice

	will be consolidated during the WG and will be implemented (IBTS advice) and disseminated (generic advice) after the WG.
Output/deliverables	Working document for the IBTSWG 2016
Dissemination of findings being addressed	It will be part of the IBTSWG 2016 report and will be disseminated to the relevant assessment and survey groups.
Utility of the developed products and expertise	Provides statistical proof for the IBTS sampling scheme, which likely leads to changes of the current scheme. Also relevant for other WOT surveys.
What are the potential risks to the project's success?	A tight time schedule till March 2016. Same period the IBTS takes place, reducing the available time for IMARES and international experts.
Project organisation	
Involvement IMARES (names and expertise)	Ralf van Hal (Survey coordinator, IBTSWG participant, statistical expertise), Niels Hintzen (Assessment expertise), Loes Bolle (Otolith expertise)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	IBTSWG: Kai Wieland (DTU); Anne Sell and Matthias Kloppmann (Ti), Finlay Burns (Marine Scotland), Jennifer Devine (IMR)
Relevance	
What is the market/ target audience	ICES
Economical relevance	Reducing the survey costs
Social relevance	Reducing number of test animals
Scientific relevance	Providing statistical proof for the survey collection scheme.
Relevance to ministry EZ	Improving data quality of WOT survey data
Summary (UK)	The IBTS otoliths sampling scheme might not be providing the best data in the most efficient way. The scheme is based on sampling otoliths by large spatial areas and cm-class. Consequence is a low spatial resolution, while large numbers of otoliths are collected. Simple analyses, based on analysis from recent publications, showed that changing the current scheme to station-specific-sampling and changing the current length stratification could result in the same or even better ALKs while largely reducing the number otoliths. These analysis require further work to improve the statistics and extend them to all target species.
Samenvatting (NL)	De huidige manier van otolieten verzamelen tijdens de IBTS levert mogelijk niet de beste gegevens in de meest efficiënte manier. Het huidige schema is gebaseerd op het verzamelen van de otolieten per ruimtelijke gebied (Round fish area) en per cm-klasse. Deze manier van verzamelen resulteert in een grove ruimtelijke schaal en grote aantallen otolieten. Een snelle simpele analyse heeft laten zien dat, gebruikmakend van voorstellen uit recente publicaties, het schema van de IBTS aangepast kan worden naar per trek verzamelen van otolieten met een andere lengte stratificatie en dat dit vergelijkbare of betere lengte-leeftijd sleutels oplevert terwijl het aantal te verzamelen otolieten verkleind wordt. Dit project moet de snelle analyse statistisch onderbouwen en de analyse uitbreiden naar alle doelsoorten.

Proposed budget			
Personnel	**tariff**	**Hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	120	11.880
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			11.880
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			11.880
Financing through other resources			
Finance needed from KB WOT			11.880

Project 9 ☺	PELSEL
Project leader	Niels Hintzen
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Since 2015 there is a landing obligation for pelagic fisheries. It is yet unknown how the landing obligation has affected fisheries behaviour. Especially when a change has occurred that affects the selectivity of the fishing fleet, this must be communicated within assessment working groups as quickly as possible. Assessment models have the tendency to pick up changes in selection with marked delays. However, advice relies heavily upon estimates of most recent selectivity by the fishing fleet. It is therefore of upmost importance to detect changes in selectivity as soon as possible outside of the regular assessment models.
Objective(s) of the project	Develop simple and easy to calculate indicators that inform about a potential change in selectivity in pelagic fisheries.
Expertise needed	Knowhow on spatial distribution and catch efficiency of the pelagic fishery, knowhow on spatial distribution and density of pelagic surveys
Expertise developed	Experience in incorporating information on fisheries behaviour in assessments and ability to use this information in TAC advice
Relevance for WOT	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: *Examine where possible the effects of the landing obligation on - distribution of the fishing fleet -.*
Why should this be funded by KB WOT?	Development of relevant indicators, outside the common assessment methods, is necessary for fisheries and ecosystem advice embedding within ICES.
What other potential funding sources have been considered?	-
International objective of research	Having a leading role within ICES on how knowledge on fisheries and surveys can be combined to assist assessment working groups.
Work plan	
Broad description of the project including expected results	3 indicator types will be calculated for the acoustic survey on herring and for the Dutch fishing fleet. 1) centre of gravity, 2) isotropy (elongation) and 3) spreading area. Combining the two datasets allows to calculate overlap (global index of collocation). 5 years of data will be used and we test whether the first 4 years differ from the last year (i.e. Year of landing obligation). Length-frequency distributions from market samples will be added and compared over time, in relation to the 4 indicators from above. Results can indicate differences in overlap and differences in the distribution of the fishing fleet compared to the resource over time which may be interpreted as a change in selectivity of the fishing fleet.
Approach and time schedule	Only Q1 is available (HAWG meeting is in April). Jan: preparing datasets of acoustic distribution, fisheries distribution and length-frequency data. Feb: generating time series and calculation of indicators. Mar: interpretation of

	results and preparation of presentation for HAWG
Output/deliverables	Presentation to HAWG & IMARES if results are relevant
Dissemination of findings being addressed	Presentation to HAWG and reporting in HAWG 2016 as it addresses a specific ToR of HAWG. Discussions will be held at HAWG. In case a change is observed, results will be communicated with the PFA as well
Utility of the developed products and expertise	The methodology developed can be used by many different stock assessment working groups. Also within IMARES results from this study will be applicable for the demersal fleet from 2016 onwards. Experience in using qualitative knowledge for advisory purposes is a skill with increasing demand
What are the potential risks to the project's success?	Timeline is somewhat short. However, we select indicators that are already developed, understood and used by IMARES in earlier projects. The social aspect of fisheries behaviour is not studied as it considered less relevant at this stage as quantitative indicators are necessary in the decision making process.
Project organisation	
Involvement IMARES (names and expertise)	Niels Hintzen (Spatial fisheries distribution, stock assessment & advice) Sascha Fassler (acoustic survey expert, stock assessment)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	If necessary, Scotland will be contacted for survey / fisheries data. Good connections exist
Relevance	
What is the market/ target audience	Recipients of advice (EZ, industry, NGOs, EC)
Economical relevance	Providing stable and reliable advice is of commercial interest. Reducing fluctuations in our advice owing to changes in selectivity in the fishing fleet will benefit economic fishing operations
Social relevance	Improving on advice also improves sustainable management and early detection if changes in fishing behaviour have negative effects.
Scientific relevance	Improving knowledge on early detection of changes in fishing selectivity is needed (one of the most common problems in assessments).
Relevance to ministry EZ	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
Summary (UK)	Early detection of changes in fishing selectivity is crucial in providing reliable TAC advice. With the introduction of the landing obligation for pelagic fisheries in 2015, a change in fishing selectivity may have occurred. Assessment models, that on a year basis detect changes in selectivity, are not well equipped to rapidly detect changes in selectivity, hence additional indicators are needed to inform scientists on potential changes, so they can adapt TAC advice using the best knowledge available.
Samenvatting (NL)	Het op tijd detecteren van een verandering in de selectiviteit van een visserij is cruciaal in het geven van betrouwbaar visserij TAC advies. Met de introductie van de aanlandplicht voor de pelagische visserijsector in 2015 kan er een verandering in selectiviteit opgetreden zijn. Assessment modellen zijn vaak niet geschikt om al in een vroeg stadium veranderingen in

selectiviteit waar te nemen, en daarom zijn aanvullende indicatoren nodig die wetenschappers informeren van mogelijke veranderingen zodat aanpassingen in het TAC advies proces gemaakt kunnen worden. Op die manier wordt de beste wetenschappelijke kennis gebruikt voor advies.			

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	140	13.860
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			13.860
Financing through other resources			
Finance needed from KB WOT			13.860

Project 10 🙂	Acoustic methods for trawl surveys
Project leader	Lorna Teal
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Trawl surveys provide a platform to collect additional data across the North Sea with little extra effort making them a good basis for more ecosystem focussed surveys. We aim to explore the use of acoustic equipment on board RV Tridens to collect additional data on seabed types and pelagics during trawl surveys and to assess value such data adds to the trawl survey at what extra analytical costs. Aside from the methodological development the project aims to explore the spatial connectivity of seabed type, benthos, benthic, demersal and pelagic fish and plankton.
Objective(s) of the project	To develop: survey methods for combining trawl and acoustic data collection, analytical techniques for ME70 bathymetric data, statistical methods for linking different types of data in space
Expertise needed	Trawl survey design, acoustic data collection and analysis, geostatistics
Expertise developed	Analysis of seabed bathymetrical mapping
Relevance for WOT	Gaining extra value from WOT trawl surveys (Tridens)
Why should this be funded by KB WOT?	Developing methods and expertise in seabed mapping and bathymetrical acoustics to gain extra value from WOT surveys, measuring simultaneously different trophic levels will give surveys an extra ecosystem perspective
What other potential funding sources have been considered?	None
International objective of research	Ecosystem survey development and analytical techniques for such data
Work plan	
Broad description of the project including expected results	The Beam Trawl Survey will serve as the trial trawl survey for the collection of the additional acoustic data. As the BTS follows the herring acoustic survey within a reasonably short space of time, no additional calibration of acoustic equipment will be needed. Manuals on the set-up of the acoustic equipment for recording acoustic data will be provided to the BTS personnel and allow data to be collected during the 4 week survey. Analysis of EK60 (pelagics and plankton) and ME70 (seabed, techniques to be developed) data will commence following the survey. As it will not be possible to ground truth the acoustic data, we will use a combination of existing identification algorithms (taking advantage of multifrequency backscatter) and thresholding to group scattering targets (i.e. swimbladdered vs non-swimbladdered fish, separate plankton into broad zooplankton groups). As the acoustic data will not be collected along transects as is usual with acoustic surveys, specific methods developed for analysis of acoustic data from trawl/fishing vessel surveys will be applied to allow acoustic data and trawl survey data to be linked. Geostatistical methods will be applied to quantify the links between seabed types, benthic biomass, abundance/biomass of benthic/demersal fish and relative abundance of pelagic fish groups. The project will thus not only develop methods for surveys and multi-trophic level data analysis but also provide ecological insights into ecosystem connections across trophic levels.

Approach and time schedule	Step 1 – data collection August/September, Step 2 – analysis acoustic data September/October, step 3 – statistical analysis October/November, step 4 – write-up December
Output/deliverables	Update of ME70 manual for combined used of EK60 and ME70, analysis technique for ME70 bathymetrical data, peer-reviewed publication
Dissemination of findings being addressed	peer-reviewed publication, survey reports, ICES survey group, potential for conference presentation(s) in 2017 providing funding is available then
Utility of the developed products and expertise	The manuals will provide useful tools for future trawl surveys, the analytical techniques developed will add to IMARES expertise and be useful for future ecosystem survey developments
What are the potential risks to the project's success?	The analysis of ME70 data is a novel technique for IMARES and the time required for this is difficult to estimate.
Project organisation	
Involvement IMARES (names and expertise)	Ben Scoulding (Acoustics expert, geostatistics), Lorna Teal (Trawl survey design, geostatistics)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	NA
Involvement parties outside WUR (names and expertise)	NA
Relevance	
What is the market/ target audience	ICES survey community, Scientists, EZ and RWS
Economical relevance	cost effective ecosystem surveys
Social relevance	
Scientific relevance	Characterising spatial links in complex ecosystems. Trophic interactions. Provides info on species (or group) abundance and distribution.
Relevance to ministry EZ	Enhanced performance of scientific trawl surveys.
Summary (UK)	Trawl surveys provided a platform with potential for more ecosystem focussed surveys. Applying acoustic methods during the survey allows additional data to be collected on seabed types and pelagic fish and plankton abundances whilst adding no extra cost to the survey. The project aims to exploit the BTS to trial the collection of such additional data and explore the analytical techniques required post survey. In addition to the methodological developments, on an ecological level ecosystem linkages will be explored and quantified in space providing new insights into trophic interactions in space.
Samenvatting (NL)	Vissurveys geven de kans om extra informatie te verzamelen tijdens de survey zonder hiervoor extra kosten te maken. Vooral het gebruik van akoestische apparatuur kan waardevolle extra informatie opleveren over de zeebodem (type) en ook relatieve aantallen pelagische vissoorten en plankton. Dit project maakt gebruik van de BTS als proef survey om tijdens een vissurvey akoestische data te verzamelen en de nodige analyses na de survey te ontwikkelen. Boven de methodische ontwikkelingen binnen dit

project heeft de data ook een ecologische waarde. Connecties tussen verschillende (trofische) niveaus in het ecosysteem worden onderzocht en gekwantificeerd om inzichten te krijgen in hoe de connecties ruimtelijk in elkaar zitten.			

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	340	33.660
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			33.660
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			33.660
Financing through other resources			
Finance needed from KB WOT			33.660

Project 11 ☹	Spatial changes in nursery habitat use
Project leader	Lorna Teal
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Coastal nursery habitat use is continuously adapting to environmental changes. Modelling work based on plaice physiology has indicated the reduced suitability of coastal areas for juvenile plaice. Although our coastal DFS survey provides spatially resolved data, it has seldom been analysed in terms of spatial habitat use. Visualising and quantifying these changes is of high importance to understanding potential effects on recruitment.
Objective(s) of the project	To develop specifically geostatistical methods for identifying and quantifying changes in habitat use of juvenile plaice and sole in coastal areas since 1970
Expertise needed	Geostatistics, knowledge of DFS survey and coastal ecology
Expertise developed	Geostatistical applications for survey data
Relevance for WOT	The declining function of nursery areas in the Netherlands currently receives much attention from policy makers. Helping to understand factors that determine nursery quality will help solve questions of the declining function
Why should this be funded by KB WOT?	Use of WOT survey data, developing analytical methods useful for all WOT surveys which are currently underutilised within IMARES and ICES
What other potential funding sources have been considered?	None
International objective of research	The approach taken in this study is of direct use to several ICES groups such as the WGVHES
Work plan	
Broad description of the project including expected results	The shift in distribution juvenile plaice has been observed and documented in a number of studies. Quantitatively describing and visualising these shifts is however still challenging. Knowledge on changes in distributions observed during fieldwork is lost during the reporting of survey findings in which observations within subareas are often pooled. The DFS survey provides an ideal data set to study shifts of juvenile plaice and sole distributions and the use of the coastal area as nursery habitat. Here we propose to develop the use of geostatistical methods to quantify spatial distribution and habitat use of plaice and sole in the coastal zones using DFS data. We aim to gain a better understanding of annual differences in habitat use whilst at the same time developing expertise in geostatistical methods that can be applied to all WOT survey data in the future. Methods include calculating spatial indices to describe spatial characteristics of the population (location, spread, and area use), kriging and co-kriging to map and visualise the distribution in relation to other variables. The developed scripts can be adapted for all survey data to provide such output as a standard besides the abundance indices.
Approach and time schedule	As the data is ready, this work can be carried out within the first quarter of 2015. Spatially resolved analyses will be carried out using geostatistics. A draft manuscript will be prepared by autumn 2016.
Output/deliverables	Peer-reviewed publication, R scripts that can be applied for annual spatial output for reporting (possibility of applying to other trawl surveys)
Dissemination of	Peer-reviewed publication, IMARES DFS report

findings being addressed	
Utility of the developed products and expertise	Besides increasing knowledge on juvenile plaice/sole ecology, the methods and R scripts developed will be useful for analysis of other trawl survey data to provide potential additional output from surveys in annual reporting.
What are the potential risks to the project's success?	Use of geostatistical approaches is new within the institute and it is difficult to estimate the time needed to develop the methods needed.
Project organisation	
Involvement IMARES (names and expertise)	Lorna Teal (geostatistics, flatfish ecology), Ingrid Tulp (geostatistics, coastal ecology, DFS data), Loes Bolle (DFS data, coastal ecology)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	Pierre Petitgas, Nicolas Bez – geostatistical and R geostatistics package support
Relevance	
What is the market/ target audience	policy makers, NGO's, scientific world
Economical relevance	
Social relevance	Our coastal areas and the Wadden Sea are often viewed as fish nurseries. Recent findings showed that these areas have lost much of this function, which is a worry for NGO's and the general public.
Scientific relevance	Build on the understanding of the functioning of fish nurseries
Relevance to ministry EZ	Identifying nursery areas of high value as nurseries and changes therein will help in spatial management
Summary (UK)	The use of nursery habitats in Dutch coastal waters is a current hot topic. The use of these coastal areas, including the Wadden Sea, by species previously found in high numbers has declined strongly. Despite availability of spatial data through the DFS survey from the 1970s onwards, spatial analysis on habitat use is not conducted. Tools (geostatistics) to conduct the analysis are available within IMARES but underutilised. Using plaice and sole as example species these methods can be developed whilst at the same time exploring the development in coastal nursery habitat use over time to see where the largest changes have taken place.
Samenvatting (NL)	De kinderkamerfunctie van de Nederlandse kustwateren staat momenteel erg ter discussie. Het gebruik van gebieden als de Waddenzee en de kustzone, traditioneel gebieden waar veel vissoorten opgroeiden is sterk afgenomen. Hoewel we de beschikking hebben over de DFS survey waarin al sinds 1970 de verspreiding van vis wordt vastgelegd op dichte ruimtelijke resolutie, zijn die data nooit op een ruimtelijke manier geanalyseerd. De ontwikkeling van de kwaliteit van de kraamkamers kan heel goed beschreven worden met behulp van geostatistische methoden. We hebben hiervoor de tools in huis, maar nog weinig ervaring. Aan de hand van een of twee voorbeelden (schol en tong) willen we de ontwikkeling van het gebruik van de kinderkamers analyseren in de tijd, waarbij duidelijk wordt welke gebieden de grootste veranderingen hebben plaatsgevonden.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	280	27.720
CAT IV	122	50	6.100
CAT V	143		
CAT VI	172		
Total Personnel			33.820
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			33.820
Financing through other resources			
Finance needed from KB WOT			33.820

Project 12	International Exchange
Project leader	Cindy van Damme
Theme	3. International Exchange
Motivation and Project aims	
Problem definition	By its nature fisheries research is international. This project aims to fund participation of IMARES scientists in international (ICES) science networks.
Objective(s) of the project	To participate in meetings and workshops that are considered important for the WOT Fisheries statutory tasks. With this project IMARES scientists stay up to date with international developments and participate in the international science developments by presenting IMARES research. Value of WOT Fisheries increases by technology or expertise transfer from international partners.
Expertise needed	Expertise needed to carry out the WOT Fisheries programme
Expertise developed	Expertise needed to carry out the WOT Fisheries programme
Relevance for WOT	Through participation in international networks and ICES meetings, expertise needed to carry out the WOT Fisheries programme is maintained and developed.
Why should this be funded by KB WOT?	These groups are core to the development of KB WOT and maintenance of IMARES as centre of excellence and an institute for innovation and leader in fisheries research. The network provided by these groups provides great added value to the KB WOT resources.
What other potential funding sources have been considered?	WOT and IMARES R&D funds, but these are the groups that most require KB WOT funding.
International objective of research	Maintain IMARES at the centre of fisheries research in Europe and project our skills to arenas beyond the EU.
Work plan	
Broad description of the project including expected results	To fund participation in international science networks and ICES meetings. In 2016 participation in 18 working groups and workshops will be funded (see the summary for group names).
Approach and time schedule	See ICES calendar for meeting dates http://www.ices.dk/news-and-events/meeting-calendar/Pages/default.aspx
Output/deliverables	Formal working group reports, internal IMARES reports of groups and collaborative manuscripts for peer reviewed journals.
Dissemination of findings being addressed	Through the ICES website, ICES theme sessions, symposia and through the ICES advisory system.
Utility of the developed products and expertise	Maintaining and developing expertise to carry out the WOT Fisheries tasks through international exchange in international (ICES) networks.
What are the potential risks to the project's success?	Over-commitment of staff.
Project organisation	
Involvement IMARES (names and expertise)	I. de Boois, A. Rijnsdorp, L. Bolle, T. Brunel, K. van der Wolfshaar, G. Piet, C. van Damme, B. Scoulding, B. Couperus, P. Molenaar and N. Hintzen.
Is the appropriate capacity available?	Yes

Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Mostly across the North Atlantic marine science community but now also with FAO and with scientists from countries involved in PICES (Japan, Korea, China).
Relevance	
What is the market/ target audience	International science networks and ICES.
Economical relevance	
Social relevance	
Scientific relevance	Added value by participating in collaborative international projects and groups.
Relevance to ministry EZ	These groups are core to the development of KB WOT and the network provided by these groups provides great added value to the KB WOT resources.
Summary (UK)	This project is specifically to fund participation in international networks and ICES meetings. These groups are core to the development of KB WOT. The network provided by these groups provides great added value to the KB WOT resources. In 2016 participation will be funded in: Data and Information Group (DIG), WG on Fisheries-Induced Evolution (WGEVO), WG on the Value of Coastal Habitats for Exploited Species (WGVHES), WG on Fishing Technology and Fish (WGFTFB), WG on Fisheries Acoustics and Technology (WGFAST), WG on Integrating Surveys for the Ecosystem Approach (WGISUR), WG on cod and plaice eggs surveys in the North Sea (WGEGGS2), WG on Biological Parameters (WGBIOP), WG on Integrative Physical-biological and Ecosystem Modelling (WGIPEM), WG on Electrical Trawling (WGELECTRA), WG on Integrated Assessments of the North Sea (WGINOSE), WK on Growth-increment Chronologies in Marine Fish (WKGIC2), WG on Methods of Fish Stock Assessments (WGMG), WG on Atlantic Fish Larvae and Eggs Surveys (WGALES), WG on Target Classification (WGTC), WK to Plan and Integrate Monitoring Program in the North Sea (WGPIMP), Benthos Ecology WG (BEWG) and WK on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN). Results will be published in formal working group reports, internal IMARES reports of groups and collaborative manuscripts. Results will be disseminated through the ICES website, theme sessions at the ICES Annual Science Conference and international symposia.
Samenvatting (NL)	In dit project worden internationale uitwisseling en samenwerking gestimuleerd en wordt specifiek deelname aan onderzoeksnetwerken en ICES groepen gefinancierd. Deze groepen zijn belangrijk voor de ontwikkeling van het KB WOT programma. In 2016 wordt deelname gefinancierd aan: DIG, WGEVO, WGVHES, WGFTFB, WGFAST, WGISUR, WGEGGS2, WGBIOP, WGIPEM, WGELECTRA, WGINOSE, WKGIC2, WGMG, WGALES, WGTC, WGPIMP, BEWG and WKCOSTBEN. Resultaten van de bijeenkomsten zullen worden gerapporteerd in de formele werkgroep rapporten, interne IMARES rapporten en wetenschappelijke manuscripten. Resultaten worden verspreid via de ICES website, sessies op de ICES jaarvergadering en symposia.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	784	77.616
CAT IV	122	100	12.200
CAT V	143	80	11.440
CAT VI	172		
Total Personnel			101.256
Material costs			
Facilities			
Specific costs			
Travel costs			18.744
Project equipment			
Other material costs			
Total Material costs			18.744
Total project budget needed			120.000
Financing through other resources			
Finance needed from KB WOT			120.000

Project 13 ☺	Ecosystem Acoustics
Project leader	Sascha Fässler
Theme	2. Maintaining Quality
Motivation and Project aims	
Problem definition	Acoustic methods are an important source of information for standard fish stock assessment (CFP) but also for monitoring purposes of the state of the wider ecosystem (MSFD). In order to maintain the quality, it is important to invest into the maintenance and further development of these monitoring methods according to the concept of 'Marine Ecosystem Acoustics' (Godø et al. 2014).
Objective(s) of the project	Maintenance and expansion of hydroacoustic work and expertise within IMARES and integration of newest technology in monitoring tasks
Expertise needed	hydroacoustic scattering theory, acoustic data processing, optical techniques, electromechanical engineering, spatial modelling
Expertise developed	pelagic ecosystem monitoring
Relevance for WOT	
Why should this be funded by KB WOT?	Monitoring of the pelagic ecosystem is a key component of the statutory tasks (WOT) to deliver data underpinning policy drivers such as MSFD, CFP and DCF. The continuing project this year aims to further develop acoustic ecosystem monitoring techniques (acoustic-optical) and explore species discrimination using multibeam acoustic data. Therefore, it will keep the methods at the most current state, foster knowledge exchange through meeting attendance, and explore alternative ways to apply new and upcoming techniques.
What other potential funding sources have been considered?	-
International objective of research	To maintain and raise the IMARES active acoustics profile on a national and international level.
Work plan	
Broad description of the project including expected results	With the shift in survey focus towards an ecosystem approach, data collected on acoustic surveys needs to be supplemented with standard and (developed) complementary sensors to improve monitoring and classification of (many more) species. New findings wil be disseminated in publications and participation to international meetings and workshops will be supported.
Approach and time schedule	Q1/Q2: attendance of meetings/workshops: WGTC (contribute with target classification expertise), WGMHM (knowledge exchange acoustic seabed mappting), +1 additional WGFAST (always like a conference setup – the WG has 177(!) members; presentations on Marsdiep paper (Bram) and broadband modelling (Ben)). Further development of acoustic-optical sampling system to be used on surveys. Start developing classificaiton approaches from multiobeam data. Q3/Q4: BioAcoustics Day, testing systems during surveys at sea, papers.
Output/deliverables	- Biocoustics Day contributions/participation of 7 IMARES personnell (4 presentations to be decided in July) / - Participation at ICES meetings / - Next development phase of the Acoustical-Optical sampling technology / - Start developing multibeam classification methods

Dissemination of findings being addressed	- Scientific publications (2 papers: trawler data & broadband classificaiton) - ICES WG and conference presentations
Utility of the developed products and expertise	The acoustic-optical sampling system started off previously will be further developed and multibeam classification development started to be used during pelagic WOT ecosystem surveys for ecosystem characterisation. Workshop/meeting attendance will be used to exchange knowledge.
What are potential risks to the project's success?	no specific risks
Project organisation	
Involvement IMARES (names and expertise)	Sascha Fässler (fisheries acoustics, data processing, modelling), Ben Scoulding (fisheries acoustics, data processing, modelling), Bram Couperus (fisheries acoustics, data processing), Dirk Burggraaf (electrical engineering), Kees Bakker (electrical engineering), Erwin Winter (telemetry), Ben Griffioen (fisheries acoustics), Dick de Haan (acoustics), Daniel Benden (software)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	Ifremer (multibeam acoustics), IMR (broadband acoustics)
Relevance	
What is the market/ target audience	pelagic ecosystem monitoring scientists
Economical relevance	hydroacoustics is becoming increasingly relevant as primary tool for integrated ecosystem monitoring to aid management.
Social relevance	monitoring to guarantee GES and sustainable resource exploitation (MSFD, CFP)
Scientific relevance	acoustic methods are a vital monitoring method. Practical implementaiton of combined acoustic and auxilliary sampling techniques will make data analyses more efficient.
Relevance to ministry EZ	guarantee quality of pelagic monitoring work (WOT, DCF)
Summary (UK)	Ecosystem Acoustics is a multiannual project that aims to maintain and furhter 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.
Samenvatting (NL)	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.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	120 (developments)	9.480
CAT III	99	224 (meetings)	22.176
		80 (developments)	7.920
		80 (dissemination)	7.920
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			47.496
Material costs			
Facilities			
Specific costs			
Travel costs			7.500
Project equipment			3.000
Software licenses			1.500
Total Material costs			12.000
Total project budget needed			59.496
Financing through other resources			
Finance needed from KB WOT			59.496

Project 14 ☹	Seafloor Integrity Advice
Project leader	Karin van der Reijden
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Fisheries are managed under the Common Fisheries Policy (CFP), with an emphasis on the sustainable exploitation of fish populations, mainly through catch or effort limitations. With the introduction of the Marine Strategy Framework Directive (MSFD), focus is partly shifted towards ecosystem management, targeting Good Environmental Status (GES). In order to achieve GES, two criteria need to be considered, i.e. "Physical damage, having regard to substrate characteristics" and "Condition of benthic community". Combining the aims of the CFP with the MSDF could become problematic when a fishery targeting a healthy fish population is causing high (physical) damage to the benthic community. Integrating MSFD-criteria within the CFP-management would limit potential problems.
Objective(s) of the project	A first step at combining MSDF and CFP goals is to evaluate seafloor integrity indicators under the existing single-species and mixed-fisheries advice. Side-by-side presenting TACs and trawling footprint will display the trade-offs between CFP and MSFD goals. In this project, a framework is developed to explore the possibility of calculating trawling footprint based on ICES single species and mixed fisheries advice. The results will be presented during the ICES ACOM presentation at the Dutch Ministry of Economic Affairs in which the fishing industry and several NGO's take part as well. The recipients are requested for feedback on the trawling footprint integrated advice.
Expertise needed	Knowledge of single and mixed-fisheries stock assessments and of trawling footprint-concept.
Expertise developed	Linking spatial fleet dynamic behaviour to assessment results is a new field.
Relevance for WOT	The WOT-program is used to produce annual catch advice, in line with the goals of the CFP. This project will investigate the potential of integration MSFD-goals into the annual advice, as WOT will likely be guided by MSFD in the near future as well.
Why should this be funded by KB WOT?	By exploring the integration of the trawling footprint-concept into mixed fisheries advice, the WOT-programme will increase in power and value for policy makers, industry and NGOs.
What other potential funding sources have been considered?	The European BENTHIS project, but funds were too limited.
International objective of research	Achieve sustainable and eco-balanced fisheries.
Work plan	
Broad description of the project including expected results	(1) Analyses of trawling footprint related to effort by different fleet segments of the Dutch demersal mixed fisheries using VMS-data and logbook data. (2) Preparing framework to automatically calculate trawling footprint based on mixed-fisheries or single species TAC/effort scenarios. (3) Incorporating footprint indicators into ACOM advice. (4) Requesting feedback
Approach and time	**Jan-Mar:** Data analysis of trawling footprint and mixed-fisheries effort and

schedule	combining both datasets to obtain impact per unit TAC / effort; **Mar-May:** Calculation of indicators; **Jun:** Present concept results; **Jul- Aug:** Collect feedback on approach and write final report.
Output/deliverables	(1) Standardized framework to calculate footprint. (2) Table in ACOM advice. (3) Report
Dissemination of findings being addressed	Presentation of ACOM advice to ministry EZ, NGO's and industry Report to IMARES
Utility of the developed products and expertise	Marine policy makers could use the combined footprint / TAC advice to comply with both the CFP as the MSFD.
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Gerjan Piet (footprint concept); Ruben Verkempynck (single-species assessment); Thomas Brunel (mixed fisheries assessment); Niels Hintzen (VMS-data and footprint concept advice); Karin van der Reijden (footprint concept, VMS-data processing)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	-
Relevance	
What is the market/ target audience	Marine policy makers, industry and NGO's.
Economical relevance	Incorporate MSFD with CFP requirements.
Social relevance	Creating a sustainable management system with respect to both environment and fish populations.
Scientific relevance	Investigate the extension of mixed-fisheries advice with ecological objectives
Relevance to ministry EZ	Incorporate MSFD with CFP requirements.
Summary (UK)	Management goals for fisheries are defined in both the CFP and the MSFD. CFP is already well complied with, by regulations in catch and effort. To facilitate compliance with MSFD, ACOM advice should integrate CFP and MSFD goals. This project will produce an evaluated framework to calculate trawling footprint based on ICES single species and mixed fisheries assessments to present integrated advice. ACOM advice can hence be used by policy makers to comply with both the CFP and the MSFD.
Samenvatting (NL)	Management doelen in de visserij zijn gewaarborgd in zowel de CFP als de MSFD. Het CFP wordt goed gevolgd, met regulering van zeedagen en vangsten. Om nakoming van de MSFD te faciliteren, zou het ACOM advies doelen van de CFP en de MSFD moeten integreren. Dit project zal een framework opleveren dat de visserij impact berekend gebaseerd op de ICES soort-specifieke en gemengde visserij schattingen welke resulteert in geïntegreerd advies. ACOM advies kan hiermee door beleidmakers gebruikt worden om de CFP als de MSFD doelen na te komen.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	200	19.800
CAT IV	122		
CAT V	143	40	5.720
CAT VI	172		
Total Personnel			25.520
Material costs			
Facilities			
Specific costs			
Travel costs			500
Project equipment			
Other material costs			
Total Material costs			500
Total project budget needed			26.520
Financing through other resources			
Finance needed from KB WOT			26.020

Project 15 😊	"Remote mussel bed sensing"
Project leader	Karin Troost
Theme	2. Maintaining Quality
Motivation and Project aims	
Problem definition	Within WOT Shellfish mussel and oyster beds in the Wadden Sea are mapped every spring using a hand-held gps, after an inspection flight has confirmed presence/absence of existing and new seed beds. This method is time consuming and not all beds can be visited every year. The use of satellite images can increase the efficiency of the survey but a method that can readily be implemented has not yet been developed.
Objective(s) of the project	Earlier studies (Davaasuren et al. 2013 (KB WOT); Nieuwhof et al. 2014) show the high potential of satellite images. We want 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 will identify circumstances under which (e.g. cover by algae, low densities), and areas (e.g. soft vs. hard substrate) where, satellite data give reliable results.
Expertise needed	Remote sensing (RS; Alterra). Shellfish bed surveys (IMARES).
Expertise developed	Within IMARES: How to use remote sensing in shellfish stock assessments.
Relevance for WOT	Based on RS the number of beds to be visited annually may be reduced, first leading to a higher accuracy of the estimated total area of mussel and oyster beds, and eventually to a reduction in fieldwork needed.
Why should this be funded by KB WOT?	Because of the potential to increase efficiency of the mussel bed survey, to reduce costs, and to master the application of remote sensing within WOT.
What other potential funding sources have been considered?	Helpdeskvraag
International objective of research	Indirectly, not benefiting WOT: Germany and Denmark may also adopt the RS technique to improve their mussel bed stock and cover estimates.
Work plan	
Broad description of the project including expected results	Funded by KB WOT Davaasuren et al. (2013) used multispectral (Formosat-2 satellite) and radar (Ers-2 and Radarsat-2 satellites) and Nieuwhof et al. (2014) used radar (TerraSAR-X and Radarsat-2) data to try and map mussel beds. Both give results for a limited number of mussel/oyster beds and compare these with contours mapped within WOT Shellfish. Especially the Radarsat-2 results were promising but lower density parts of beds were not detected. Therefore, the comparison needs to be extended to a variety of beds with different compositions (mussel/oyster), algae cover, densities, and with different substrates ranging from highly muddy to firm sandy. This way we can assess under which circumstance RS gives reliable results, so we can focus the field work on area's that are less reliably detected by RS. We will assess differences in cover estimate with the field technique and advice on solutions is deviations are indeed found. Contours mapped in the field are available for the entire survey period since 1994 but satellite data are not. We will only use satellite data with the highest resolution presently available, and go as far back in time as these are available. Expected results include: 1) a distribution map for mussel and oyster beds created from satellite data for 2015 and earlier years if the highest possible resolution data are

	available, 2) with an overlay of the contours mapped in the field, 3) an overview of circumstances under which beds are detected with an acceptable precision, 4) an analysis of differences in cover estimate between techniques and advice on how to solve or mitigate this, and 5) a plan on how to implement the method in the WOT survey.
Approach and time schedule	ALTERRA acquires and analyses satellite images (multispectral and radar). Beds are mapped within WOT in April-May. RS maps are compared with field- measured contours in Sep–Oct. The report will be written in Oct-Nov.
Output/deliverables	A report describing methods, results, implications for the WOT survey.
Dissemination of findings being addressed	The report is written in English and will be available on the CVO website. It will be shared with colleagues internationally working on shellfish bed monitoring. Findings and implications are discussed with the ministry (EZ).
Utility of the developed products and expertise	The technique developed may and will also be used in other coastal areas, e.g. to map shellfish beds in Oosterschelde and Westerschelde estuaries.
What are the potential risks to the project's success?	No risks. Parties involved have a high level of expertise and are available, and the needed data are available.
Project organisation	
Involvement IMARES (names and expertise)	Karin Troost (WOT shellfish stocks/mapping), Douwe van den Ende (stock assessment/mapping), Sander Glorius (mussel beds and analysis tools).
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	Alterra: remote sensing techniques and image analyses: Sander Mücher and Henk Kramer
Involvement parties outside WUR (names and expertise)	None
Relevance	
What is the market/ target audience	Ministry (EZ), fisheries and nature policy makers (Natura 2000).
Economical relevance	May result in lower costs for shellfish bed mapping in future.
Social relevance	None.
Scientific relevance	Develop new scientific expertise within IMARES, increase accuracy surveys.
Relevance to ministry EZ	
Summary (UK)	The goal is to increase efficiency of the annual estimate of mussel- and oyster bed area using remote sensing techniques. Bed contours mapped in the field (IMARES) will be compared with bed contours mapped using remote sensing techniques (Alterra). A method will be developed to implement remote sensing in the annual survey, to increase accuracy and efficiency.
Samenvatting (NL)	Het doel is om remote sensing methodieken toe te passen in het karteren van mosselbanken en oesterbanken, om zo de precisie te verbeteren en te efficiëntie te vergroten. Het karteren van mossel- en oesterbanken is tijdrovend en middels remote sensing (satellietbeelden) kan mogelijk de inspanning nodig in het veld gereduceerd worden. Daartoe wordt voorgesteld om contouren in het veld gekarteerd (IMARES) te vergelijken met contouren verkregen middels RS (Alterra) en zo een methodiek te ontwikkelen die jaarlijks toegepast kan worden.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	24	1.896
CAT III	99	128	12.672
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			14.568
Material costs			
Facilities			
Specific costs	26.276 for work by Alterra: 176 hours, tariff 101 (CAT II), amount 17.776 68 hours, tariff 125 (CAT IV), amount 8.500		
Travel costs			400
Project equipment			
Other material costs			
Total Material costs			26.676
Total project budget needed			41.244
Financing through other resources			
Finance needed from KB WOT			41.244

