

Deliverable 9.13

First Periodic Activity and Management Report

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Main Contributors:

Adriaan D. Rijnsdorp & Gerda Booij , IMARES (Partner 1, Dienst Landbouwkundig Onderzoek, Netherlands)

Ole R. Eigaard, National Institute of Aquatic Research (Partner 9, DTU Aqua, Denmark)

Andrew Kenny, The Secretary of State for Environment, Food and Rural Affairs (Partner 3, CEFAS, UK)

Jan Geert Hiddink, Bangor University (Partner 4, BU, UK)

Katell G. Hamon, LEI (Partner 1, Dienst Landbouwkundig Onderzoek, Netherlands)

Gerjan Piet, IMARES (Partner 1, Dienst Landbouwkundig Onderzoek, Netherlands)

Antonello Sala, National Research Council (Partner 14, CNR, Italy)

Rasmus Nielsen, National Institute of Aquatic Research (Partner 9, DTU Aqua, Denmark)

Hans Polet, ILVO (Partner 2, Vlaams Gewest, Belgium)

Pascal Laffargue, IFREMER (Partner 7, Institut Francais de Recherche pour l'Exploration de la Mer, France)

Dave Reid, MI (Partner 8, Marine Institute, Ireland)

Lene Buhl-Mortensen, IMR (Partner 13, Havforskningsinstituttet, Norway)

Chris Smith, HCMR (Partner 15, Hellenic Centre for Marine Research, Greece)

Mustafa Zengin, Central Fisheries Research Institute (Partner 16, CFRI, Turkey)

Olavur Gregerson, SME01 (Partner 17, Synthesa, Faroer)



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SUMMARY

This deliverable reports on the activities and progress made during the first 18 month of the FP7-project BENTHIS. The project studies the effect of fishing, in particular bottom trawling, on the sea bed and the benthic ecosystem and studies in collaboration with the fishing industry innovative fishing techniques and management measures to mitigate the impact. After an introduction on the objectives and the approach, the activities conducted for the individual tasks are reported, as well as the progress made and the results obtained so far. Deviations from the work plan in Annex 1 (DOW: Description of work) are noted. Most are relatively small and none are hampering the progress of the work scheduled for the second period. BENTHIS is well on track and all milestones and most of the deliverables set for the 1st reporting period have been achieved. Exceptions are the deliverables due on the last day of this period and the minutes of the meeting of the Stakeholder Advisory Board which are currently under review and will be submitted around month 21. The 2nd Regional Case Study Meetings are postponed in order to discuss the results of the field work scheduled in 2014. In the 1st reporting period already 6 papers were published in the peer reviewed journals and another 4 were submitted for publication.

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INTRODUCTION

Fishing has a major impact on marine ecosystems in general and benthic ecosystems in particular (Halpern et al. 2008; Jackson et al. 2001). The main fishing gears utilised on the continental shelves are towed bottom gears such as otter and beam trawls. Because these gears are heavy when in contact with the seabed, they cause significant mortality among the animals that live on the seabed and this results in chronic alteration of the state and functioning of seabed ecosystems. There is evidence for a loss in biodiversity and shifts in the benthic community from large long-lived species to small fast growing species (Frid and Hall, 1999). There is also a major concern about the detrimental effects of fishing on bioengineering species such as cold water corals, sponge aggregates, mussel beds, and on the long lived and slow growing megafauna (e.g. burrowing crustaceans: Duineveld et al. 2007). These changes not only affect the biodiversity but also affect the benthic ecosystem functioning and production with ramifications for the provisioning of ecosystem goods and services. Trawling will influence the structure of the seabed and will bring sediments into resuspension, affecting the geo-chemical processes. Discards that are not consumed by seabirds will sink to the bottom and provide food for benthic scavengers.

In order to integrate fisheries impacts on benthic ecosystems in fisheries management, the EU needs to be informed about a number of salient questions.

- 1) Which benthic ecosystems and habitats are most sensitive for fishing impacts?
- 2) Which fishing gears have the biggest impact upon benthic systems?
- 3) How does the impact of fishing compare to the impact of natural disturbance?
- 4) What options are available to mitigate the adverse impacts of fishing, and how can these options be converted into effective management?
- 5) How can science and the fishing industry be brought together to collaborate on innovative technology and innovative management approaches to mitigate the impact?
- 6) What are the socio-economic implications of changes induced in benthic systems by fishing and of the proposed management actions to mitigate these effects?