Project 16 😞	Length based assessment models for fish stocks in lake Ijssel
Project leader	Tessa van der Hammen
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Commercial fish stocks (i.e. pikeperch, perch, bream and roach) in lake Ijssel and Marker, are doing poorly. This is recognized by the ministry and currently attention is given to implement reductions in catch and effort. The advice for management of these stocks is based on simple trend analyses, where trends in recent years are compared with trends in earlier years (ICES method for data limited stocks (DLS), cat. 3). The index used for this purpose is from the open water survey (FYMA), which is optimized for young fish. A clear stock-recruitment relationship is absent for these stocks, therefore the index does not reflect the status of older fish. The trends in recruitment are highly variable, while there are indications that there are only few larger fish left. There is need to assess the stocks with methods that can indicate the status of the stocks better. Length-based stock assessment models do not need detailed age data, and provide estimates of fishing mortality (F) and stock status based on catches, length-frequency distributions and on parameters of growth, longevity, age at maturity, etc. (methods described by Ault et. al. 2008) and are therefore suitable for DL - stocks for which only lengths are collected.
Objective(s) of the project	Parameterize length based DLS assessment models for pikeperch (and possibly perch, roach and bream) in lake IJssel and Marker, based on Ault et. al and possibly other length based models. Also, develop general knowledge of data poor stock assessment models.
Expertise needed	Basic knowledge of stock assessment methods, the lake IJssel surveys and ecosystem, data analysis and statistics.
Expertise developed	Knowledge of length based DLS assessments models that can also be used for DLS in marine data poor stocks.
Relevance for WOT	Knowledge is developed for length based assessment methods, which can assess the status of fish stocks without extensive (and expensive) age reading programs. This is also of specific interest for fresh water systems, for which the wish to manage the stocks sustainably has increased and for which often length data, but not much age data is available.
Why should this be funded by KB WOT?	Knowledge is developed for length based assessment methods for data poor stocks.
What other potential funding sources have been considered?	Ministry of EZ. There might be some resources available, but this will not be enough to develop and test different data poor models.
International objective of research	For many data poor marine fish stocks catch advice is now also provided. They are often based on few datasets, such as a survey trend. To give better advice, several models for DL stocks are currently under development. Length based models are an example, and can be used for many stocks for which lengths are sampled, but for which age readings are not available.
Work plan	
Broad description of the project including expected results	Parameterize length based models starting with pikeperch (if time allows perch, roach and bream) in lake IJssel, based on Ault et al. Broaden and strengthen general knowledge in IMARES of DLS assessment models. Expected results are estimates of fishing mortality (F) and stock status. If

	time is available, length based spawning potential ratio model (Hordyk et al.) and the lifetime egg production method (O'Farrell et. al.) will be tested.
Approach and time schedule	Data is already available (FYMA, historic market sampling, gill net survey), project can start any time.
Output/deliverables	Stock assessment based on length frequency distribution of commercial lake IJssel species with the final goal of writing a peer reviewed article.
Dissemination of findings being addressed	A report in English or a paper for a peer reviewed journal will be written. Methods may be used in other data poor assessments.
Utility of the developed products and expertise	Sampling of age data is costly and often do not compare to the financial value of a fisheries (typically in fresh water). Length based stock assessment models are a solution to get knowledge of the status of data poor stocks.
What are the potential risks to the project's success?	-
Project organisation	
Involvement IMARES (names and expertise)	-Tessa van der Hammen (FYMA, stock assessments models and ICES DLS methods), -Thomas Brunel (stock assessments, experience with Ault model), -Nicola Tien (Lake IJssel system, surveys and ICES DLS methods)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR	-Jerald Ault (University of Miami, Expert in length based models). Has visited IMARES recently to cooperate with Thomas Brunel.
Relevance	
What is the market/ target audience	Managers/stock assessors for commercial fish stocks in fresh and marine water.
Economical relevance	Sustainable fishing
Social relevance	Sustainable fishing
Scientific relevance	Development/parametrization of length based models for data poor stocks
Relevance to ministry EZ	Managing data poor fish stocks without the costs of extensive age readings.
Summary (UK)	The poor status of commercial fish stocks in Lake IJssel has recently led to reduction in catches and effort. The advice for management of these stocks is based on methods for data poor stocks. Assessment models for data poor stocks, based on a length distribution can provide better advice. These models do not require detailed age data, but can calculate fishing mortality (F) on the basis of a length frequency distribution in combination with growth parameters, life time, age at maturity, etc.
Samenvatting (NL)	Door de slechte status van commerciële visbestanden in het IJssel- en Markermeer moeten vangsten en effort omlaag. Advies is gebaseerd op een methode die geen goed beeld geeft van de status van het bestand. Modellen, gebaseerd op lengtes kunnen een beter beeld geven over de status van visbestanden. Deze modellen kunnen visserij mortaliteit (F) berekenen aan de hand van een lengte frequentie verdeling in combinatie met groeiparameters, levensduur, etc. Het plan is om deze modellen te ontwikkelen en parameterizeren voor soorten uit het IJsselmeer.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	250	24.750
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			24.750
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			24.750
Financing through other resources			
Finance needed from KB WOT			24.750

Project 17 ☺	"Drone mapping of mussel beds"
Project leader	Karin Troost
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Field work involving intertidal mussel beds is highly time consuming, relatively expensive (shipping time), and the working period is tide limited. Unmanned Airborne Vehicles (UAV's, also called 'drones') may offer solutions to these problems and offer a variety of analysis techniques that may be relevant for a wider range of studies subjects than mussel beds alone. UAV's can be equipped with different devices such as orthocamera, hyperspectral camera, infrared camera, or even LIDAR (laser altimetry). In a pilot carried out in 2015 by Alterra and IMARES promising results were obtained which demonstrated the potential of hyperspectral images and possibly other techniques. Use of UAV's is still highly constricted by law but this is changing rapidly offering a range of opportunities that we would like to explore.
Objective(s) of the project	The objective is to test whether UAV's can be used to map or study the development of mussel-/oyster beds, and what the research possibilities are for obtaining more detailed information such as composition and elevation of the bed. We also want to explore future possibilities of using UAV's under less restricted laws (e.g. licences, flight distance allowed).
Expertise needed	UAV operation, image analysis, mussel/oyster bed dynamics and mapping.
Expertise developed	How to use UAV techniques in shellfish surveys, which may be extended to broader purposes within the work field of IMARES.
Relevance for WOT	Using UAV's may contribute to an increased efficiency and reduced field work. Additional information may be obtained on e.g. composition of mussel and oyster beds which is expected to be needed in near future (regulation of Pacific oyster hand-picking in relation to Natura 2000) but is time consuming without automated techniques.
Why should this be funded by KB WOT?	Because of the relevance for WOT as stated above.
What other potential funding sources have been considered?	None yet.
International objective of research	Regarding the position of IMARES: to not lag behind in applying innovative techniques, but rather to have a leading position.
Work plan	
Broad description of the project including expected results	Selected beds will be studied using UAV's and traditional field work simultaneously. Traditional field work is carried out within the annual WOT programmes. Selected beds will be described in detail. Beds are selected with different composition, cover and substrate. The applicability of different methods will be tested (RGB camera, orthophotos and 3D model, hyperspectral camera, thermal infrared camera) and perhaps of different UAV's (octocopter and fixed wing). Most suitable analysis techniques will be explored for mapping contours and assessing different bed characteristics (e.g. composition). Success of the different methods will be discussed as well as plans for either additional research or implementation in the surveys.
Approach and time	Mapping of the beds on foot and by UAV's will be carried out in the period

schedule	April–May (and/or Aug-Sep) combined with the annual WOT programmes. Image analysis: May-Oct. Report: Oct-Nov.
Output/deliverables	Report on results, possibilities and limitations, recommendation for implementation in WOT programme and/or further studies.
Dissemination of findings being addressed	The report will be written in English, be made available on the CVO website, and shared with colleagues internationally working on shellfish bed monitoring. Results and implications for WOT are discussed with CVO and EZ
Utility of the developed products and expertise	Through this project the potential of UAV's in marine monitoring will be explored.
What are the potential risks to the project's success?	Wind speed may reduce the opportunities for UAV operation. Expensive equipment may fall and be lost (financial risk for Alterra).
Project organisation	
Involvement IMARES (names and expertise)	Karin Troost (project leader WOT Shellfish), Sander Glorius (project leader WOT Natuur & Milieu – Development mussel beds), Douwe van den Ende (mussel and oyster stock assessments)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	Alterra: remote sensing techniques and image analyses: Sander Mücher, Henk Kramer (drone pilot) and Jappe Franke (drone pilot).
Involvement parties outside WUR (names and expertise)	No. ZXY Builders and/or Shore may be approached in a later stage for the use of LIDAR but with additional funding, not within this KB WOT project.
Relevance	
What is the market/ target audience	The goal is to benefit EZ through increased efficiency and colleague researchers/project leaders through exploring the potential of UAV's.
Economical relevance	Results may lead to an increased efficiency of WOT monitoring.
Social relevance	None.
Scientific relevance	To make progress in application of UAV's in marine monitoring and research.
Relevance to ministry EZ	High potential for increased accuracy and efficiency in marine monitoring.
Summary (UK)	The goal of this proposed project is to explore the potential of using UAV's (drones) in mussel bed monitoring and research. The potential is expected to be high in terms of reducing field effort and thereby costs, but is also expected to offer a wider range of research opportunities than was traditionally available, or the same opportunities but with lower effort.
Samenvatting (NL)	De toepasbaarheid van drones (UAV's) in mariene monitoring wordt onderzocht door in lopend onderzoek aan mosselbanken binnen WOT een selectie van enkele mosselbanken ook te analyseren met UAV's. De UAV's worden uitgerust met verschillende camera's zoals RGB, hyper spectraal en infrarood. Gezocht wordt naar optimale technieken voor het karteren van contouren maar ook andere parameters zoals samenstelling (oesters/mosselen) welke naar verwachting binnenkort nodig zullen zijn voor visserij- en natuurbeleid rond het rapen van oesters in de Waddenzee. Resultaten zullen ten goede komen aan het WOT programma maar zullen ook breder toepasbaar zijn binnen mariene monitoring en onderzoek.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	20	1.580
CAT III	99	80	7.920
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			9.500
Material costs			
Facilities			
Specific costs			25.180 for work by Alterra: 180 hours tariff 101 (CAT III) amount 18.180 56 hours tariff 125 (CAT IV) amount 7.000
Travel costs			1.500
Project equipment			4.000 including UAV operation costs of 200 per day
Other material costs			
Total Material costs			30.680
Total project budget needed			40.180
Financing through other resources			
Finance needed from KB WOT			40.180

Project 18 ☹	GAB - Glass eel Abundance and Behaviour
Project leader	Ben Griffioen
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Modelling fish behaviour in estuaries and tidal barriers is essential for designing and evaluating fish migration management measures for small diadromous fish (at sluices, dams etc.). However, many times and in many situations local knowledge on abundance and behaviour of these small diadromous fish is lacking especially in relation to tidal currents. A lot of standardized WOT sampling data (since 1938) is available and used for a yearly glass eel index. This standardized data contains much more information which has never been analysed before and can be used for behavioural studies. The data is of great value to gain knowledge on glass eel behaviour in relation to e.g. the tidal cycle which can be used in the future modelling of glass eel behaviour. Secondly there is a need[3] for a webpage with information about the glass eel index monitoring and its relevance for eel management (ICES etc.). This project will give the information including the results of this project.
Objective(s) of the project	Gain knowledge of glass eel behaviour at tidal barriers as input of future modelling
Expertise needed	Fish behaviour at tidal barriers, monitoring experience, data analysis
Expertise developed	Glass eel behaviour at tidal barriers
Relevance for WOT	The glass eel index (WOT) is important to evaluate the glass eel abundance along the Dutch coast and the rest of Europe (ICES WGEEL). It is used for many other purposes including the eel management plan.
Why should this be funded by KB WOT?	This project will give more information of the glass eel index monitoring and will show its relevance.
What other potential funding sources have been considered?	DUPAN
International objective of research	-
Work plan	
Broad description of the project including expected results	Many work has already been done by a student: merging tidal data and eel data, R code data processing etc. This project only needs to have further data analysis (e.g. more data and statistical analysis) and writing a draft peer reviewed paper.
Approach and time schedule	JAN data analysis, FEB Writing draft paper, MAR Writing webpage
Output/deliverables	Draft peer reviewed paper, website page with brief summary for IMARES website as part of the "aal dossier"
Dissemination of findings being	Paper, webpage of IMARES (aal dossier)

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[3] http://climategate.nl/2015/06/10/imares-belooft-openheid-van-glasaal-zaken-na-berichtgeving-climategate-nl/

addressed	
Utility of the developed products and expertise	As input for future to build modelling studies
What are the potential risks to the project's success?	Most of the work has already been done by the student. Only further data and statistical analysis is needed. Therefore no risks are expected except for absence due to sickness
Project organisation	
Involvement IMARES (names and expertise)	Ben Griffioen (monitoring, fish behaviour), Erwin Winter (fish behaviour), Chun Chen (statistics)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	-
Relevance	
What is the market/ target audience	EZ, DUPAN, RWS, public in general
Economical relevance	As input for future modelling projects
Social relevance	There is a lot of debate on the glass eel monitoring in the Netherlands. A brief summary of the glass eel index monitoring and the results of this project can be published in the "aal dossier" on the website of IMARES and give the public more understanding of the data collection and its relevance.
Scientific relevance	Behavioural patterns of glass eel near tidal barriers
Relevance to ministry EZ	A better understanding in the behaviour of glass eel. In future and existing management measures at large tidal barriers this information is needed to advice in a more efficient measure to facilitate fish in their migration.
Summary (UK)	More information of glass eel behaviour is needed as input for modelling and to be efficient in management measures. Small diadromous fish and their behaviour are difficult to monitor. The yearly glass eel index contains lots of hidden information which has not been analysed and published yet. Secondly this work and a summary of the glass eel index will be published on the IMARES website to show the public the value of this monitoring program. E.g. the relation of abundance and tidal current. This project is a follow up by a student internship and consist of more thorough data analysis and writing a draft peer reviewed paper.
Samenvatting (NL)	Er is veel behoefte aan onderzoek naar glasaal gedrag om vispassage aan te laten sluiten bij het gedrag van vis (efficiëntie verbetering). Ook voor model studies is er veel behoefte naar gedrag kennis van kleine diadrome vis die afhankelijk zijn van getijde stroming. Onderzoek naar het gedag van kleine diadrome vis, zoals glasaal, is zeer moeilijk en bevat vaak moment opnames. De jaarlijkse glasaal monitoring (sinds 1938) kan een deel van deze kennishiaat opheffen door de data te koppelen aan getijdestromingen. In 2015 is er al veel voorwerk door een student gedaan en dit project kan zijn werk afmaken en publiceren. Vanuit het algemene publiek is er ook behoefte aan meer uitleg van de glasaal index. Dit project draagt daar aan bij door het maken van een webpagina voor de IMARES website.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	4	316
CAT III	99	80	7.920
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			8.236
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			8.236
Financing through other resources			
Finance needed from KB WOT			8.236

Project 19 ☺	Programme management
Project leader	Cindy van Damme
Theme	Management
Motivation and Project aims	
Problem definition	To manage and develop the KB WOT Fisheries theme.
Objective(s) of the project	Manage and develop the KB WOT Fisheries programme.
Expertise needed	Background in the WOT Fisheries programme.
Expertise developed	
Relevance for WOT	The KB WOT programme is essential to maintain and develop expertise to carry out the WOT Fisheries programme.
Why should this be funded by KB WOT?	Management of the theme is fundamental to an effective and inovative programme.
What other potential funding sources have been considered?	None.
International objective of research	Maintain IMARES at the centre of fisheries research in Europe and project our skills to arenas beyond the EU.
Work plan	
Broad description of the project including expected results	To manage and develop the KB WOT Fisheries theme. Reporting on the 2015 programme and a description and rationale for the 2017 programme.
Approach and time schedule	Q1: Write report on the results of the 2015 programme Q3: New call for proposals for the 2017 programme Q4: Establish new programme for 2017 from submitted proposals and write report with the programme description and rationale for 2017
Output/deliverables	2 reports – reporting on the 2015 programme and a description and rationale for the 2017 programme.
Dissemination of findings being addressed	Through a range of media and 2 reports – reporting on the 2015 programme and a description and rationale for the 2017 programme.
Utility of the developed products and expertise	A review of the functioning of KB WOT fisheries was carried out in 2010 (see report 10.IMA0283.mdc) which involved LNV (directorates AKV and Kennis), CVO, WUR and IMARES. This found that the programme was forward looking, viewed high quality innovative science as important and yet maintained the direction considered important by LNV. Thus the KB WOT programme appears to utilise the expertise available to DLO on fisheries and look to the future research needs of society.
What are the potential risks to the project's success?	Minimal
Project organisation	
Involvement IMARES (names and expertise)	Sieto Verver (head CVO), Ingeborg de Boois (deputey head CVO), Rian Schelvis (BAPS and MyProjects) and Cindy van Damme (KB WOT programme leader)
Is the appropriate capacity available?	Yes

Involvement parties within WUR (names and expertise)	Close links to the KB programme. KB WOT Fisheries functions within the new KB theme System Earth Management (SEM).
Involvement parties outside WUR (names and expertise)	Close links through ICES, the EU STECF, PICES and FAO. Plus a network of marine researchers in Universities across Europe and North America.
Relevance	
What is the market/ target audience	Ministry of EZ
Economical relevance	
Social relevance	
Scientific relevance	To manage and develop the KB WOT Fisheries theme.
Relevance to ministry EZ	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 KB WOT programme appears to utilise the expertise available to DLO on fisheries and look to the future research needs of society.
Summary (UK)	This project is specifically to manage and develop the KB WOT Fisheries theme within WUR KB programme. We will report on the 2015 programme carried out and publish a description and rationale for the 2017 programme. A review of the functioning of KB WOT fisheries was carried out in 2010 (see report 10.IMA0283.mdc) which involved LNV (directorates AKV and Kennis), CVO, WUR and IMARES. This found that the programme was forward looking, viewed high quality innovative science as important and yet maintained the direction considered important by LNV. Thus the KB WOT programme appears to utilise the expertise available to DLO on fisheries and look to the future research needs of society.
Samenvatting (NL)	Dit project is er specifiek op gericht om het KB WOT visserij thema binnen WUR KB programma te beheren en te ontwikkelen. In 2016 wordt er gerapporteerd over het programma dat in 2015 is uitgevoerd en een rapport gepubliceerd met de beschrijving van het programma voor 2017. In 2010 is de functionering van KB WOT visserij programma, samen met LNV (directie AKV en Kennis), CVO, WUR en IMARES, geëvalueerd (zie het rapport 10.IMA0283.mdc). Deze evaluatie liet zien dat het programma vooruitstrevend was met hoog kwalitatief onderzoek, maar ook de richting had die LNV noodzakelijk achtte. Het KB WOT programma lijkt dus de visserij expertise die beschikbaar en nodig is bij DLO te leveren en vooruitstrevend te blijven om toekomstige vragen te kunnen beantwoorden.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	250	24.750
CAT IV	122	8	976
CAT V	143	4	572
CAT VI	172	4	688
Total Personnel			26.986
Material costs			
Facilities			
Specific costs			
Travel costs			250
Project equipment			
Other material costs			
Total Material costs			250
Total project budget needed			27.236
Financing through other resources			
Finance needed from KB WOT			27.236

Project 20	Genetic Species Identification Elasmobranchs
Project leader	Harriet van Overzee
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	Traditionally, countries reported rays and skates landings under a generic category. Since 2008, EC member states are obliged to provide species-specific landings data for the main ray and skate species. In order to determine whether species identification is occurring correctly, the ICES WGEF has compared the species-specific landings data with the market sampling and observer programmes (ICES, 2015)[1]. It has been concluded that misidentification has occurred (especially between *R. montagui* and *R. brachyura*). Consequently it is possible that declining trends in some species become unnoticed due to continued landings of the more common species. Robust protocols for ensuring correct species identification are therefore needed. [1] ICES. 2015. Report of the Working Group on Elasmobranch Fishes (WGEF), 17-23 June 2015, Lisbon, Portugal. ICES CM 2015/ACOM:19. 711pp.
Objective(s) of the project	The aim of this project is to explore molecular techniques that can be used for the identification of ray and shark species. If such expertise is not available in-house we will need to search within and possibly outside WUR.
Expertise needed	Knowledge on elasmobranchs
Expertise developed	Knowledge on molecular techniques for species identification in rays and sharks, with possible extensions in other species.
Relevance for WOT	The correct species identification is of crucial importance for understanding trends in species abundance.
Why should this be funded by KB WOT?	(i) This project is a first step in exploring tools to obtain and validate species-specific data in rays and sharks. (ii) The methods we explore are potentially useable for other species/fields
What other potential funding sources have been considered?	None
International objective of research	Ultimately presenting validated species-specific landings data.
Work plan	
Broad description of the project including expected results	Search for experts on molecular techniques for species identification. In close collaboration set up a protocol on what is exactly needed for species identification (e.g. fin clips, tissue), how samples should be stored etc. Make estimate of the costs involved.
Approach and time schedule	Q1 + Q2: Searching for expertise. Q2 + Q3: set up protocol. Q3: present possibilities within IMARES and ICES WGEF.
Output/deliverables	Protocol for molecular species identification rays and sharks. This can be used in the future for species identification for auction data and surveys in the Netherlands and abroad.
Dissemination of findings being	Presentation of the results at IMARES and ICES WGEF.

addressed	
Utility of the developed products and expertise	The protocol may be used to optimise the species-specific landings data.
What are the potential risks to the project's success?	No expertise on molecular techniques for species identification of rays and sharks can be found. However, we find this very unlikely.
Project organisation	
Involvement IMARES (names and expertise)	Harriet van Overzee, Jan Jaap Poos
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	Possibly we will find expertise on molecular techniques for species identification within IMARES and WUR (Hilde van Pelt, Arjan Palstra).
Involvement parties outside WUR (names and expertise)	If expertise on molecular techniques cannot be found within IMARES or WUR we need to look into other possible suitable parties (e.g. CEFAS).
Relevance	
What is the market/ target audience	Ministry EZ (ultimately optimising the species-specific landings data)
Economical relevance	Validated species-specific landings data that can be used by ICES in assessments and by STECF.
Social relevance	Rays and skates are popular in the societal debate. Accurate landings data will contribute to this debate.
Scientific relevance	Validated species-specific landings data.
Relevance to ministry EZ	Validated species-specific landings data is essential for proper management of the stocks.
Summary (UK)	Since 2008, EC member states are obliged to provide species-specific landings data for the main ray and skate species. The ICES WGEF has concluded that misidentification has occurred (especially between *R. montagui* and *R. brachyura*). The correct species identification is of crucial importance for understanding trends in species abundance. Robust protocols for ensuring correct species identification are therefore needed. The aim of this project is to explore molecular techniques that can be used for the identification of ray and shark species (and possible other species).
Samenvatting (NL)	Lidstaten zijn sinds 2008 verplicht om soort-specifieke aanlandingsgegevens van roggen te leveren. Hierbij is echter de vraag hoe accuraat de soort identificatie verloopt. Correcte soorten identificatie is essentieel om trends in de verschillende bestanden te kunnen begrijpen. Binnen dit project wordt een inventarisatie gemaakt van moleculaire technieken rondom de soortendeterminatie van roggen en haaien (en eventueel andere soorten).

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	25	2.475
CAT IV	122	25	3.050
CAT V	143		
CAT VI	172		
Total Personnel			5.525
Material costs			
Facilities			
Specific costs			
Travel costs			175
Project equipment			
Other material costs			
Total Material costs			175
Total project budget needed			5.700
Financing through other resources			
Finance needed from KB WOT			5.700

Project 21 😞	Does pulse fishing affect rays?
Project leader	Harriet van Overzee
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	In recent years the Dutch demersal beam trawl fleet has gradually switched from beam trawl to pulse fishing. While the standard beam trawlers use heavy tickler chains or chain mats to disturb fish out of the seabed into the trawl, the pulse trawl uses electrics. This new fishing technique enables fishermen to fish on fairly rough rocky grounds, often used by rays and skates as refuge area. It is possible that the introduction of the pulse trawl has resulted in a shift of fishing effort towards the habitat of rays and skates. This shift may have three potential effects. First, an increase in fishing mortality is undesirable for skates and rays given their high susceptibility to overfishing. Second, increased mortality undermines achieving "Good environmental status" indicators within the MSFD for skates and rays. Finally, skates and rays may become "choke" species under the landing obligation.
Objective(s) of the project	The aim of this project is to determine whether the recent shift in the Dutch demersal fishery, from beam trawl to pulse fishing, has resulted in a change in fishing pressure on rays, thereby affecting GES targets under the MSFD and generating "choke" species.
Expertise needed	Knowledge on rays and skates biology, distribution and fisheries. Knowledge on distribution of Dutch fisheries and fisheries behaviour.
Expertise developed	Spatial analysis to combine survey and landings data with fishing behaviour.
Relevance for WOT	Understanding possible effects of a recent change in the Dutch fishing technique on the abundance of ray and skate species.
Why should this be funded by KB WOT?	As rays and skates may become "choke" species under the upcoming demersal landing obligation due to the restrictive quota, it essential to understand whether pulse fishing affects the catches of rays and skates. Furthermore, as rays and skates are considered to be indicator species of a healthy ecosystem, they play a key role in the ecosystem approach to fisheries management. To be able to provide good quality advice on skates and rays in the future, also MSFD aspects need to be considered.
What other potential funding sources have been considered?	Science hours (in case project is granted, Harriet will contribute 40 hours to the project from the science hours she receives because of publishing a first-author paper in 2015).
International objective of research	Presenting potential effects of pulse trawling on rays and skates.
Work plan	
Broad description of the project including expected results	Identify areas where rays occur based on survey and landings data and compare those to the areas where beam trawl fisheries operate before and after the introduction of the pulse trawl. Investigate whether a potential increase in spatial overlap between rays and the fishery has resulted in a change in fishing pressure on rays.
Approach and time schedule	Q1: Collect and prepare survey information, landings data and fisheries distribution. Q2: Combine data. Q3: Calculate potential spatial overlap. Q4: Discussion results.

Output/deliverables	Draft manuscript
Dissemination of findings being addressed	Present preliminary results at ICES WGEF.
Utility of the developed products and expertise	The results may be used in discussions on the effect of pulse trawling.
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Harriet van Overzee, Niels Hintzen, Adriaan Rijnsdorp, Jan Jaap Poos
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	None
Relevance	
What is the market/ target audience	Ministry EZ, fishing industry, NGOs, society
Economical relevance	Pulse trawls are an economic viable alternative for the tickler chain beam trawls but is not allowed under EU-legislation. Whether the ban on pulse fishing will be lifted will depend on the assessment of the effects of pulse fishing on the ecosystem. This project will provide an important contribution quantifying the effect of the transition from beam trawl to pulse trawl fishing on rays.
Social relevance	Both rays and skates and pulse fishing are hot topics in societal debates.
Scientific relevance	Publications on the possible effects of pulse trawling are limited.
Relevance to ministry EZ	Knowledge on potential effects of pulse trawling and appropriate management of rays and skates.
Summary (UK)	The recent shift in the Dutch demersal fishery from beam trawl to pulse may have resulted in a shift in fishing effort towards the habitats of rays and skates. This project aims to determine whether the introduction of the pulse fishery has resulted in a change in the fishing pressure on rays and skates and thereby affecting GES targets under the MSFD and generating "choke" species under the landing obligation.
Samenvatting (NL)	De recente verandering in de Nederlandse bodemvisserij van de boomkor naar pulstuig zorgt mogelijk voor een verschuiving in visserijdruk naar gebieden waar roggen vaker voorkomen. In deze studie wordt onderzocht of de introductie van de pulsvisserij heeft geresulteerd in een verandering in de visserijdruk op roggen. Dit zal op zijn beurt effect hebben op de GES targets binnen MSFD en "choke" soorten genereren onder aanlandplicht.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	220	21.780
CAT IV	122	30	3.660
CAT V	143	30	4.290
CAT VI	172		
Total Personnel			29.730
Material costs			
Facilities			
Specific costs			
Travel costs			50
Project equipment			
Other material costs			
Total Material costs			50
Total project budget needed			29.780
Financing through other resources			40 science hours
Finance needed from KB WOT			25.820

Project 22 ☹	Improve FYMA data for fisheries management
Project leader	Nicola Tien
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	The active open water survey in IJssel- and Markermeer (FYMA) is vitally important for the fisheries advice IMARES gives to EZ. The ministry puts much effort into managing stocks of pikeperch, perch, bream and roach. IMARES gives yearly fisheries advice for these stocks, which has relied primarily on temporal trends in FYMA-catches. However, in 2013 the survey changed gear from 'kuil' to 'verhoogde boomkor'. In a comparative gear study, the estimated kuil-boomkor relation had such high uncertainty margins that temporal trends crossing into 2013 are highly uncertain. This diminishes the strength of the fisheries advice too. However, FYMA has an additional gear, the 'electrostramien-kor' which has catches in similar ranges as the boomkor. By statistically correcting for differences in catch due to gear type, data from all three gears could be used simultaneously and less unreliable temporal trends could be generated. Another factor which might have decreased the representative value of the FYMA-trend is the strongly decreased nutrient level in these lakes. Its effect on the catch success for these stocks, via an effect on visibility, has never been properly examined for these stocks.
Objective(s) of the project	Making the data collected in the FYMA more suitable and representable for temporal trend analysis for fisheries advice.
Expertise needed	Knowledge on survey design and history, relevant statistical models
Expertise developed	Knowledge on the relation between survey catches and the actual situation in the lakes.
Relevance for WOT	The project focusses on a better understanding of WOT-survey data and making it more representative for the commercial stocks developments.
Why should this be funded by KB WOT?	The analyses are fundamentally linked to running a WOT-programme useful for detailed and reliable advice on the lakes' commercial stocks.
What other potential funding sources have been considered?	Some funding can be set aside from the fisheries advice project, but the budget is limited and extra funding from EZ is unlikely. Also, KB WOT is the most logical source.
International objective of research	
Work plan	
Broad description of the project including expected results	A statistical model per stock for catch success, with gear type (boomkor, kuil and e-kor), visibility and year as main explanatory factors (GLM, GAM or GLMM). The comparative gear study data (kuil-boomkor) will also be included. Result is a temporal trend, corrected for gear, station and visibility.
Approach and time schedule	Statistical analysis (June-August). Report (September-October).
Output/deliverables	Report or, if results are interesting internationally and time is sufficient, a peer reviewed article.
Dissemination of findings being addressed	Relation for all 4 stocks of CPUE of the three gears and with visibility. A temporal trend which is more representative for the actual stock developments.

Utility of the developed products and expertise	More good-quality data for research into temporal trends in the stocks and catch advice for these stocks.
What are the potential risks to the project's success?	None.
Project organisation	
Involvement IMARES (names and expertise)	Nicola Tien and Tessa van der Hammen: survey design and history (NT), FRISBE database (NT and TH), statistical models (NT and TH).
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	-
Relevance	
What is the market/ target audience	Especially EZ, but also relevant for RWS, PO IJsselmeer and other parties interested in temporal trends in the IJsselmeer commercial stocks.
Economical relevance	Better fisheries advice which will hopefully lead to more sustainable fisheries
Social relevance	More trust of fishermen in the IMARES advice. Especially the influence of decreasing nutrients on the temporal trends makes fishermen wary of our results.
Scientific relevance	Research into relative catch efficiency of various gear types under controlled conditions (simultaneous sampling) and into the relation between visibility and catch efficiency is of general relevance for applied aquatic science.
Relevance to ministry EZ	More accurate fisheries advice. Better use of the WOT survey data
Summary (UK)	The FYMA is vitally important for the fisheries advice IMARES gives to EZ for the IJsselmeer stocks. The switch from kuil to boomkor in the FYMA has deteriorated the reliability of the generated temporal trends, and thus the advice. By incorporating data collected with the additional gear (electrostramienkor) and correcting for gear type in the time series, the trend can be made more representative of the stock developments. Also, correction for the potential influence of increasing visibility (due to decreasing nutrient levels) on the catch efficiency is important for generating representative temporal trends.
Samenvatting (NL)	De FYMA is van essentieel belang voor het visserij-advies dat IMARES EZ geeft voor de IJsselmeer bestanden. De wissel van kuil naar boomkor heeft geleid tot een verlaagde nauwkeurigheid van de gegenereerde temporele trends, en dus van het advies. Door ook de gegevens van de electrostramienkor mee te nemen, en te corrigeren voor tuigtype in de tijdreeks kan de temporele trend meer representatief gemaakt worden voor de bestandsontwikkelingen. Ook is correctie voor een mogelijke invloed van toegenomen zichtbaarheid (door afnemende nutrientenconcentratie) op het vangstsucces belangrijk voor het genereren van representatieve temporele trends.

Proposed budget	

Personnel	tariff	hours	amount (€)
CAT I	58		
CAT II	79		
CAT III	99	300	29.700
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			29.700
Financing through other resources			4.950 (fisheries advice project)
Finance needed from KB WOT			24.750

Project 23 ☺	Storage of electronic monitoring data
Project leader	Edwin van Helmond
Theme	2. Maintaining Quality
Motivation and Project aims	
Problem definition	Electronic monitoring (EM) or video-based monitoring is increasingly being used in fisheries research. Currently there is no possibility to store EM data in the IMARES database, with the risk to loose data and incapability to protect data and/or deny for unauthorized access.
Objective(s) of the project	Develop facilities to store EM data in a secure environment.
Expertise needed	Database and software development EM expertise across different EM projects
Expertise developed	Data storage of EM methods.
Relevance for WOT	In the context of the landings obligations, EM is developing and becoming an important tool to monitor commercial fishing activities in the future.
Why should this be funded by KB WOT?	Currently there is no EM data storage facility.
What other potential funding sources have been considered?	Overhead of different EM projects. However, this capacity is limited.
International objective of research	Keep up with current international developments in EM. Increase the possibility to join international consortia (EU funded).
Work plan	
Broad description of the project including expected results	1. Inventory of all possible EM output formats. 2. Investigate the security level to store EM data and select a database for future storage of EM data. 3. Investigate and adjust the database to store all EM data formats. 4. Develop a software to translate output from EM analysis software to a frisbe compatible format. 5. Process monitoring and trials 6. Present results.

Approach and time schedule	1 and 2. meeting/brainstorm session: 1day
	3. -Impact analysis: 5days
	   -Adjust database: 20 days
	4. Develop software to
	   -store sensor data: 5 days
	   -translate XML output from EM analysis software: 20 days
	   -translate and store (existing) excel logbooks: 10 days
	5. Trials with EM experts and feedback to developers: 4 days
	6. Prepare presentation and present results: 2 days

Output/deliverables	database conversion software
Dissemination of findings being addressed	Present results to EM data users.
Utility of the developed products and expertise	Improved reporting and analysis of EM data.
What are the potential	Technical failure of EM software.

risks to the project's success?	Complexity of the EM data in relation the database set up is currently unclear. There is a minor risk that this will lead to increased use of resources.
Project organisation	
Involvement IMARES (names and expertise)	Edwin van Helmond (cross EM project expertise) Daniel Benden (software and database development) Bram Couperus (cross EM project expertise) Peter van der Kamp (database mangagement)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	Advice from legal department concerning privacy sensetive information.
Involvement parties outside WUR (names and expertise)	No
Relevance	
What is the market/ target audience	researchers -> ministry & compliance
Economical relevance	Advanced support of fishery management
Social relevance	Advanced support of fishery management.
Scientific relevance	Advanced availability of data.
Relevance to ministry EZ	Advanced support of fishery management.
Summary (UK)	This is a proposal to develop facilities to store Electronic Monitoring (EM) data. Currently there is no possibility to store EM data in an IMARES database, with the risk to loose data, incapability to protect data and/or manage access. EM is currently developing into apromising tool to monitor fishing activity on national and international level. The proposal is divided in 6 stages, including (1)an inventory of EM output formats, (2)security/privacy issues, (3)possible adjustments of the database, (4) development of software to translate output from EM software tot frisbe compatible format, and (5&6) process monitoring, trials and presentation of the results. The estimated workload is 408 hours in CAT II and 144 hours in CAT III, representing an amount (€) of 46488 euro.
Samenvatting (NL)	Dit is een voorstel om opslagfasciliteiten te ontwikkelen of data afkomstig van Electronic Monitoring (EM). Op dit moment is er geen mogelijkheid om EM data op te slaan in een IMARES database, waardoor het gevaar bestaat dat data verloren gaan en er geen mogelijkheid is voor degelijk databeheer. EM is op dit moment aan het ontwikkelen in een veelbelovende techniek voor bemonstering van de visserij, zowel nationaal als internationaal. Dit voorstel omvat 6 stadia: (1) een iventarisatie van de verschillende EM output fomats, (2)databeveiliging/privacy aspecten, (3)benodigde aanpassingen aan de IMARES database, (4) ontwikkeling van software om de output van gebruikte EM softwareom te zetten in een format dat geschikt is voor frisbe en (5&6) begeleding van het proces, test-sessies en presentatie van de resultaten. De hoeveelheid werk wordt geschat op 408 uren in CAT II en 144 uren in CAT III, hetgeen neerkomt op een bedrag van 46488 euro.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	408	32.232
CAT III	99	144	14.256
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			46.488
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			46.488
Financing through other resources			
Finance needed from KB WOT			46.488

Project 24	Trawl Samples For Acceptable abundance Estimates (TSFACES).
Project leader	Bram Couperus
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	For the estimation of abundance of fish species from acoustic/trawl surveys, a number of biological catch samples is required to achieve a certain survey variance. A sample requires a minimum number of specimens to be representative for that species. In pelagic fish the total catch weight may be an important criterion as schools of fast swimming fish can often avoid the net, sometimes resulting in very small catches (a few 10s of specimens). However, if the targeted school is "hit", the catch may contain thousands of specimens. It seems likely that small catches are less representative of the fish in that area of the survey as they contain smaller specimens or with lower weights. At present, the use of (very) small catches for biological sampling is accepted in international coordinated surveys. The reason is that it is sometimes very time consuming or even impossible to catch the target schools, depending on natural conditions but also on the equipment of the vessel, the experience of the (scientific) crew and cruise planning (for example time constraints). This means that the representativeness of biological samples, and thus total survey variance, may differ between - and sometimes even on the same vessel. Following changes in international management policies (EAFM in CFP) there is an increased requirement to monitor the wider ecosystem. It is therefore warranted to quantitatively assess the minimum required (costly) sample quantity & quality to achieve an acceptable survey variance for 'single species' assessments, to potentially free additional survey resources (time).
Problem definition	Fish abundance estimates from acoustic/trawl surveys require (1) a minimum number of trawl samples, consisting of (2) sufficient individuals. However, the composition of the samples may also depend on (3) the catch weight. These factors are connected and have influence on the variance of abundance estimates. Knowing the minimum sampling requirements allows to quantify available resources for additional monitoring.
Objective(s) of the project	The aim of this project is to determine (1) the minimum sampling quantity (trawl number & catch weight) & (2) quality (individuals per trawl) required to achieve a given survey CV. To model (3) differences in (1) and (2) and their influence on accuracy and variance of acoustic abundance estimates.
Expertise needed	Experience with acoustic surveys; Spatial statistics & modelling skills; use of programming software; Acoustic abundance estimation
Expertise developed	Knowledge on how sample/catch size affects accuracy and variance of acoustic abundance estimates and the minimum required samples.
Relevance for WOT	Biological sampling WOT herring surveys; protocols WOT herring surveys
Why should this be funded by KB WOT?	This study will lead to improved biological sampling and sampling protocols, nationally and internationally.
Other funding sources?	None
International objectives	Improved biological sampling and synchronization between National surveys.
Work plan	
Broad description of the project including expected results	Test relationship between herring catch weights from 1991 – 2015 in HERAS with condition at age & length; test the influence of data sets from different catch sizes on the acoustic abundance estimates with simulated sample sizes and number of samples on the outcome of the acoustic abundance estimate.