BENTHIS aims to provide the urgently required scientific basis to integrate the benthic ecosystem into fisheries management and collaborate with the fishing industry and other stakeholders to investigate both technological innovations and alternative management scenarios to mitigate the impact of fishing on the benthic ecosystem.

PROJECT OBJECTIVES

The main objectives of this project are to

- Provide the knowledge base that allows an assessment of the status of different types of marine benthic ecosystems in European waters on a regional basis and support indicators of Good Environmental Status (GES), in particular on Seafloor Integrity;
- Develop the tools required to assess the effects of bottom trawling on the structure and functioning of these benthic ecosystems.
- Study and test, in close collaboration with the fishing industry, innovative technologies that reduce the impact of demersal fisheries on benthic ecosystem on a regional basis, encompassing the Baltic, North Sea, western waters, Mediterranean and Black Sea;
- Develop in consultation with the fishing industry and other stakeholders on a regional scale, sustainable management plans that reduce the impact of fishing and quantify its ecological and socio-economic consequences

Sub-objectives

- To assess the degradation and loss of habitats caused by different bottom trawling fleets

- To assess the impact of bottom trawling on biodiversity, nutrient recycling and benthic-pelagic coupling
- To study which factors facilitates the introduction of new technology to mitigate ecosystem impacts by fishing activities
- To demonstrate in close cooperation with SME's in the fishing industry how recent innovative technologies can contribute to reducing impact on benthic communities and other eco-system components
- To evaluate the effects of innovative management approaches such as gear substitutions and discard bans on the benthic ecosystem and the economy of the fishing sector

WORK PROGRESS AND ACHIEVEMENTS DURING THE REPORTING PERIOD

In the Table below, the milestones for the reporting period are summarised and the status indicated. The Deliverables will be presented in the chapters on the individual Work Packages.

Milestones List

	Milestone No and Milestone name	Work Package(s) involved	Expected date ¹	Means of verification ²	Status
1	Kick off meeting (P1)	1, 2, 3, 4, 5, 6, 7, 8	3	Meeting completed	Done
2	Project website	9	3	Website operational	Done
3	Regional case study meetings (RWP1)	7	4	Meetings completed	Done
4	Regional Stakeholder Workshops (RSE1)	7, 8	6	Workshops completed	Done
5	Project meeting (P2) to decide on workplan case studies. Agreement on a list of fishing gears and innovations and management scenario's to be included in the case studies.	1, 2, 3, 4, 5, 6, 7, 8	9	Meeting completed	Done
6	Compilation of relevant biological traits and functional literature (P2)	3	9	List available to partners	Done
7	Completion of industry questionnaire surveys (P2)	2	9	Survey completed	Done
8	Workplan for economic performances analysis (P2)	5	9	Workplan completed	Done

¹ Measured in months from the project start date (month 1).

² Show how you will confirm that the milestone has been attained. Refer to indicators if appropriate. For example: a laboratory prototype completed and running flawlessly; software released and validated by a user group; field survey complete and data quality validated.

9	Review of knowledge according to different types of gears from industry and research (P2)	7	9	Review completed	Done
10	EU-wide Stakeholder Workshops (SH1)	7, 8	9	Workshops completed	Done
11	General Assemblage meeting (GA1)	9	9	Meeting completed	Done
12	Steering Committee (SC1)	9	9	Meeting completed	Done
13	Stakeholder advisory board meeting (SHB1)	9	9	Meeting completed	Done
14	WP3 internal workshop	3	11	Meeting completed	Done
15	Regional case study meetings (RWP2)	7	16	Meetings completed	Done
16	Steering Committee (SC2)	9	18	Meeting completed	Done
17	Workshop with WP2, WP3 and WP4 to assign seabed functions to habitat types for mapping purposes (W2)	2, 3 and 4	18	Workshop completed	Done
18	Development and implementation of new methodology for assessing actual seabed impact from fishing activities on a fine spatial and temporal scale (W2).	2	18	Methodology documented and available to partners	Done
19	Collation of fish diet data (W2)	3	18	Data base completed	Done
20	Establish biological database (W2)	3	18	Data base completed	Done
21	Ranked list of fishing gear components that have most physical impact (W2)	4	18	List completed	Done
22	Workshop with WP4 and WP5 (W3)	4 and 5	18	Workshop completed	Done
23	Case study workshop to discuss progress (W4)	7	18	Workshops completed	Done