Approach and time schedule	January–March: collation of data from database/March–May: analysis/ June–July: prepare working paper and presentation for WGIPS/September: write paper for ICES Journal
Output/deliverables	Paper in ICES Journal
Dissemination	WGIPS; manual for the international HERAS survey
Utility of the developed products and expertise	Direct relevance for ICES coordinated surveys (HERAS, ASH, IBWSS,…) in relation to the number of biological trawl samples which are used in the process of abundance estimation.
Potential risks?	None
Project organisation	
Involvement IMARES (names and expertise)	Bram Couperus (acoustic surveys), Sascha Fässler & Ben Scoulding (acoustic survey & statistical modelling)
appropriate capacity?	Yes
parties within WUR	Not outside of IMARES
parties outside WUR	None
Relevance	
market/target audience	WOT
Economical relevance	Better performance of fishery surveys.
Social relevance	None
Scientific relevance	Better understanding of catchability on pelagic fish stock assessment.
Relevance to EZ	Better performance of fishery surveys
Summary (UK)	During acoustic/trawl surveys a minimum number and weight of biological samples is needed to achieve a certain survey uncertainty. Schools of pelagic fish sometimes escape the net and the resulting small catches may not be representative. If this problem can be quantitatively evaluated, it may be possible to recommend a minimum number of samples and catch weights to achieve a reliable survey estimate, and at the same time free resources for additional ecosystem monitoring. The aim is to simulate (1) how many trawls are required and (2) how many individuals sampled for a given survey CV in the case of the North Sea Herring Survey (HERAS). In addition we will test (3) the effects of trawl catch weights on the acoustic abundance estimates. This project will lead to an improvement of the quality of pelagic surveys and will result in recommendations for standardisations and potentially free survey resources for additional ecosystem monitoring.
Samenvatting (NL)	In akoestische- en trawl surveys is een minimum aantal biologische monsters van een minimum grootte vereist. Daarnaast is de grootte van de vangst van belang: scholen pelagische vis ontsnappen soms aan het net, waardoor de vangsten niet representatief zijn. Wanneer dit probleem kwantitatief geëvalueerd kan worden, kunnen aanbevelingen worden gedaan voor een minimum aantal monsters, minimum monstergrootte en minimum vangst gewicht die zijn vereist voor een betrouwbare bestandsschatting, terwijl tegelijk tijd beschikbaar komt voor toegevoegde ecosysteem gerichte bemonstering. Het doel is om (1) om het aantal vereiste trawl monsters en (2) minimaal vereiste monstergrootte voor een bepaalde CV te simuleren voor de Noordzee Akoestische survey (HERAS). Daarnaast testen we (3) de invloed van trawl-vangstgewichten op de akoestische bestandschattingen. Dit project leidt tot een verbetering van pelagische surveys en tot aanbevelingen voor standaardisering en maakt tijd vrij voor toegevoegde ecosysteem bemonstering.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	240	23.760
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			23.760
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			23.760
Financing through other resources			
Finance needed from KB WOT			23.760

Project 25	Dab maturity
Project leader	Ruben Verkempynck
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	In 2016, dab (*Limanda limanda*) will be benchmarked by the demersal working group WKNSEA. Until present, dab is defined as a data poor stock due to the fact that information on the stock structure, (population) biology, and fishery has not been compiled in a stock assessment yet. However, dab is predominantly caught in the Dutch demersal fisheries and its abundance was estimated to be one of the highest in the North Sea (Daan et al. 1990). In a benchmark process, thorough collection of maturity data is overlooked most of the time and flatfish often are assigned a simple knife edge maturity ogive. Since substantial discarding of dab is taking place in the North Sea (van der Reijden et al. 2014), it is vital to develop a better insight in maturity of dab, to investigate the risk of, for instance, overfishing of the North Sea dab stock.
Objective(s) of the project	Collect dab maturity data and construct a maturity ogive Compare derived maturity ogive to historical data (Rijnsdorp et al. 1992) Report dab maturity research in manuscript for scientific journal
Expertise needed	Macroscopic and microscopic maturity staging, fish gonad histology, survey design, catch sampling, stock assessment.
Expertise developed	Updated insight in maturity of dab from present data
Relevance for WOT	Dab is currently scheduled to be benchmarked, thus solid up-to-date information on its biology is essential. Getting a better insight in the maturity dynamics of dab from present data would increase validity of the advice resulting from its stock assessment.
Why should this be funded by KB WOT?	Dab is an important stock in the North Sea ecosystem and a commercial caught species. Data on the maturity ogive is currently lacking and is vital for the assessment of a fish stock.
What other potential funding sources have been considered?	None
International objective of research	Investigating dynamics in maturity of dab would increase the knowledge base of one of the most abundant stocks in the North Sea.
Work plan	
Broad description of the project including expected results	Collect dab specimens from surveys and catch monitoring programmes, stratify specimens, macroscopic maturity estimation, validation of the macroscopic maturity with histology, identify the best period to collect macroscopic maturity data for the estimation of the maturity ogive, , combine age and maturity data, compare newly derived maturity information with historical data, report findings in a manuscript for submittal to a scientific journal
Approach and time schedule	Feb: collection of dab specimens from IBTS survey, Aug-Oct: collection of dab specimens from autumn surveys, Jan, Mar-Jul, Nov: collection of dab specimens from catch monitoring programme, Feb-Nov: Macroscopic maturity estimation, histological validation and age reading, Nov: construction of dab maturity ogives and investigating dynamics, Nov-Dec:

	reporting of findings in a manuscript
Output/deliverables	Dab maturity ogive
	Working document for WGNSSK
	Manuscript for submittal in scientific journal
Dissemination of findings being addressed	Working document for North Sea and Skagerrak demersal working group (WGNSSK)
	Manuscript for submittal to a scientific journal
Utility of the developed products and expertise	The products resulting from this project will feed into the stock assessment of North Sea dab. The approach and methodology used can be used for collecting data and investigating maturity dynamics of other flatfish stocks.
What are the potential risks to the project's success?	Unavailability of dab samples
Project organisation	
Involvement IMARES (names and expertise)	Loes Bolle, Cindy van Damme, Ruben Verkempynck, Ineke Pennock, Hanz Wiegerinck, Ewout Blom
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Holger Haslob (Thünen Institute, Germany) – Stock coordinator North sea dab
Relevance	
What is the market/ target audience	Fisheries biologists, assessment scientist, fisheries managers
Economical relevance	Dab is the most caught fish in the Dutch demersal fishery, therefore it is of great importance to invest in a good knowledge base, including good maturity data.
Social relevance	A good assessment is important for a commercial and widely distributed stock.
Scientific relevance	Insight in dab maturity dynamics
Relevance to ministry EZ	Under the landings obligation, dab will probably become the focus of attention since it is substantially discarded, therefore a solid and complete stock assessment, including good maturity data, is highly relevant.
Summary (UK)	This project aims to develop better insight in the maturity of dab. Dab is one of the most abundant species in the North Sea but yet there are still many gaps in the knowledge base. From specimens of dab collected during surveys and from the catch monitoring programmes maturity data and information of the maturity dynamics will be derived.
Samenvatting (NL)	Dit project beoogt een beter inzicht te krijgen in de maturity van schar. Schar is een van de meest gevangen soorten uit de Noordzee en daarom is het van groot belang om de kennisleemtes rond deze soort te vullen. Op basis van specimenen van schar verzameld in de surveys en het vangstmonitoringsprogramma zullen de rijpheidsstadia van schar en de dynamieken daarvan onderzocht worden.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58	16	928
CAT II	79	303	23.953
CAT III	99	164	16.236
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			41.117
Material costs			
Facilities			
Specific costs			
Travel costs			500
Project equipment			1.000
Other material costs			
Total Material costs			1.500
Total project budget needed			42.617
Financing through other resources			
Finance needed from KB WOT			42.617

Project 26 ☺	Geostatistics for estimating shellfish biomass
Project leader	Ingrid Tulp
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	
Problem definition	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 based on averages of swept areas, however geostatistics could provide a more robust method for estimating biomass from the given sampling design.
Objective(s) of the 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.
Expertise needed	Geostatistics, knowledge of WOT shellfish survey
Expertise developed	Geostatistics for biomass estimation
Relevance for WOT	Improvement of methods for analysing WOT shellfish survey data
Why should this be funded by KB WOT?	Uses WOT survey data, developing potentially more robust method for estimating densities of shellfish from survey data
What other potential funding sources have been considered?	None
International objective of research	Method for biomass estimation from survey data
Work plan	
Broad description of the project including expected results	Densities of key shellfish species are estimated annually for the Dutch coastal zone using an annual shellfish survey. Samples of shellfish are taken based on a grid, but in areas where higher densities are expected, the resolution of sampling is increased resulting in an uneven distribution of sampling. Up until now, densities have been estimated based on numbers per depth stratum per area and summed for all areas. However, such an approach can be problematic due to the patchiness of shellfish and the spatial autocorrelation in the data. Commonly applied statistics will be difficult to apply also because of the high number of zeros. Geostatistics on the other hand is not affected by the zeros and explicitly models the spatial correlation in the data allowing densities of shellfish to be predicted across the area. Using this approach it also possible to calculate total densities in taking into account the spatial differences in sampling intensity. The project aims to explore these geostatistical approaches and assess the robustness of the method for estimating total densities.
Approach and time schedule	Data is ready and can be prepared early in the year allowing analysis to commence in the first quarter of the year. Results and write-up can be expected in autumn 2016.
Output/deliverables	R scripts for the applied methods, peer-reviewed publication
Dissemination of findings being addressed	peer-reviewed publication, input in the ICES benthic ecology working group , and use in the annual IMARES survey report.
Utility of the developed	This approach is commonly used in other fields of fisheries research

products and expertise	worldwide, but only sparsely applied within IMARES. Here we propose to use it to arrive at a biomass estimate, but other applications with the benthos surveys are possible as well, once we have mastered the geostatistical approach on this dataset.
What are the potential risks to the project's success?	Use of geostatistical approaches is new within the institute and it is difficult to estimate the time needed to develop the methods needed.
Project organisation	
Involvement IMARES (names and expertise)	Karin Troost (shellfish and survey expert), Johan Craeymeersch (shellfish and survey expert), Ingrid Tulp (geostatistics), Lorna Teal (geostatistics)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	NA
Involvement parties outside WUR (names and expertise)	NA
Relevance	
What is the market/ target audience	Ministry of EZ, scientific world, ICES, fisheries organisations
Economical relevance	The shellfish fisheries is of considerable economic importance and improved biomass estimates will lead to a management based on better estimates
Social relevance	
Scientific relevance	Improved estimates of shellfish stocks
Relevance to ministry EZ	The proposed approach takes spatial processes into account and will improve biomass estimates
Summary (UK)	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 based on averages of swept areas, however geostatistics could provide a more robust method for estimating biomass from the given sampling design. We propose to follow a geostatistical approach to the WOT shellfish survey to calculate biomass and thereby better accounting for spatial processes.
Samenvatting (NL)	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 is dit wel mogelijk en kunnen ook covariabelen als diepte en sediment meegenomen worden om dichtheden te schatten in de gebieden tussen de monsterpunten en zo tot een beter onderbouwde schatting van het totale schelpdierbestand te komen.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	200	19.800
CAT IV	122	80	9.760
CAT V	143		
CAT VI	172		
Total Personnel			29.560
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			29.560
Financing through other resources			
Finance needed from KB WOT			29.560

Project 27 ☺	Mackerel Egg Development and Mortality
Project leader	Cindy van Damme
Theme	2. Maintaining Quality
Motivation and Project aims	
Problem definition	Accurate egg development equations are vital for the estimation of total egg production. The Lockwood *et al.* (1977) and Mendiola *et al.* (2006) development equations have been used to estimate mackerel egg production. Both studies suffer from a delay between the fertilization of the eggs at sea, until the experiment started on land. Due to this egg development of the first stage is delayed resulting in an underestimate. Egg development equations need to be estimated at sea (ICES, 2014; 2015). During the egg survey mackerel eggs are collected in all 6 development stages, but since mortality is not included only the first two stages are used for the estimation of total egg production. This results in an underestimation of total egg production. Egg mortality for the different development stages is available (Mendiola *et al.* 2006).
Objective(s) of the 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.
Expertise needed	Fertilization and cultivation of fish eggs, egg production estimation.
Expertise developed	Updated egg development equations, including all egg development stages in egg production estimation.
Relevance for WOT	Results of this project will improve the outcome of the mackerel egg surveys, which constitute a large part of the WOT surveys.
Why should this be funded by KB WOT?	Within the egg survey budget it is not possible to carry out this work, while these results will improve the accuracy of the total mackerel egg production.
What other potential funding sources have been considered?	None.
International objective of research	Mackerel is an important international commercial species. The mackerel egg survey is a survey carried out by 11 European countries.
Work plan	
Broad description of the project including expected results	During the mackerel egg survey cruises, in April and June, spawning mackerel will be collected. Oocytes will be collected and fertilized. Experimental setup, from Norwegian colleagues (successfully used to estimate egg development for different temperatures for plaice), can be use on board Tridens. After the surveys egg development equations will be estimated from the collected data. Starting with the 2013 egg survey data total egg production will be estimated using all egg development stages. Once this calculation is available this can be expanded to the whole time series and a preliminary estimate for the 2016 survey.
Approach and time schedule	Q1: Total mackerel egg production estimation using all egg stages. Q2: Egg development experiments on board Tridens. Q3: Egg development equations and total egg production estimate of the 2016 survey. Q4: prepare manuscript for publication in peer reviewed journal.
Output/deliverables	Mackerel egg development equations, total mackerel egg production using

	all development stages, working document for WGWIDE, manuscript.
Dissemination of findings being addressed	Working documents for WGWIDE and WGMEGS (2017) and manuscript for peer reviewed journal.
Utility of the developed products and expertise	Results will be used by WGMEGS for the estimation of total mackerel egg production and by WGWIDE for the mackerel assessment.
What are the potential risks to the project's success?	Bad weather preventing the mackerel egg survey to be carried out.
Project organisation	
Involvement IMARES (names and expertise)	Ewout Blom (egg fertilization and culture, egg development), Ineke Pennock, Ruben Hoek, Hanz Wiegerinck (mackerel eggs and fecundity), Cindy van Damme (egg fertilization, egg production estimation)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Richard Nash (IMR, Norway), Audrey Geffen (UBI, Norway), Finlay Burns (MSS, Scotland), Brendan O'Hea (MI, Ireland), Matthias Kloppmann (TI, Germany), Gersom Costas (IEO, Spain)
Relevance	
What is the market/ target audience	Mackerel egg survey participants, WGMEGS, WGWIDE, fisheries managers
Economical relevance	Mackerel is an important commercial species.
Social relevance	Mackerel is an important commercial species.
Scientific relevance	This project will provide egg production development equations from experiments conducted at sea. This will improve the total mackerel total egg production estimation. Using all available data on mackerel eggs will improve the total egg production estimation.
Relevance to ministry EZ	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.
Summary (UK)	Accurate egg development equations are vital to be able to estimate total egg production. Current mackerel egg development equations suffer from a delay between the fertilization of the eggs at sea, until the start of the experiment. New egg development equations will be estimated at sea during the mackerel egg survey. Mackerel eggs are collected in all 6 development stages, but only the first two stages are used. This results in an underestimation of total egg production. Including all egg development stages will improve the total egg production estimate.
Samenvatting (NL)	Accurate ei-ontwikkelingsformules zijn essentieel voor het bepalen van de totale eiproductie. Huidige makreel ei-ontwikkelingsformules zijn bepaald met een vertraging van de start van de ontwikkeling na de bevruchting. Nieuwe ei-ontwikkelingsformules worden bepaald op zee tijdens de makreeleisurvey. Makreel eieren worden verzameld in alle 6 ontwikkeling stadia, maar alleen de eerste 2 stadia worden gebruikt. Met als resultaat een te lage schatting van de totale eiproductie. Het gebruiken van alle ei stadia zal de totale eiproductie van makreel verbeteren.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	60	4.740
CAT III	99	250	24.750
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			29.490
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			500
Total Material costs			500
Total project budget needed			29.990
Financing through other resources			
Finance needed from KB WOT			29.990

Project 28 😞	Can we detect ecological relationships (diet overlap) in time trends of abundance and growth in survey data?
Project leader	Tobias van Kooten
Theme	1. Underpinning WOT Fisheries programme
Motivation and Project aims	Is the strength of correlations of growth rates and abundance among fish species consistent with their diet overlap?
Problem definition	See description
Objective(s) of the project	Find out if the strength of correlations of growth rates and abundance among fish species is consistent with their diet overlap.
Expertise needed	Data analysis, fish ecology
Expertise developed	Data analysis, fish ecology
Relevance for WOT	The ecosystem approach assumes that elements of the ecosystem are connected and respond to each other. We test whether or not we can see such connections in survey data, based on where ecological theory and diet data would hypothesize such connections. The result will allow us to assess to what extent our current surveys are able to pick up and show signals traveling through the ecosystem. This essentially studies the question 'to what extent can our current surveys be considered ecosystem surveys?'.
Why should this be funded by KB WOT?	See relevance for WOT
What other potential funding sources have been considered?	None
International objective of research	See objective of the project
Work plan	
Broad description of the project including expected results	Substantial research effort is currently devoted to developing and implementing an ecosystem-based approach to marine management, which can assess the effects of exploiting one species on the ecosystem as a whole. A fundamental assumption behind the plea for an ecosystem approach to management is that links between species and functional groups in the ecosystem are sufficiently strong that a change in one group does indeed propagate to other species/functional groups. An important link between harvested demersal stocks in the North Sea is their food. It has been shown based on diet data that many species have a substantial diet overlap (Labberton, 2009) and that this diet overlap leads to significant competitive interactions among species (Stuke 2009). Food availability essentially determines the productivity of a population. When food is scarce, individual growth slows down, and starvation mortality may occur. Growth and starvation are individual-level processes, the rates of which are determined by *per capita* food availability. The growth of species which have substantial diet overlap are expected to respond similarly to resource availability. In this project we aim to find such correlative patterns in the growth of several North Sea fish species. Based on a combination of back-calculated growth trajectories, size-at-age data from survey samples, annual length-frequency estimates which are used in stock assessments, and the abundance and fishing mortality rates, we will use exploratory data analysis to look for correlations among species growth rates and abundances. We take into account the fishing mortality, because we expect the competition-mediated growth effects to be stronger when fishing

	mortality is low. The outcome will be compared with competition strengths calculated on the basis of food overlap. If the patterns are consistent, this provides a strong cross-validation of both datasets, and a strong argument in favour of the ecosystem approach. Inconsistencies between the datasets can be used to modify the calculation of competition strength from diet data, and contribute to a better insight into the ecological interactions which shape the production of harvestable fish biomass.
Approach and time schedule	The work will be carried out in the first half of 2016.
Output/deliverables	1 manuscript ready to be submitted to a peer reviewed journal
Dissemination of findings being addressed	Peer reviewed paper
Utility of the developed products and expertise	Insight into the co-variation of various demersal fish species in the North Sea
What are the potential risks to the project's success?	-
Project organisation	
Involvement IMARES (names and expertise)	Tobias van Kooten (fish ecology, data analysis) Ralf van Hal (fish ecology, data analysis)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	-
Involvement parties outside WUR (names and expertise)	-
Relevance	
What is the market/ target audience	ICES/research community
Economical relevance	We study if current EZ-paid surveys can function as ecosystem survey.
Social relevance	See relevance for WOT
Scientific relevance	See relevance for WOT
Relevance to ministry EZ	We study to what extent current EZ financed surveys are capable to function as an ecosystem survey.
Summary (UK)	The ecosystem approach assumes that elements of the ecosystem are connected and respond to each other. We test whether or not we can see such connections in survey data, based on where ecological theory and diet data would hypothesize such connections. The result will allow us to assess to what extent our current surveys are able to pick up and show signals traveling through the ecosystem. This essentially studies the question 'to what extent can our current surveys be considered ecosystem surveys?'.
Samenvatting (NL)	De ecosysteembenadering verondersteld dat onderdelen van het ecosysteem via ecologische interacties verbonden zijn en op elkaar reageren. We testen of een dergelijk verbondenheid in survey-data is terug te vinden, tussen ecosysteem-onderdelen waar ze op ecologische basis te verwachten zijn. Op die manier onderzoeken we of de huidige surveys in staat zijn om signalen die zich door het ecosysteem verplaatsen te detecteren. We onderzoeken

hiermee de vraag in hoeverre het huidige palet aan surveys kan worden gezien als een grote, samengestelde, ecosysteem-survey.			

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	120	11.880
CAT IV	122	80	9.760
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			21.640
Financing through other resources			
Finance needed from KB WOT			21.640

Project 29 ☺	Catch sampling on-board pelagic freezer trawlers
Project leader	Edwin van Helmond
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	A key element in the reformed CFP is the gradual introduction, between 2015 and 2019, of a landing obligation. For the Dutch pelagic freezer trawler fleet the landing obligation came into effect on 1st January 2015. This means that it is now illegal to discard quota-species within this fisheries. The introduction of the landing obligation has got an effect on the 'discard' sampling programme on-board pelagic freezer trawlers; catches are now being monitored instead of discards. However, due to technical modifications on-board the vessels it is becoming increasingly difficult and dangerous for the observers to take unsorted catch samples (e.g. increasingly difficult to reach conveyer belts, collecting unsorted catch from hoppers and buffers in renewed catch sorting devices is difficult). This creates the need to develop alternative sampling methods on board.
Objective(s) of the project	The aim of this study is to develop an alternative method to sample catches on board pelagic freezer trawlers.
Expertise needed	Knowledge on the fisheries
Expertise developed	Innovative sampling methods.
Relevance for WOT	Optimization of the catch sampling protocol on-board pelagic freezer trawlers.
Why should this be funded by KB WOT?	Catch data of pelagic freezer trawlers are monitored under the DCF. This project will be valuable in further adjusting the sampling programme due to the implementation of the landing obligation.
What other potential funding sources have been considered?	WOT Discards Pelagics; the observer trips will be funded by this project. However, the capacity to test new methods this project is very limited.
International objective of research	Presenting catch information of the Dutch pelagic freezer trawler fleet
Work plan	
Broad description of the project including expected results	Within this fishery catch is transported over a processing belt where it is automatically sorted into different lanes, i.e. market size categories. We suggest that catch is sampled during this sorting process. This means that by haul (i) sub-samples need to be taken of the different market categories (including catch below minimum size, BMS) and (ii) the contribution of the different categories to the total catch needs to be determined. For the second step we propose that the observers take several digital pictures of the processing belt (using a 'selfie stick'). These pictures need to be analysed after the trip, based on this digital 'snap-shot' catch compositions can be estimated and sampled of the different categories can be raised accordingly. With this alternative sampling method there is no need to take a physical unsorted catch sample and avoid dangerous situations on board.
Approach and time schedule	Q1: apply new catch sampling method during observer trip. Q1 + Q2: analyse the data, report results, and if successful adjust sampling protocol (Q4).
Output/deliverables	Catch sampling protocol for pelagic freezer trawlers.