WP1 – FRAMEWORK AND SYNTHESIS

Lead IMARES (Adriaan Rijnsdorp)

This aim of WP1 for the 1st reporting period is to develop a carefully designed research workplan that balances scientific depth with an adequate coverage of the multitude of aspects of the problem. To achieve credibility and enhance the uptake of results, the research will be discussed with the fishing industry and other stakeholders throughout the project.

The activities developed within this work package focussed on summarising the key benthic processes (Task 1.1a) and the key characteristics of the fishing gears that are relevant to analyse their impact on the benthic ecosystem (Task 1.1b). The deliverables of task 1.1a and task 1.1b have been combined in a single deliverable to be in line with the Description of Work.

Task 1.1a: Key benthic ecosystem processes

Lead: CEFAS Contributors: BU, IMR, HCMR

Summary of progress

This task has been finished with the submission of Deliverable 1.1a in June 2013

Clearly significant results

A list of traits have been compiled that may be considered as those particularly relevant for inclusion within the subsequent broad-scale biological traits analysis being undertaken on benthic invertebrate assemblage data under WP3. The ten traits include a number of life-history, behavioural and morphological characteristics and, in combination, are likely to reflect relationships with a range of important ecosystem functions (e.g. nutrient fluxes, carbon storage, benthic-pelagic coupling, secondary production). Finally, we advocate that a focus on acquiring accompanying metrics of functioning (e.g. sediment biogeochemistry, secondary production) aligned with traits information would significantly improve our ability to determine both the identity and importance of effects traits for specific ecosystem processes.

Task 1.1b: Fishing impact from the perspective of the fisheries

Lead: DTU-Aqua Contributors: IMARES, BU, CEFAS

Summary of progress

This task has been finished with the submission of Deliverable 1.1b in December 2013.

Clearly significant results

The fisheries of the BENTHIS case study areas represent a variety of fleet segments which have very different effects on the benthic ecosystem depending on fishing methods and target species. Effort and landings of the commercial fisheries of the case study areas are reviewed and summarized with starting point in the official effort and landing statistics collected by the EU Scientific, Technical and Economic Committee for Fisheries (STECF) supplemented with information of Turkish effort and Landings data provided by CFRI (the Central Fisheries Research Institute in Turkey). Following a general regional based

description of the fisheries, a review and classification of impact mechanisms allows for a grouping of vessels and gear types according to expected level of seabed impact. The relative importance of these groups, in terms of contributions to total effort and landings of the case study fleets, is summarized and forms the basis for a prioritisation of the gear types and impact mechanisms that will be the focus of the fishing pressure mapping in WP2.

The benthic impacts of demersal otter trawlers, demersal seines, beam trawlers and dredges were identified as the most significant, and the major effects and mechanisms of impact were assessed to be: 1) Mortality of benthic organism from direct gear- sea bed gear contact during fishing, 2) food subsidies from discards and gear track mortality, 3) habitat alterations through disturbance of sediments and biogenic habitats, and 4) geo-chemical processes from disturbance of sediment. Although food subsidies from discards are acknowledged to be an important benthic impact mechanism, the task of mapping discards was not assessed to be feasible within BENTHIS WP2 due to the poor availability (lack of coverage) of discard data from the European fisheries (the effects of discards will, however, be dealt with in WP4). Therefore the mapping efforts in WP2 will prioritize the mechanisms of direct physical seabed impacts of demersal fishing activities. Following this prioritisation, the four gear types are described and broken down into individual components. The gear-seabed contact by component is conceptualised in “gear footprints” of each gear. These footprints form the basis of an industry questionnaire designed to deliver information of the dimensions of the individual gear components for those gears currently in use in European and Turkish fisheries. The industry information is combined with VMS and logbook data of fishing effort and activity in WP2 in BENTHIS to provide fine-scale mapping of fishing pressure from physical gear-seabed interactions for each case study region. The questionnaires are appended to this report, and the further implementation of questionnaire data and the developed BENTHIS WP2 methodology for mapping of fishing pressure on the benthic habitats is described in detail in Deliverable 2.1

Task 1.2: Fishing impact from the perspective of the benthic ecosystem

Lead: BU. Contributors: IMARES, CEFAS, DTU-Aqua, IFREMER, IMR, CNR, HCMR

This task is scheduled at the end of the project and has not yet started.

Task 1.3: Economic performances of the fisheries

Lead: LEI Contributors: IMARES, IFREMER, UCPH, CNR, SME's

This task is scheduled at the end of the project and has not yet started.

Task 1.4: Mitigation of fishing impacts on the benthic ecosystem

Lead: IMARES Contributors: LEI, ILVO, CEFAS, Bangor, IFREMER, DTU-Aqua, CNR, SME's

This task is scheduled at the end of the project and has not yet started.

Deliverables

		Delivery date Annex 1	Actual date
1.1	<p>Report on benthic ecosystem processes and the impact of fishing gear.</p> <p>1.1.a Bolam S, Kenny A, Parker R, Hiddink JG, Buhl-Mortensen L, Smith C (2013) Key benthic ecosystem processes: Relationships between macroinvertebrate biological traits and sea bed functioning in European waters</p> <p>1.1b Eigaard OR, Breen M, Buhl-Mortensen L, Dinesen L, Sørensen TK, Jonsson P, Zengin M, Rijnsdorp AD. (2013) Benthic impact from the perspective of the fisheries.</p>	30 June 2013	7 Jan 2014

Deviations.

Slight delay in submitting the deliverable. This has had no consequences for the progress of the project.

Failing to achieve objectives.

None

Use of resources

Participant	WP1	WP1
	Budget (pm)	Realised (pm)
SDLO	8	0.9
ILVO	0.4	0.5
CEFAS-DEFRA	3.7	2.9
BU	3.1	0.8
UNIABDN	0.5	0.2
Mar lab	0.2	0.0
IFREMER	1.9	0.0
MI	0.2	0.2
DTU-Aqua	2.6	2.1
AU-Bioscience	0.1	0.0
UCPH	0.5	0.0
SLU	0.2	0.0
IMR	0.8	0.0
CNR	1.9	0.9
HCMR	1.3	1.3
CFRI	0.4	0.1
OMU	0.3	0.1
sum	26.1	9.9
remaining personmonths		16.2

WP2 - MAPPING

Lead: DTU-Aqua (Ole Eigaard).

Project objectives for the period

The main WP2 objective of the reporting period is to develop and implement new methodology, combining VMS, logbook and industry data, to assess actual seabed impact from large scale fishing activities on an appropriate spatial and temporal scale.

The gear specifications available in the official EU fisheries statistics, the logbooks, are limited and not well suited for estimating the bottom contact of the gears. Consequently, a true and fair large scale mapping and classification of sea bed impact from EU fishing activities requires additional gear data, such as trawl door type and ground gear length, to be included. As collection of such data is not feasible on a single trip or vessel basis other approaches have to be developed to overcome the gear specification deficiencies of the official statistics.

In the BENTHIS project the proposed solution for incorporating quantitative information of gear-sea bed interactions into the logbooks is to first classify the logbook observations in functional gear groups/fisheries on a trip basis, secondly identify and parameterize appropriate proxies for gear size by functional group (e.g. engine power and wingend spread) using questionnaire data from industry surveys, and thirdly assign quantitative information of bottom contact to each logbook trip by converting proxy values into measures of gear size.

Once each logbook trip is extended with quantitative information of the contact between the fishing gear and the bottom it is possible to estimate the frequency and severity at which the sea bed is impacted in a given area. For logbook trips where VMS data are obtainable, the trawling intensity and benthic impact will be expressed at a fine spatial scale and where VMS data are not available, the impact will be expressed on the ICES rectangle scale.

Work progress and achievements during the period are reported below.