Dissemination of findings being addressed	Presentation of the results at IMARES and to German colleagues (already expressed their interest in the results)
Utility of the developed products and expertise	The protocol will be used for sampling of pelagic freezer trawlers.
What are the potential risks to the project's success?	Not possible to take high-quality pictures of the conveyor belt.
Project organisation	
Involvement IMARES (names and expertise)	Edwin van Helmond, Harriet van Overzee, Michiel Dammers, Martien Warmerdam, Thomas Pasterkamp, Hanz Wiegerinck and Hendrik Jan Westerink
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Thünen Institute (Germany)
Relevance	
What is the market/ target audience	Ministry EZ
Economical relevance	Efficient catch monitoring pelagic freezer trawler fleet
Social relevance	Save working conditions for observers on board pelagic trawlers.
Scientific relevance	Improve catch monitoring
Relevance to ministry EZ	Optimized catch sampling protocol pelagic freezer trawlers.
Summary (UK)	Catches (instead of discards) are being monitored on board pelagic freezer trawlers (active in European water) since the implementation of the landing obligation. However, it is becoming increasingly difficult for observers to take unsorted catch samples. Within this project an alternative method to sample catches on board pelagic freezer trawlers is tested.
Samenvatting (NL)	Sinds de invoering van de aanlandplicht worden vangsten (i.p.v. discards) aan boord van pelagische hektrawlers (actief in Europese wateren) bemonsterd. De praktijk wijst echter uit dat het steeds moeilijker wordt voor de waarnemer om een ongesorteerd vangstmonster te nemen. Binnen dit project wordt een alternatieve methode om vangst te bemonsteren getest.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	20	1.580
CAT III	99	120	11.880
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			13.460
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			1.200
Other material costs			
Total Material costs			1.200
Total project budget needed			14.660
Financing through other resources			
Finance needed from KB WOT			14.660

Project 30 ☹	Horse mackerel stock identification using GCxGC-MS (and Genetics)
Project leader	Thomas Brunel
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	The horse mackerel (HM) caught in the eastern channel (ICES division VIId) is offically reported as coming from the North Sea stock. However, the Western HM is also in VIId during this time of the year when most of the fishery takes place. This presumably results in a mixed catch of the two fish stocks in VIId. The accuracy of the catch data for both stocks, and therefore the quality of the assessments (especially for the North Sea stock) would greatly benefit from a better insight in the origin of the catches from VIId. There is currently no accepted scientific method to identify the stock origin of HM taken in VIId. A pilot project funded by the Dutch industry is currently trying to use chemical analyses (GCxGC-MS : Gas chromatography–mass spectrometry) and genetic methods to establish a primary baseline for alloting samples from catches in VIId to either the North Sea or the Western HM stock. Samples collected on the spawning stocks (taken in July, the end of the spawning season) are currently beeing analysed. In this proposal, a continuation of this research for collecting more samples from different parts of the population (more females/males, older and younger indiviuals) is requested to increase the power of preliminary results.
Objective(s) of the project	To develop a method to distinguish stock origin based on the fish chemical composition, which can potentially be applied to other species. To gain better knowledge of the North Sea stock landings for use in the management of the North Sea HM stock.
Expertise needed	GCxGC-MS use and statistical analyses for data interpretation
Expertise developed	Better insight of stock dynamics of different stocks/feeding areas
Relevance for WOT	A better insight in the stock structure of HM and the stock origin of the catches from VIId will increase the knowledge base thus potentially strengthening the advice for these 2 HM stocks
Why should this be funded by KB WOT?	This method to distinguish fish stocks / feeding areas of fish will be optimised, so it can be used as tool, also for other stocks
What other potential funding sources have been considered?	None, the industry will contribute samples
International objective of research	Improving the assessment of the North Sea and Western HM stocks and thereby get a better basis for management
Work plan	
Broad description of the project including expected results	With GCxGC-MS individuals of the two stocks may be discriminated. This technique delivers a 'fingerprint', showing the chemicals in the fish meat, which have been taken up by feeding and by respiration. As individuals of the two stocks reside at different feeding areas, they have absorbed different chemicals, resulting in distinguishable fingerprints. The project will analyse samples that belong to both putative sotcks using GCxGC-MS to look for chemical differences between them. Then samples from the area in which the stocks mix will also be analysed; the chemical fingerprint will determine to what stock these individuals, all caught in area VIId, belong.

Approach and time schedule	Jan-May: planning sample collection, Jan: sample collection from VIId, Aug-Sep: sample collection from North Sea and Western stock from a broader part of the population, Jul:-Oct: chemical analyses and analysis of results, Oct-Nov: writing of manuscript and other deliverables
Output/deliverables	Manuscript for submittal in scientific journal detailing findings Working document for WGWIDE
Dissemination of findings being addressed	To scientific community through WD at WGWIDE and submittal of manuscript to scientific journal. Article in Visserijnieuws for pelagic industry
Utility of the developed products and expertise	Direct input for North Sea Horse Mackerel management plan GCGCxMS methodology can be optimised for use in other stocks
What are the potential risks to the project's success?	Bad timing of sampling HM from both stocks, but this will be prevented
Project organisation	
Involvement IMARES (names and expertise)	Michiel Kotterman, Christiaan Kwadijk : GCxGC-MS Thomas Brunel, Ruben Verkempynck: statistical analyses
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Martin Pastoors (PFA) and Aukje Coers (Cornelis Vrolijk): knowledge of the fishery, access to fish samples. Edward Farrell (population genetics at University of Dublin, Ireland) is involved in the current project. All new samples will be made available to him for genetic analysis.
Relevance	
What is the market/ target audience	WGWIDE, ministry, chemical analysts, stock assessors
Economical relevance	Better North Sea HM management
Social relevance	
Scientific relevance	Use of the GC-GC-MS to distinguish between two feeding areas Insight in HM stock structure and dynamics
Relevance to ministry EZ	Better North Sea HM management
Summary (UK)	This project aims at getting insight in the stock structure of Western and North Sea HM and the origin of the VIId catches. Following up on a pilot project where genetic analysis and GCGCMS have constructed a baseline for testing the GCGCxMS methodology, this project will continue sampling and analysis on a broader part of both stocks and catch samples to obtain more power in derived results. This will increase the quality of the catch data for both HM stocks, and therefore potentially improve their assessments.
Samenvatting (NL)	Dit project beoogt een beter inzicht te verkrijgen in de structuur van de Noordzee en Westenlijke HM bestanden, en in de vangsten van HM uit VIId. Volgend op de resultaten van een piloot project waarbij een genetische en GCGCxMS analyse van HM een basis gelegd hebben voor interpretatie van de GCGCxMS methodologie, wil dit project voortbouwen en een betere en bredere analyse voltrekken op meer individuen uit beide stocks en vangstmonsters.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	192	15.168
CAT III	99	136	13.464
CAT IV	122	40	4.880
CAT V	143		
CAT VI	172		
Total Personnel			33.512
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			2.500
Total Material costs			2.500
Total project budget needed			36.012
Financing through other resources			
Finance needed from KB WOT			36.012

Project 31	:(	Evaluating the use of Fmsy ranges for managing North Sea mixed fisheries
Project leader		Thomas Brunel
Theme		1. Underpinning WOT fisheries programme
Motivation and Project aims		
Problem definition		At the request of the EU, ICES has recently advised on ranges of fishing mortality values leading to "pretty good" long term yields (> 95% MSY). The advantage these so-called "Fmsy ranges", compared to the single Fmsy value, is that they allow for some flexibility to set the TACs, while still agreeing with MSY principles. This is particularly interesting in a mixed fisheries context where the TAC defined for one stock may affect the caches taken from other species caught by the same fleets. In this case, the Fmsy ranges offer the possibility to adjust the TACs of the different species so that the over- and under-shooting of the different TACs is minimised. However applying such a management strategy potentially results in constantly changing management targets (Ftarget used within the Fmsy range). This is actually contradictory with how Fmsy (and the ranges) are estimated, based on simulations applying consistently a constant management target at Fmsy.
Objective(s) of the project		Evaluate the performance of a mixed fisheries management strategy using dynamically set Fmsy ranges in terms of yields and of stock status, and comparing with managing using a fixed F target equal to Fmsy
Expertise needed		Management strategy evaluation + mixed fisheries
Expertise developed		Management strategy evaluation in a mixed fisheries context
Relevance for WOT		This project deals with finding a definition for MSY in a mixed fisheries situation, and with developing an innovative management strategy that leads to harmonious TACs in a mixed fishery.
Why should this be funded by KB WOT?		IMARES participation to ICES groups on 1) mixed fisheries, 2) North Sea demersal stock assessment, 3) Fmsy definition are funded through WOT. This project would be using the concept from 3) in the context of 2) to improve the advice given by 2) and 3).
What other potential funding sources have been considered?		None
International objective of research		The EU is developing a multiannual management plan for the North Sea mixed fisheries based on the use of the MSY ranges. This work was initiated at STECF, building on the work from WGMIXFISH. This project would allow to go further with the development of such management strategies.
Work plan		
Broad description of the project including expected results		Carrying out long term simulations of the dynamics of the main North Sea demersal stocks management based on the Fmsy range approach, and compare the outcome against a management based on the default ICES MSY Advice Rule approach.
Approach and time schedule		The input data used (fleet and stock assessment) is available through ICES and annually updated at the MIXFISH May meeting. Work will be necessary to develop a long term simulation tool, based on an already existing (but simpler) simulation tool. Simulations should then be run for different management strategies, and the results compared before the MIXFISH

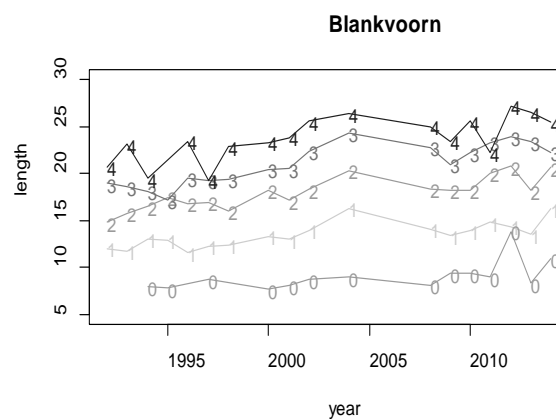|	October meeting.
Output/deliverables	An evaluation of the performance of a management strategy based on use of the Fmsy ranges A report presenting these findings
Dissemination of findings being addressed	The results will be presented at the WGMIXFISH methods meeting. This work will produce material to write a paper.
Utility of the developed products and expertise	This work will show the implications of managing using the Fmsy ranges in terms for yields, stock status, TAC over or under consumption. The tool developed can also be used in other management strategies (for instance if the EU wants to test other management strategies to develop their Multi-Annual Plan)
What are the risks to the project's success?	Computing time might be very long. This might limit the number of management strategies to be tested
Project organisation	
Involvement IMARES (names and expertise)	Thomas Brunel and Jan Jaap Poos : stock assessment, management strategy evaluation, mixed fisheries modelling
Is the appropriate capacity available?	Yes
Involvement parties within WUR	
Involvement parties outside WUR)	Youen Vermard (IFREMER) and Clara Ulrich (DTU Aqua) from the ICES MIXFISH working group
Relevance	
What is the market/ target audience	Managers (EU + national governments), fisheries scientist community involved in the provision of advice
Economical relevance	Insuring the sustainability of mixed fisheries and a high long term yield
Social relevance	Quantify the implication in terms of yields but also of potential TAC overshoot of mixed fisheries management plan based on Fmsy ranges.
Scientific relevance	Fmsy ranges are a new concept and their relevance for management has not been properly tested. A mixed fisheries context is obviously relevant for this.
Relevance to ministry EZ	Most of the fish stocks potentially included in a mixed fisheries management plan based on FMSY ranges are key to the Dutch demersal fleets.
Summary (UK)	The newly defined ranges of Fmsy values were introduced to allow for some flexibility in TAC setting. Using dynamically these ranges can help reduce incompatibilities in single species TACs in a mixed-fisheries context. However, other important aspects of such a management strategy – i.e. expected yields, stock status- have to be evaluated using long term simulations.
Samenvatting (NL)	De recentelijk gedefinieerde Fmsy ranges hebben tot doel om flexibiliteit te brengen in het vast stellen van TACs in gemengde visserijen. Wanneer deze ranges dynamisch gebruikt worden kunnen inconsistente TACs op basis van een single species benadering voorkomen worden. Voordat zulk beleid geïmplementeerd kan worden moet eerst bekend zijn wat de eventuele gevolgen zijn in termen van verwachte vangsten, en bestandsgrootte. In dit project simuleren wij de verwachtingen hierover met behulp van "management strategie evaluaties".

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	100	9.900
CAT IV	122	40	4.880
CAT V	143		
CAT VI	172		
Total Personnel			
			14.780
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			14.780
Financing through other resources			
Finance needed from KB WOT			14.780

Project 32 ☹	Increased growth in pike/pikeperch in lake Ijssel
Project leader	Tessa van der Hammen
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	Over the years, the length by age of perch and roach (and possibly also other species) in lake IJssel are increasing (see pictures in appendix), whereas nutrient levels (mainly phosphor; source: Rijkswaterstaat) have been decreasing.
Objective(s) of the project	Study the processes causing increased length by age of perch and roach.
Expertise needed	Knowledge of statistical analysis, data analysis (von Bertallanfy, body condition etc.), species interactions (inter and intraspecific), population dynamics.
Expertise developed	This project will gain insight in inter and intra processes going on in lake IJssel, which may also be applicable to other (international) fresh water systems.
Relevance for WOT	Perch and roach are fished commercially. Insight in the system will gain insight in future improved management of the stocks.
Why should this be funded by KB WOT?	It would aid management of the perch and roach stocks which are currently overfished and of other fresh water stocks.
What other potential funding sources have been considered?	Cooperation with other research going on in lake IJssel (BO projects, catch and effort advice, development of better management).
International objective of research	Perch and roach occur in many fresh water systems, also in foreign countries and are fished commercially.
Work plan	
Broad description of the project including expected results	Understanding the impact of a changing environment (biotic and abiotic) on processes such as growth, maturity and fecundity are essential for good management of fish stocks. Within the ecosystem of lake IJssel, fish stocks (large individuals) have decreased, nutrient levels have decreased, but length at age has increased. Within this project we will analyse the following hypotheses with statistical models: (1) better environmental conditions (food, temperature, visibility), (2) density dependence - because of the poor status of many lake IJssel stocks, there may be less competition for food (3) Interactions with other species (i.e. there is an increased number of gobies). If environmental conditions come out to be important factors, a DEB model could be developed to study the physiological processes going on and/or the ecosystem model developed by Brinkman will be parameterized.
Approach and time schedule	Start with statistical analyses of age and length data from the FYMA survey, gillnet survey and market sampling. Depending on results, make either a physiological DEB model to analyse effects of environmental conditions, develop a model describing interactions between species or parameterize the ecosystem model.
Output/deliverables	Report/peer reviewed article.
Dissemination of findings being addressed	Report/Peer reviewed article. Depending on the conclusions, it will also be communicated to the ministry, fishers and sport fishers.

Utility of the developed products and expertise	It will help in the ongoing discussion if the depletion of fish stocks in lake IJssel are caused by overfishing, nutrient depletion or both.
What are the potential risks to the project's success?	The increase is already observed and found statistically significant. It is not guaranteed that we find a good explanation for the observed trends.
Project organisation	
Involvement IMARES (names and expertise)	Tessa van der Hammen (knowledge Fyma data, statistical analysis, DEB expert),Tobias van Kooten (population dynamics expert), Karen van de Wolfshaar (expert competition and predation interactions), Bert Brinkman (knowledge ecosystem model lake IJssel)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	If a DEB model is being developed: Bas Kooijman (retired from VU, but still enthusiastic for discussions)
Relevance	
What is the market/ target audience	Fishers, managers, NGO's
Economical relevance	Perch and roach are commercially important fish species. Knowledge of the stocks in lake IJssel may improve the management of these species.
Social relevance	There is a discussion ongoing between fishers, sport fishers and other parties whether the depletion of fish stocks in lake IJssel is the result of the depletion in food availability, overfishing or both. For this discussion to stop, more scientific knowledge is needed.
Scientific relevance	Knowledge about the lake IJssel system and fresh water systems in general.
Relevance to ministry EZ	Management of commercially important fish stocks in lake IJssel.
Summary (UK)	In lake IJssel, length at age of perch and roach has increased. Within this project we will analyse the this increase with statistical models: (1) better environmental conditions (2) density dependence - (3) Interactions with other species. If environmental conditions come out to be important factors, a DEB model or the ecosystem model could be developed to study the physiological processes going on. This project will be important for managers to manage the overfished stocks.
Samenvatting (NL)	In het IJsselmeer is de lengte per leeftijd van baars en blankvoorn toegenomen. Binnen dit project zullen we deze toename analyseren met statistische modellen: (1) betere condities voor groei (2) dichtheid afhankelijkheid, (3) Interacties met andere soorten. Als condities zoals voedsel of temperatuur belangrijke factoren blijken te zijn, kan een DEB model worden ontwikkeld om de fysiologische processen te onderzoeken of het ecosysteem model ontwikkeld door Brinkman zal worden geparameteriseerd. Dit project zal van belang zijn voor managers om de overbeviste bestanden te beheren.

Proposed budget			
Personnel	**Tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	250	24.750
CAT IV	122	40	**4.880**
CAT V	143		
CAT VI	172		
Total Personnel			29.630
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			29.630
Financing through other resources			
Finance needed from KB WOT			29.630

Appendix: Length of Perch and Roach by age (numbers in the lines) and year. Data from Fyma (Roach) and fyma + market sampling (Perch)

Project 33 ☹	Top down impact of seals and fisheries on fish stocks
Project leader	Geert Aarts
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	The Wadden Sea (WS), is one of the largest intertidal areas of the world, is an important nursery and feeding area for fish species. In recent decades, stocks of larger/older fish have decline sharply, with fierce debate over potential causes. The **aim** of this project is to use data on predator processes (including fishery bycatch) to assess their causes of the declines.
Problem definition	To what extent could the WS's function as a nursery and feeding area be diminishing due to fishery pressures and/or increased predation?
Objective(s) of the project	1) Define all predators (including fisheries) that could cause a significant reduction in the WS fish stock. 2) Estimate total 'take' of demersal fish by the defined predators, with a prime focus on harbour seals (the most abundant large predator). 3) Evaluate to what extent these sources for mortality could contribute to the declining trend in fish abundance.
Expertise needed	Fisheries and Fish stock expertise: WOT DFS and BTS survey data, fisheries and bycatch data, and expert interpretation; Marine wildlife expertise: seal population counts and expert interpretation; Expertise in spatial and population modelling of marine wildlife (incl. fish).
Expertise developed	Basis for a multi-species, ecosystem-based management framework by combining various (WOT) data sources. Integration of higher and lower trophic levels in a marine food web.
Relevance for WOT	An ongoing national debate on the declining fish stocks is addressed in this project using data primarily collected in the WOT framework. Next to providing information to develop policy advice, this project will also demonstrate the value (& possible shortcomings) of the existing WOT data.
Why should this be funded by KB WOT?	It addresses a lack of knowledge on the causes of decline of fish biomass in the WS, and provides a scientific basis for the debate. It highlights the importance of different WOT data sources, and the added value of combining them in a single framework.
What other potential funding sources have been considered?	The results of this project will serve as a basis for more in depth studies of predator-prey relationships in the WS. The project aims to provide an overview. It will highlight knowledge gaps, providing direction for future applied fishery, nature management, or fundamental science studies, for which specific funding will be sought.
International objective of research	The WS is a transboundary UNESCO area, shared with Germany and Denmark. In addition, worldwide several marine mammal and bird populations are growing, fuelling international debate on the combined impact of natural predators and fisheries on coastal fish stocks.
Work plan	
Broad description of the project including expected results	1) Use survey data to estimate abundance and trend in fish biomass in the WS and adjacent waters. 2) Define if, in addition to seals, other possible predators could cause the declining fish stocks. 3) Estimate spatial foraging activity of seals and other predators (if required) and estimate their consumption based on energetic demand. 4) Estimate total bycatch of the shrimp fishing fleet. 5) Evaluate effects of estimated fish removal by seals and fisheries on fish population. 6) Use simulations to describe changes in fish biomass in space and time.