Task 2.1. Development and implementation of new methodology for assessing benthic pressure from fishing

Lead: DTU Aqua; Contributors: IMARES, ILVO, CEFAS, MarLab, IFREMER, MI, SLU, IMR, CNR, HCMR, CFRI)

Summary of progress

- A framework for understanding and classifying main demersal gear types in relation to sea bed contact (area and severity of impact) has been established
- Following this framework the participants defined a gear questionnaire and implemented an industry survey.
- The questionnaire data have been compiled and used for a classification of the most important types of European fishing activities into functional gear groups/fisheries according to species targeted and type of gear used.
- Logbook proxies of key gear parameters for each fishery/gear group were identified (vessel kiloWatt and overall length) and linkages between proxies and size of key gear measures (e.g. between engine power and wingend spread) were parameterized using data from the industry-based questionnaire survey.
- Quantitative information of bottom contact (gear width) was assigned to each logbook trip by converting proxy values into measures of gear size.

- The frequency and severity of seafloor pressure is mapped on different temporal and spatial scales using catch profiles from logbooks and new methodology developed from the outcomes of the VMS-tools project.
- The complete methodology has been documented and implemented by partners

Clearly significant results

With reference to the métier groupings of EU logbooks in the Data Collection Framework (DCF), 17 distinct towed gear groups were defined for European waters (11 otter trawl groups, 3 beam trawl groups, 2 demersal seine groups, and 1 dredge group), for which we established seafloor “footprints”. The footprint of a gear was defined as the relative contribution from individual larger gear components, such as the trawl doors, sweeps and ground gear, to the total area and severity of the gear impact. An industry-based vessel and gear survey covering 13 different countries provided the basis for estimating the relative impact-area contributions from individual gear components, whereas seafloor penetration and resuspension was estimated for different sediment types based on a review of the scientific literature. For each defined gear group a vessel-size (kW or total length) – gear size (total gear width or circumference) relationship was estimated to enable the prediction of gear footprint area and sediment penetration from vessel size.

Individual logbook observations from 13 countries were assigned to these 17 different functional gear groups (métiers) based on target species and gear type information. Secondly, relationships between gear width and vessel size (e.g. trawl door spread and vessel kW) for each métier were used to assign quantitative information of bottom contact to each logbook trip by translating vessel size information into measures of gear size. Thirdly the extended logbook data was merged with high-resolution activity data (VMS) and gear width estimates were assigned to individual interpolated vessel tracks based on VMS data. The outcome was European wide high-resolution fishing intensity maps (total yearly swept area within grid cells of 1*1 minutes longitude and latitude) for 2010, 2011 & 2012.

Task 2.2. Survey of existing habitat maps of case study areas

Lead: AU-BIOSCIENCE; Contributors: DTU Aqua, CEFAS, IMR, CNR, CFRI)

Summary of progress

A survey of existing sea bed substrate and habitat classification maps was conducted with the objective to identify the most suitable templates and classification categories. This survey and choice of habitat map template was closely aligned with the habitat and functional trait classification and modelling work in WP3

Clearly significant results

Based on the European wide survey the EUSeaMap template was identified as the best suited.

Task 2.3.a. Selection of optimal spatial resolution for mapping European-wide fishing pressure

Lead: DTU Aqua; Contributors: IMARES, IMR, CNR

Summary of progress

The analyses and efforts to identify the appropriate spatial scales to map European-wide fishing pressure have been conducted in parallel and iteration with the efforts in the two previous tasks described above. The final choice of spatial resolution (1*1 minutes longitude and latitude) was based on two primary considerations; i) the finest precision which could be obtained from the developed VMS-Logbook-gear methodology (task 2.1) when also considering uncertainty in the VMS data interpolations and in the estimations of vessel size ~ gear size relationships from industry survey data, and ii) the distribution and size of the selected sediment maps and habitat categories (task 2.2) as well as the uncertainty associated with these maps.

Clearly significant results

Based on the above described efforts it was agreed that the optimal spatial resolution for mapping fishing pressure (yearly frequency of area swept) of European-wide fishing activity based on VMS and logbook information is grid cells of 1 minute longitude * 1 minute latitude.

Task 2.3.b. To overlay fishing pressure data and habitat maps to identify potential ecosystem service conflicts

Lead: AU-BIOSCIENCE; Contributors: DTU Aqua, IMARES, CEFAS, IMR, CNR, CFRI

This task is scheduled for the 2nd part of the project and has not yet started.