Approach and time schedule	Jan-Feb: Data collation. Mar-July: Estimate fish stock biomass, total seal consumption and fishery bycatch. Aug-Dec: Write publication
Output/deliverables	Estimates of total bycatch and consumption, scientific paper and symposium presentation to aid the national debate.
Dissemination of findings being addressed	Presentation at national/international conferences, open discussions with stakeholders to define policy measures and direct further studies. Press release following publication.
Utility of the developed products and expertise	This is a long standing/ returning question on which scientists have not been able to formulate an answer, even though much of the data needed are likely available. Given growing predator populations and calls for culls in neighbouring countries, a first step should be made to elucidate this issue.
What are the potential risks to the project's success?	Lack of data on seasonal variability in fish abundance and specific predator-prey consumption rates. However, data on the year-round distribution of seals and fishery bycatch are available to aid scenario interpretations.
Project organisation	
Involvement IMARES (names and expertise)	*Geert Aarts and MSc student*: Spatial modelling (main work). *Ingrid Tulp*: Fishery & bycatch, *Tobias van Kooten*: Modelling, *Jan-Jaap Poos*: Stock assessment, *Sophie Brasseur & Roger Kirkwood*: predator ecology.
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	N.A.
Involvement parties outside WUR (names and expertise)	Possibly Henk van der Veer (NIOZ) for year-round fish data
Relevance	
What is the market/ target audience	All organisations with an interest in the WS, e.g. Ministry EZ, provinces, fishing industry, recreational anglers, NGO's.
Economical relevance	The revenue of the Dutch shrimp fishery is ca €44 million, and seal watching is an important and growing industry in the WS.
Social relevance	Seals are charismatic megafauna and the shrimp fishery is a commercial industry. This study facilitates an evidence-based assessment of conflicts.
Scientific relevance	Roles of top-down control by marine predators can be underestimated, data from the WS provides an excellent test case.
Relevance to ministry EZ	The WS is of high ecological value (e.g. a Natura 2000 site, designated World Heritage Area) and is commercially exploited. This study will assist ecosystem-based assessment using top-level ecosystem interactions.
Summary (UK)	The WS's high ecological importance is recognised internationally. Fish stocks in the WS have declined in recent years. Fisheries and seals are potential causes. We will model the take by fisheries and predators. This will elucidate whether the WS has lost its function as a critical nursery area (ecological change), or if stock declines result from excessive take.
Samenvatting (NL)	De WZ is een natuurgebied van internationaal belang. Een aantal visbestanden in er zijn recent sterk gekrompen. Visserij en toegenomen aantallen zeehonden zijn als oorzaak aangemerkt. Hier berekenen we de vissterfte als gevolg van predatoren. We proberen te achterhalen of de afname te wijten is aan deze factoren, of dat de oorzaak moet worden gezocht in andere veranderingen in het gebied.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	175	17.325
CAT IV	122	150	18.300
CAT V	143		
CAT VI	172		
Total Personnel			35.625
Material costs			
Facilities			
Specific costs			
Travel costs			1.000
Project equipment			
Other material costs			
Total Material costs			1.000
Total project budget needed			
Financing through other resources			
Finance needed from KB WOT			36.625

Project 34 ☹	RayDyn
Project leader	Jan Jaap Poos
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	The ICES advice for rays and skates in the North Sea is now based on crude calculations of CPUE time-series from surveys in the North Sea. These CPUE time series are assumed to inform on the changes in abundance of different ray species in the North Sea as a whole. Ideally the advice on ray species is based on a more sound ecological understanding on what causes the changes in abundance. A better ecological understanding can be reached by analysing the surveys using the available length information, and the spatial structure in the survey data. The length information potentially disentangles effects of recruitment and mortality, while linking the spatial information to fisheries data may reveal the contribution of fisheries mortality to changes in overall mortality.
Objective(s) of the project	The aim of this project is to (1) get better estimates of abundance of the different ray species in the North Sea, (2) get a better understanding of what causes the changes in abundance, leading to (3) better advice on the exploitation of North Sea fish species on rays
Expertise needed	Knowledge on biology of rays, knowledge on survey data, knowledge on estimating population dynamics of data poor species.
Expertise developed	Spatial analysis of population dynamics of data poor species, including basic ecological processes. Two methods will be applied: length structured spatial GAMs (cf Poos et al. 2013) and a log-Gaussian Cox model as implemented by Kristensen et al. (2014).
Relevance for WOT	Improved understanding of the trends in abundance of rays in the North Sea, leading to improved advice .
Why should this be funded by KB WOT?	Under the WOT programme IMARES takes part in the ICES WGEF group. It is important that we improve the advice given through WGEF, and method development such as proposed here is of crucial importance to do so.
What other potential funding sources have been considered?	A student from Agrocampus in Rennes has shown interest in this subject and may come to IMARES in 2016 for a 6 months training period. She could do a parts of the required work.
International objective of research	Develop methods to evaluate population dynamics of rays and show the trends in abundance of rays in the North Sea in a manuscript to be submitted to a journal. Within ICES, we are leading an initiative to do intersessional work along the same lines, together with the WGEF chairs and the secretariat.
Work plan	
Broad description of the project including expected results	Spatial analysis of population dynamics of data poor species, including basic ecological processes. Two methods will be applied: length structured spatial GAMs (cf Poos et al. 2013) and a log-Gaussian Cox model as implemented by Kristensen et al. (2014). These methods disentangle effects of recruitment and mortality, while linking the spatial information to fisheries data may reveal the contribution of fisheries mortality to changes in overall mortality.
Approach and time	Q1: Prepare survey information (from DTRAS), Q2: implement methodology

schedule	in collaboration with Kasper Kristensen from DTU-Aqua Q3: Relate results to fisheries effort data and finish manuscript.
Output/deliverables	Draft manuscript
Dissemination of findings being addressed	Present results at ICES WGEF, submit manuscript to journal.
Utility of the developed products and expertise	The results may be used for the next round of advice on North Sea rays.
What are the potential risks to the project's success?	(1) Time constraints from researchers. mitigation measure: regular project group meetings. (2) Student not coming to IMARES. Mitigation measure: focus only on method by Kristensen et al. (2014) rather than also further develop GAMS
Project organisation	
Involvement IMARES (names and expertise)	Harriet van Overzee (ray biology), Jan Jaap Poos (population dynamics)
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	Jim Ellis (WGEF chair): North Sea ray biology and ecology. Kasper Kristensen (DTU-Aqua): log-Gaussian Cox model, Kasper has developed this in a "ready to use" package. Inigo Martinez (ICES secretariat): international planning
Relevance	
What is the market/ target audience	Ministry EZ
Economical relevance	The ray species are potentially a choking species for the fishery, depending on our perception on the stock trends and the effects of fisheries on these trends, different management measures will be taken, with different effects on fisheries.
Social relevance	The effects of fishing on species with life-history characteristics like rays are hot topics in societal debates.
Scientific relevance	Recent publications on the trends in ray species in the North Sea are rare, and the development of methods for data-poor stocks is much debated in scientific literature at the moment (e.g. special issue Fish Res)
Relevance to ministry EZ	Knowledge on stock status of rays in the North Sea and improved and advice that appropriately accounts for effects of fishing on ray stocks.
Summary (UK)	This project analyses the surveys using the available length information, and the spatial structure in the survey data. The length information potentially disentangles effects of recruitment and mortality, while linking the spatial information to fisheries data may reveal the contribution of fisheries mortality to changes in overall mortality. To this end, two novel methods are used. The results allow for advice that appropriately accounts for effects of fishing on ray stocks.
Samenvatting (NL)	Dit project analyseert survey gegevens om een beter begrip te krijgen van de ecologische processen achter de dynamiek in de roggen bestanden. Door gebruik te maken van de lengte en ruimtestructuur in de survey gegevens kunnen we verschillende processen scheiden met behulp van innovatieve assessment methoden. De resultaten kunnen leiden tot een beter beheer

	van de roggen bestanden.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	40	3.960
CAT IV	122	140	17.080
CAT V	143		
CAT VI	172		
Total Personnel			
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			21.040
Financing through other resources			
Finance needed from KB WOT			21.040

Project 35 ☹	Discard ogives
Project leader	Ruben Verkempynck
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	Under the impending Landing obligation (LO) it is important to gain better insight in the factors that might influence the probability of a fish being discarded. Modelling discard ogives is an approach that provides a means of more fully extracting the information content of available data. Such modelling approaches can also be used to minimize ''noise'' in the available data while still presenting some measure of precision. Moreover, discard models may be used to predict discards in unsampled strata or into the future for partially discarded length/age classes. Discarding can be expressed as the probability of an individual being discarded at a given length. For commercial species, this probability generally decreases with increasing length and is zero after a certain length, because the specimen will eventually attain a commercial size and will be landed. Such data will have an S-shape curve and have been described as discard ogives. While estimating these species-specific curves, one can determine the effect of certain variables (e.g. year, area, gear) on the probability of discarding. The Dutch demersal fishery has undergone many developments in the last thirty years. Therefore it is important to gain knowledge on the discarding patterns of the main stocks caught (plaice, sole, dab) through the analysis of discard ogives and describe the dynamics of discarding through the last thirty years.
Objective(s) of the project	(i) Gain better insight in the patterns of dynamics in the recent history of the Dutch flatfish fishery (ii) Construct discard ogives from available discard monitoring data through general additive modelling (GAM)
Expertise needed	Statistics, discard data
Expertise developed	Modelling of discard ogives, discarding dynamics
Relevance for WOT	Very relevant as a better understanding of discarding patterns can increase the strength of advice and content of WOT demersal discard reporting
Why should this be funded by KB WOT?	This should be funded by KB WOT as this is an excellent addition to carried out under the demersal discards programme
What other potential funding sources have been considered?	None
International objective of research	Optimising modelling approach of discard ogives Increasing knowledge base of discarding practice in the North Sea
Work plan	
Broad description of the project including expected results	First, discard data collected historically at RIVO and IMARES will be gathered, through GAM the probability of fish being discarded at certain lengths will be described in accordance with certain explanatory variables
Approach and time schedule	Jan-Mar: collection of discard data, Apr-Jul: selection of explanatory variables and modelling approach, Aug-Sep: GAM analysis, Oct-Nov: result analysis and writing of manuscript
Output/deliverables	Manuscript detailing findings from discard modelling Chapter on discarding patterns in yearly WOT report

Dissemination of findings being addressed	Ambition is to write a manuscript for submittal in a scientific journal Discard ogives can be added to yearly WOT reporting
Utility of the developed products and expertise	Analysis of results derived can be used in policy advising and, stock assessment and catch monitoring Methodology approach can be used for other fisheries and stocks
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Chen Chun, Ruben Verkempynck, Karin van der Reijden
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	WGNSSK, policy makers at WGNSSK
Relevance	
What is the market/ target audience	Ministry of EZ, scientific community
Economical relevance	Better understanding in discarding practices
Social relevance	New insight in discarding in Dutch demersal fisheries
Scientific relevance	Modelling approach of discarding ogives, better knowledge of discarding patterns in North sea
Relevance to ministry EZ	Better knowledge base for advice of avoiding discards under LO
Summary (UK)	The development of discard ogives are an appropriate way of improving knowledge on discarding patterns. In this project the aim is to model discard ogives of plaice, sole and dab using GAM and analysing trends over the last thirty years. This way, advice for avoiding discarding under the LO can be better substantiated.
Samenvatting (NL)	Discard ogieven zijn een aangewezen manier om kennis over de dynamiek van discarden te verbeteren. In dit project worden discard ogieven van schol, tong en schar ontwikkeld met GAM. Op deze manier kan de advisering voor het beleid onder de aanlandplicht beter onderbouwd worden.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	168	16.632
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			16.632
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			16.632
Financing through other resources			
Finance needed from KB WOT			16.632

Project 36 ☹	Sampling units and auxiliary variables in Dutch discard monitoring programme
Project leader	Ruben Verkempynck
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	The demersal discard programme in the Netherlands has undergone many changes in recent history. Since the reform of the DCF, self-sampling has been incorporated which has resulted in a better coverage of the many metiers in the diverse Dutch demersal fishery. However, the raising procedure and sampling unit based on assumptions from the main fleet segment are also used for raising of all other metiers in the reference fleet. Landings and fishing effort have been the auxiliary variables used by the majority of discard studies found in the literature. Unfortunately, there is evidence that effort and landings might not always be proportional to discards. Furthermore, most published studies do not investigate the relationship between the variables used and discarding. In some metiers, landings or effort might even behave non-linearly with discards, and the resulting discard estimates are likely to be biased. Another problem in discard estimation is the choice of sampling unit to be considered. Discard data has a hierarchical structure—hauls are nested within fishing trips, which are nested within vessels. This structure allows for discard estimations based on a multilevel approach or at different levels (dependent on the level at which the sampling unit is considered). A multilevel analysis may be optimal since it considers the input of each sampling unit in the overall nested variance estimation. However, using multistage formulas requires detailed fleet information (number of hauls, trips and vessels in the fishing fleet), which is usually unavailable in most fisheries. In many studies, the sampling unit is simply adopted without an investigation of its impact on the variability of the final estimation. The aim of this project is to examine the potential sampling units and auxiliary variables for metiers within the Dutch demersal fleet and analyse the consequences of these choices.
Objective(s) of the project	(iii) Examine potential sampling units in diverse Dutch demersal fleet (iv) Examine potential auxiliary variables for raising (v) Analyse consequences of choices on different aggregation levels
Expertise needed	Catch monitoring, statistics, monitoring design, discard data
Expertise developed	Better insight in catch monitoring design and discard data raising
Relevance for WOT	Highly relevant as this would strengthen scientific basis of discard monitoring programme
Why should this be funded by KB WOT?	By investing in this proposal both the monitoring programme as the discard estimations going into the yearly assessments will be ameliorated
What other potential funding sources have been considered?	None
International objective of research	Achieve better practice in discard data raising of broad range of metiers operating in the North Sea
Work plan	
Broad description of the project including expected results	First discard data on different levels and auxiliary variables should be aggregated. Secondly a regression analysis will be conducted to examine the relationships between auxiliary variables at each sampling unit. Next,

	discards sampled per stratum will be raised for each potential combination of auxiliary variables and sampling units. To determine if significant differences are used between auxiliary variables, and to investigate if temporal trends are apparent an extensive statistical analysis will be conducted. Finally results will be analysed and reported.
Approach and time schedule	Jan-Mar: Data aggregation, Mar-May: Raising of all potential combinations of sampling unit and auxiliary variable, Jul-Sep: Statistical analysis, Oct-Nov: Analysis of results and drafting of manuscript
Output/deliverables	Working document for WGCATCH Manuscript for submittal in scientific journal Better understanding of raising procedures for demersal discard data
Dissemination of findings being addressed	Presentation of findings and methodology approach at WGCATCH and through submittal of a manuscript to scientific journal
Utility of the developed products and expertise	The results of this project can be used to ameliorate the raising procedures and sampling design of several metiers in the demersal discard programme
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Chen Chun, Ruben Verkempynck, Edwin van Helmond, Harriet van Overzee, Karin van der Reijden
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	No
Involvement parties outside WUR (names and expertise)	Members of WGCATCH, ministry of Economic Affairs
Relevance	
What is the market/ target audience	Scientists responsible for catch monitoring and discard data
Economical relevance	New raising procedures can result in better estimates of discards.
Social relevance	Discards from less dominant metiers in Dutch fisheries fleet are adequately raised
Scientific relevance	Better insight in raising strategies for a broad range of metiers operating in the North Sea
Relevance to ministry EZ	Better discard estimates for all metiers in Dutch demersal fisheries fleet Better raising procedures in WOT demersal discard programme
Summary (UK)	The aim of this project is to gain better insight in the auxiliary variables and sampling unit in all metiers of the reference fleet used in the WOT demersal discard programme. A statistical analysis of different raising strategies will be undertaken and consequences of choice will be analysed.
Samenvatting (NL)	Dit project wil een betere kennis ontwikkelen van de verschillende monstereenheden en variabelen voor het opwaarderen van discard data van metiers uit het WOT demersale discard programma. Een statistische analyse van de verschillende opwaarderingen en analyse van de consequenties wordt volbracht.

Proposed budget			
Personnel	tariff	hours	amount (€)
CAT I	58		
CAT II	79		
CAT III	99	240	23.760
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			23.760
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			23.760
Financing through other resources			
Finance needed from KB WOT			23.760

Project 37 ☺	Discards ashore
Project leader	Ruben Verkempynck
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	The landing obligation (LO) for demersal fisheries is phased in starting from the 1st January 2016. Fishermen will be obliged to land their unwanted catches. It is expected that these unwanted landings will be quite substantial. At the same time good estimates are lacking for information and good policy advising. Since the behaviour of fisherman is uncertain under the LO, the estimates should be calculated under specific scenario's (single species, mixed fisheries, …). Under the DCF, the Netherlands has an obligation to deliver suitable catch (wanted and unwanted catches) estimates. With the phasing in of the landings obligation three "flows" are expected; (i) wanted landings that are commercialized for direct human consumption, (ii) unwanted catches that will be discarded at sea, and (iii) unwanted catches that have to be landed but that are not intended for direct human consumption. Previously, unwanted catches in the Dutch demersal fisheries were monitored at sea by observers and an extensive self-sampling programme. A new flow of unwanted catches will have to be monitored ashore. How this will have to be set up, insuring scientific validity and, at the same time, practicality, is necessary to investigate.
Objective(s) of the project	(vi) Inform community (scientific, policy, and industry) about expected unwanted catches under different scenario's (vii) Develop monitoring design for unwanted landings that is statistically and practically solid
Expertise needed	Catch monitoring, statistics, monitoring design, discard data
Expertise developed	Estimating unwanted catches, setting up monitoring of unwanted catches ashore
Relevance for WOT	Highly relevant as a new flow of unwanted catches will have to be monitored ashore and there is no monitoring design to this issue yet.
Why should this be funded by KB WOT?	By investing in this proposal both the yearly advice of catch options will be extended with an informative estimate of predicted unwanted landings which will make it more relevant for many potential new actors. At the same time, a new monitoring design will be made that could extend the WOT discards programme and can possibly integrate with the current market sampling.
What other potential funding sources have been considered?	BO Uitvoering GVB 2016 was considered but the idea did not make the cut.
International objective of research	Achieve better practice in catch monitoring
Work plan	
Broad description of the project including expected results	(i) Analyses of discarding rates and patterns over last 5 years forming bases of estimations of unwanted catch, (ii) coupling latest stock assessment results with discarding rates, (iii) Incorporating scenario's with unwanted catch estimates, (iv) incorporate unwanted catch estimates into ACOM advice, (v) map unwanted catch landings, (vi) develop statistical power analysis for unwanted catches (vii) combine results with practical approach (viii) report monitoring strategy

Approach and time schedule	Jan-Mar: Data analysis of discarding rates, Mar-May: develop scenario's for estimations of unwanted catches, Jun: present estimated results, perform power analysis, Jul-Aug: derive ideal monitoring design and combine results with reality, Aug-Sep: fine tune monitoring design, Oct: write report
Output/deliverables	(i) Design framework for monitoring unwanted landings, (ii) Estimations of unwanted landings (iii) Report (iv) case study at WGCATCH
Dissemination of findings being addressed	Presentation of estimations of unwanted landings at ACOM advice to ministry EZ, NGO's and industry, article in Visserijnieuws, Report to IMARES
Utility of the developed products and expertise	A practical monitoring design for unwanted landings, estimations of unwanted landings
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Chen Chun, Ruben Verkempynck , Marcel Machiels, Marcel de Vries, Harriet van Overzee, Thomas Brunel, Sieto Verver
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	No
Involvement parties outside WUR (names and expertise)	Other member states with obligation to monitor unwanted landings
Relevance	
What is the market/ target audience	Industry, policy-makers, WGCATCH
Economical relevance	Estimations of unwanted catches for handlers of cat. III fish
Social relevance	Estimations of unwanted catches
Scientific relevance	Sound monitoring design for unwanted landings brought ashore
Relevance to ministry EZ	Compliance with DCF
Summary (UK)	A new stream of discards will be landed in the harbours under the LO. How many discards this will be has not been quantified yet. Additionally, these landed discards will need to be monitored. The aim of this project is to estimate how much discards will potentially be landed and to design a monitoring scheme of these landed discards.
Samenvatting (NL)	Onder het DCF is NL verplicht vangsten te bemonsteren. Zo zal er een nieuwe stroom bijvangsten die nu verplicht moeten aangevoerd worden, aangeland worden in de havens, met de invoering van de aanlandplicht. Om hoeveel volume aan te landen bijvangsten het gaat is nog niet geschat. Daarnaast zullen deze aanlandingen gemonitord moeten worden, hoe dit volbracht moet worden is nog niet gekend. Dit project beoogt te kwantificeren hoeveel discards er mogelijk aangeland worden en hoe deze efficiënt gemonitord kunnen worden.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	24	1.896
CAT III	99	320	31.680
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			33.576
Material costs			
Facilities			
Specific costs			
Travel costs			500
Project equipment			
Other material costs			
Total Material costs			500
Total project budget needed			34.076
Financing through other resources			
Finance needed from KB WOT			34.076

Project 38 ☺	Use of electronic measuring devices
Project leader	Ruben Verkempynck
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	On several seagoing trips, registration and import of data of length measurements is time consuming, e.g. shrimp fishery and large demersal trawlers. This lag in data entry leads to i) a delay in the data availability and ii) a high risk of errors. Many other fisheries research institutions use or have developed their own electronic measuring devices(EMDs), and its use could solve above mentioned problems. Also in the past IMARES has tried to introduce these systems but it did not lift off the ground due to i) the complexity and state of the EMDs, and ii) limited participation of users.
Objective(s) of the project	To investigate latest possibilities of EMDs from other research institutions and how they can be used at IMARES
Expertise needed	Catch handling procedures, programming expertise of translation of EMD output to IMARES database format, data quality checking
Expertise developed	Use of EMDs, efficient catch handling protocols
Relevance for WOT	Highly relevant as many WOT projects as well as other IMARES projects use catch handling protocols where fish is measured. The use of EMDs will results in improved data quality and dataflow.
Why should this be funded by KB WOT?	This project should be funded by KB WOT because it would improve the data collection of many WOT projects.
What other potential funding sources have been considered?	Project funding, but it is limited
International objective of research	Achieve better practice in catch handling, improved data quality for stock assessments, collaboration with other fisheries research institutions
Work plan	
Broad description of the project including expected results	First, Belgian and German research institutions will be contacted for information of their EMD use and prototypes and permission to use their EMDs on loan will be obtained. Then, lab testing with EMDs is conducted together with sea-going observers and other catch handlers and its use is evaluated. These findings will be reported. Secondly, EMDs will be tested on board and evaluated. These findings will be added to the draft report. Simultaneously the EMDs are evaluated in terms of possible translation of their output of EMDs into IMARES database and workflow. At last, the traditional methods of measuring fish and method using EMDs is assessed and, if necessary catch handling protocols are rewritten and basics will be set into place for the development of an interface with the IMARES database.
Approach and time schedule	Jan-Feb: contact other research institutions, Mar-Apr: Obtain EMDs on loan and conduct lab testing, May-Jul: report findings and evaluate potential of EMDs in terms of translation of output into IMARES database, design on board testing, Aug-Oct.: conduct on board testing and report findings, Nov-Dec: evaluate use of EMDs and assess their potential versus traditional methods, and rewrite catch handling protocols if necessary.
Output/deliverables	i) Report on potential use of EMDs in lab and on board

	ii) rewritten catch handling protocols if EMD use is considered successful
Dissemination of findings being addressed	IMARES reporting Internal workshop for sea-going observers and other catch handlers
Utility of the developed products and expertise	The new devices will be used during work on board, for WOT projects and other projects where field work is involved. A secondary benefit could be the improved selection of fish for ageing, which is important for the Law on animal testing (WoD).
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Ruben Verkempynck, Daniël Benden, Thomas Pasterkamp, Douwe van den Ende, Michiel Dammers, Pieke Molenaar, Ingeborg de Boois, Harriët van Overzee, Marcel de Vries, Betty van Os, Hanz Wiegerinck
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	No
Involvement parties outside WUR (names and expertise)	Von Thünen Institute (Germany), ILVO (Belgium)
Relevance	
What is the market/ target audience	Sea-going observers and other catch handlers, several project leaders of projects where fish is measured
Economical relevance	Efficient and faster data collection
Social relevance	Work alleviation of sea-going observers on trips with difficult length measuring
Scientific relevance	Data quality of field activities will be better guaranteed, data will be available sooner after the fieldwork
Relevance to ministry EZ	Data quality of field activities will be better guaranteed
Summary (UK)	This project will investigate the use of existing EMDs in the data collection and workflow of IMARES. The EMDs will be tested in the lab and on board and findings will be reported and disseminated under sea-going observers and other catch handlers.
Samenvatting (NL)	Dit project beoogt te onderzoeken hoe bestaande toepassingen van EMDs gebruikt kunnen worden in de data collectie en stroom van IMARES. Het gebruik van de EMDs wordt getoetst in het lab en aan boord. Bevindingen van het gebruik worden gerapporteerd en onder de zeegaande waarnemers en andere potentiele gebruikers meegedeeld.

Proposed budget			
Personnel	tariff	hours	amount (€)
CAT I	58		
CAT II	79	110	8.690
CAT III	99	40	3.960
CAT IV	122		
CAT V	143		
CAT VI	172		
Total Personnel			12.650
Material costs			
Facilities			
Specific costs			
Travel costs			500
Project equipment	500 (possible loan fees of equipment)		
Other material costs			764
Total Material costs			1.764
Total project budget needed			14.414
Financing through other resources			
Finance needed from KB WOT			14.414

Project 39 ☹	Cooperative research
Project leader	Karin van der Reijden
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	The WOT program increasingly leans on cooperative research where scientists and fishers collaborate to collect data. Such cooperative research is argued to be a fundamental element in successful management of fisheries worldwide. Due to cooperative research, (more) data with higher spatial and seasonal cover can be collected. In addition, working together increases mutual understanding and knowledge and improves transparency. However, cooperative research knows several pitfalls and if these are not avoided could lead to biased data and increasing mistrust among fishers and scientists. In this project we aim to evaluate previous collaborative research in the Netherlands and learn what are the key elements for successful cooperation within the WOT program.
Objective(s) of the project	This project will deliver an overview of cooperative research conducted in the Netherlands and international literature. From these a framework for successful cooperative research will be developed.
Expertise needed	Cooperative research experience
Expertise developed	Expertise on factors for successful cooperative research
Relevance for WOT	The reformed EU Common Fisheries Policy (CFP) emphasizes the need for a solid, scientific basis of the fisheries management plans stimulating the cooperation between fisheries and scientists. Many WOT projects already rely on cooperation with the industry and this project will identify factors that ensure successful collaboration.
Why should this be funded by KB WOT?	Many WOT projects rely already on cooperation with the industry. Investing in this project through KB WOT would help identify factors of success in cooperative research and may improve collaboration in current WOT projects.
What other potential funding sources have been considered?	None
International objective of research	This project will develop a framework than can be used for starting cooperative research in fisheries science worldwide.
Work plan	
Broad description of the project including expected results	(1) Broad literature review. (2) Compile experiences of Dutch cooperative research. (3) Structured review of experiences. (4) Identify factors to success and failure. (5) Establish a generic framework.
Approach and time schedule	Jan-Mar: review of existing literature, Feb-Apr: deriving experience from Dutch examples, May-Jul: structural review of knowledge base, Aug-Sep: development of framework, Oct-Nov: writing of manuscript
Output/deliverables	Framework for successful cooperative research; Manuscript for submittal in scientific journal
Dissemination of findings being addressed	Lunch presentation at IMARES on findings Working documents in ICES WGMARS or WGCATCH, presentation at the MSEAS conference
Utility of the developed	All projects where cooperative research can potentially be considered

products and expertise	
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Karin van der Reijden, Ruben Verkempynck, Jan Jaap Poos, Marloes Kraan, Ingeborg de Boois
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	None
Involvement parties outside WUR (names and expertise)	WKMARS, participants of MSEAS conference
Relevance	
What is the market/ target audience	Scientists, marine policy makers and fisheries representatives interested in cooperative research
Economical relevance	Science and industry cooperation
Social relevance	Better understanding and guidance for cooperative research
Scientific relevance	Generic framework for setting up cooperative research
Relevance to ministry EZ	Better advice for policy coming from results derived from cooperative research
Summary (UK)	This project aims at developing a generic framework that can guide users to successfully set up cooperative research. Through an extensive literature review and building on experience developed in the Netherlands factors for success and potential pitfalls will be identified and incorporated into a framework that can be used for setting up successful cooperative research.
Samenvatting (NL)	Dit project heeft als doel een kader te ontwikkelen waarmee gebruikers succesvolle projecten in samenwerking met de sector kunnen opzetten. Door middel van een diepgaande literatuurbeschrijving en op basis van ervaring uit Nederland kunnen succesfactoren en mogelijke valkuilen geïdentificeerd worden. Deze zullen dan in een werkbaar kader geïncorporeerd worden dat kan dienen om succesvolle samenwerkingsprojecten op te zetten.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79		
CAT III	99	160	15.840
CAT IV	122	30	3.660
CAT V	143		
CAT VI	172		
Total Personnel			19.500
Material costs			
Facilities			
Specific costs			
Travel costs			500
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			20.000
Financing through other resources			
Finance needed from KB WOT			20.000

Project 40 ☹	Fisheries behaviour
Project leader	Marloes Kraan
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	Fisheries behaviour research in fisheries science is predominantly done by natural scientists and economists. Mostly by assessing available catch and effort data and by modelling. Fisheries behaviour currently is thus approached by *inferring* human behaviour from statistics. From recent projects (CCTV, displacement, and landing obligation) we have learnt that our current research approaches can be strengthened by making use of social science methods (interviewing, focused group discussions). This 'add-on' approach can however be taken a step further by fully integrating the methods and by building a new theoretical framework of understanding fisheries behaviour. IMARES can play a leading role in this new field. The landing obligation provides an important reason to work on this topic now. It is a fundamental change in policy which makes traditional research methods and analysis-approaches inadequate
Problem definition	How should fisheries behaviour be understood, which methods and theories are available to study it and how can these different approaches be brought together?
Objective(s) of the project	Develop a new theoretical framework and develop new ways of collecting, and analysing data of fisheries behaviour.
Expertise needed	Social science, fisheries science, as well as practical knowledge of sea-going observers and fishermen
Expertise developed	Transdisciplinary approaches,
Relevance for WOT	This project will improve WOT monitoring & improve fisheries advice based on better understanding of fisheries behaviour.
Why should this be funded by KB WOT?	The landing obligation is such a change of fisheries policy that it has major consequences for fisheries behaviour which can inadequately be understood by current sampling protocols and data analyses.
What other potential funding sources have been considered?	None
International objective of research	It is expected that the article and the new sampling approach will have significant interest from the wider fisheries science society.
Work plan	
Broad description of the project including expected results.	1.Setting the stage: writing a review article on fisheries behaviour from an interdisciplinary perspective. 2. Developing a new sampling protocol by including the gathering of information about choices fishermen make before and at sea (i.e. gear adjustments, target species) as well as log fishing circumstances. In the pilot we will also test how this additional info will improve our analysis in (WOT) reporting.
Approach and time schedule	Jan-Feb: literature review, Mar-Apr: development of a new sampling protocol based on review outcome, together with sea-going observers, May: presentation of questionnaire to sea-going observers, Jun-Sep: testing of questionnaire and evaluation, Oct-Nov: rewriting of observer protocols and results translation to (WOT) reporting, Aug-Dec: manuscript
Output/deliverables	Peer reviewed review article of fisheries behaviour in scientific journal. New sampling protocol .

Dissemination of findings being addressed	Scientific community through article (WOT) reporting
Utility of the developed products and expertise	Better understanding of outcomes through addition of new data source in a transdisciplinary approach
What are the potential risks to the project's success?	None
Project organisation	
Involvement IMARES (names and expertise)	Marloes Kraan - Adriaan Rijnsdorp - Jan Jaap Poos - Edwin van Helmond - Ruben Verkempynck - Marcel de Vries - Brita Trapman - Luc van Hoof
Is the appropriate capacity available?	Yes
Involvement parties within WUR (names and expertise)	LEI – Hans van Oostenbrugge / Katell Hamond
Involvement parties outside WUR (names and expertise)	NA
Relevance	
What is the market/ target audience	Project leaders with projects dealing with WOT data collection, landing obligation and cooperative science (science/industry)
Economical relevance	Better understanding of economic drivers behind (WOT) project outcomes
Social relevance	Better understanding of social drivers behind (WOT) project outcomes
Scientific relevance	Development of a new interdisciplinary theoretical framework on fisheries behaviour.
Relevance to ministry EZ	An improved understanding of fisheries behaviour helps in providing advice on fisheries management (in relation to the landing obligation).
Summary (UK)	This project aims at developing a new interdisciplinary theoretical framework on fisheries behaviour and of new at sea sampling methods to improve our WOT programme resulting in better advice to the ministry.
Samenvatting (NL)	Dit project beoogt een nieuw interdisciplinair theoretisch kader te ontwikkelen over visserijgedrag en nieuwe monster protocollen voor zeereizen zodat WOT project resultaten een beter begrip opleveren van visserijgedrag, resulterend in beter advies.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	40	3.160
CAT III	99	200	19.800
CAT IV	122	20	2.440
CAT V	143	40	5.720
CAT VI	172		
Total Personnel			31.120
Material costs			
Facilities			
Specific costs			
Travel costs			200
Project equipment			
Other material costs			600
Total Material costs			800
Total project budget needed			31.920
Financing through other resources			
Finance needed from KB WOT			31.920

Project 41 😊	Demographic profile of recreational fisheries
Project leader	Tessa van der Hammen
Theme	1. Underpinning WOT fisheries programme
Motivation and Project aims	
Problem definition	One of the reasons why estimating catches by recreational fisheries is a major challenge is because there are many recreational fishers (~7-11 % of the Dutch population) and recreational fishers enter and leave the sector. The Dutch Recfish survey takes place every other year, and in the future might take place once every three years. To be able to provide reliable catch estimates in the intermediate years, knowledge of the population of recreational fishers is needed and their motivation to enter or leave the recreational fisheries.
Objective(s) of the 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.
Expertise needed	Statistics, knowledge Recfish database, recreational fisheries sector
Expertise developed	Improved catch estimates for recreational fisheries.
Relevance for WOT	Improvement of the accuracy of catch estimates for listed species in years between the WOT Recfish surveys.
Why should this be funded by KB WOT?	Improve the accuracy of recreational catch estimates for species such as cod, seabass, eel and salmon.
What other potential funding sources have been considered?	WOT Recfish. Part of this project will be financed through these hours, but usually not enough hours are available to do any additional analyses and write peer reviewed articles.
International objective of research	Catch estimates by recreational fisheries are now added to stock assessments (i.e. seabass, Baltic cod). For species such as seabass, cod and eel, catches compared to commercial catches are substantial (15-40%).
Work plan	
Broad description of the project including expected results	This December, the 4th online screening survey will take place (the 1st was in 2009). Thus there is a substantial time series of the number of people engaged in recreational fisheries. In addition, a telephone survey has been done to compare methods. The surveys will be compared and tested statistically on trends. Some participants have joined all 4 online surveys, and can be followed in time to see whether they have entered or left the survey or have changed their avidity (nr of yearly fish trips). Trends in avidity can and will also be analysed. If a significant trend is found, we will use the prediction of the model in years in which there is no screening survey to estimate the number of recreational fishers in these years. We will use this in combination with catch rates from the logbook surveys to estimate the catches of the years in which there is no survey.

Approach and time schedule	June-august 2016: analyse the data, make statistical models, September-October: write results.
Output/deliverables	Peer reviewed article.
Dissemination of findings being addressed	The aim is to publish the findings in a peer reviewed journal. Also in the yearly WOT report, the results will be presented and the estimates will be sent to the stock assessors of cod, seabass and to the ICES eel working group. The results will be presented at WGRFS.
Utility of the developed products and expertise	Results will be shared with WGRFS. It will give insights in the accuracy of the recreational fish surveys and on the catch estimates provided to the stock assessors.
What are the potential risks to the project's success?	Little risk for results that can be published is expected. 4 of the 5 surveys have already been executed. Around 100 thousands participants join each survey, so statistical power is definitely expected.
Project organisation	
Involvement IMARES (names and expertise)	Tessa van der Hammen (statistical analysis, reporting), Martin de Graaf (knowledge recreational fish sector), Daniel Benden (knowledge data, recreational fish database), Pieke Molenaar (knowledge recreational fish sector, discussion).
Is the appropriate capacity available?	YES
Involvement parties within WUR (names and expertise)	
Involvement parties outside WUR (names and expertise)	Jaap Quak & Remko Verspui (Sportvisserij Nederland, discussion) Anneloes Klaassen (TNS NIPO, discussion), Jeremy Lyle (expert Recreational fisheries surveys)
Relevance	
What is the market/ target audience	EU, EZ, Sportvisserij Nederland, stock assessors, WGRFS, scientists.
Economical relevance	The value of the total recreational fishery in the Netherlands is ~350 million. Survey design might be improved and be less costly in the future.
Social relevance	The stocks of species such as cod, seabass and eel are critical and accurate catch estimates are essential for the management.
Scientific relevance	Better stock assessments (especially seabass). Input in discussions about catches by recreational fishers by commercial fishers (esp. eel and seabass)
Relevance to ministry EZ	Accurate catch estimates are essential for the management and regulation of stocks that are under threat. Obligation to report catch estimates with high precision.
Summary (UK)	Estimating catches by recreational fishing is a major challenge because there are many recreational fishermen (~ 7-11% of the Dutch population) who fish irregularly. The WOT Recfish survey takes place every other year. To make reliable catch estimates in the intermediate years, knowledge of the number of recreational fishermen and their motivation to enter or exit the recreational fishery is needed. Dec. 2015 will be the 4th screening survey and a single telephone survey was also executed to compare methods. The surveys will be compared and statistically tested for trends. Some participants took part in all four surveys, which can be followed over time to see if they have left or entered the sector. Trends in avidity (number of fishing trips) will also be analysed.
Samenvatting (NL)	Het berekenen van vangsten door de recreatieve visserij is een grote

uitdaging doordat er veel recreatieve vissers zijn (~ 7-11% van de Nederlandse bevolking) en deze onregelmatig vissen. De WOT Recfish survey vindt om het jaar plaats. Om betrouwbare vangstschattingen te maken in de tussenliggende jaren, is kennis van de deelnemers aan recreatieve vissers nodig en hun motivatie om in of uit de recreatieve visserij te stappen. Dec. 2015 zal de 4e screening survey plaatsvinden, daarnaast is een telefonische enquête gedaan om methoden te vergelijken. De onderzoeken zullen worden vergeleken en statistisch getest op trends. Sommige deelnemers hebben meegedaan aan alle 4 surveys, en kunnen gevolgd worden in de tijd om te zien of ze de sector verlaten hebben of juist toegetreden zijn. Trends in fanatisme (aantal vistrips) zullen ook worden geanalyseerd.

Proposed budget			
Personnel	**tariff**	**hours**	**amount (€)**
CAT I	58		
CAT II	79	24	1.896
CAT III	99	150	7.920
CAT IV	122	20	2.440
CAT V	143		
CAT VI	172		
Total Personnel			19.186
Material costs			
Facilities			
Specific costs			
Travel costs			
Project equipment			
Other material costs			
Total Material costs			
Total project budget needed			19.186
Financing through other resources			6.930
Finance needed from KB WOT			12.256