Deliverable

	Delivery date Annex 1	Actual date
D2.1 Report of framework for estimation of EU wide fishing pressure on the benthic habitats, including the minutes of WP2 workshop	30/06/2013	09/12/2013

Deviations

Deliverable D2.1 was slightly delayed in order to allow the integration of the results of the MyGear project.

Failing to achieve objectives

None

Use of resources

Participant	WP2	WP2
	Budget (pm)	Realised (pm)
SDLO	2.8	1.8
ILVO	1.5	1.4
CEFAS-DEFRA	1.4	3.6
Mar lab	1.5	0.8
IFREMER	1.7	1.8
MI	2.0	1.7
DTU-Aqua	10.5	7.1
AU-Bioscience	2.2	1.4
SLU	2.4	1.1
IMR	1.8	1.0
CNR	4.4	3.9
HCMR	1.0	2.6
CFRI	1.8	0.5
sum	35.0	28.7
remaining person months		6.3

WP3 – BENTHIC ECOSYSTEMS

Lead: Partner 3 CEFAS (Andrew Kenny)

Benthic marine habitats and their communities provide a wide-range of goods (biomass, minerals, energy & diversity etc.) and services (nutrient and carbon recycling, life support, atmospheric regulation etc.) – they form the marine equivalent of terrestrial landscapes. To better understand their functional role in maintaining healthy and productive seafloor ecosystems this WP utilises biological traits analyses.

Biological traits analysis aims to classify benthic organisms in terms of what they do rather than what they are and therefore they are better at explaining the functions which seabed biotopes provide such as food for fish or the recycling of nutrients.

The relationship between benthic communities in terms of their traits and the corresponding seabed habitat characteristics is the focus for Task 3.1. Defining such relationships will allow habitats to be mapped not just in terms of their species composition but in terms of their functional properties.

The focus for Task 3.2 is to quantify and model the habitat functional relationships, particularly in relation to providing food for fish and the recycling of nutrients between the water column and the seabed.

Finally Task 3.3 aims to develop a generic risk based assessment method for the impacts of fishing on seafloor habitats.

Work progress and achievements during the period are reported below.

Task 3.1: Links between benthic species traits, functions and habitat types

Lead: CEFAS; Contributors: Bangor, IMARES, IFREMER, DTU-Aqua, IMR, HCMR, CFRI, OMU

Summary of progress

WP3 organised two workshops during 2013/14; i. in Haarlem (June, 2013) and ii. in Lowestoft (November, 2013). The purpose of the workshops was to coordinate the collation of relevant data and to agree on methodological approach to achieve the WP3 objectives. The minutes of these meetings have been provided as project deliverables D3.1 and D3.2.

A total of 888 macrobenthic grab samples have now been integrated from 6 European regional seas supplied from 8 institutes. Furthermore, a total of 4,900 macrobenthic epifauna samples have been integrated from 7 European regional seas provided by 7 institutes.

A biological traits database derived from the biological samples has been compiled consisting of over 1000 benthic invertebrate species – each species has been classified according to 10 principal trait categories (maximum size, morphology, longevity, larval development, living habitat, sediment position, egg development, feeding, mobility, bioturbation), and each trait supports a number of modalities, resulting in a total of 48 biological trait variables.

The definition and relationship between benthic biological traits, biological processes, functions and the provision of benthic ecosystem goods and services has been agreed and defined.

The data corresponds to 16 EUNIS habitat types of which the most represented habitat types are; i. deep circalittoral mud, ii. deep circalittoral sand, iii. deep circalittoral fine sand, and iv. circalittoral coarse sediment.

A key objective of deliverable D3.4 is to establish the relationships between the macrobenthic biological traits and different habitat types. By using biological traits analysis we are aiming to define habitats from a functional perspective which has direct and measurable value for the provision of ecosystem goods and services, including fish and fisheries.

The analytical approach we have adopted in WP3 is a multivariate technique called co-inertia analysis. This is similar to a canonical correlation analysis which examines the relationship between two separate, but related, ordinations of multivariate data. WP3 is using a sample traits matrix and environment sample

matrix to assess habitat/trait relationships. The analysis has to be finalised, but provisional results are providing some clear trends.

A further workshop to initiate the integration of results between WP2, WP3 and WP4 was organised under WP3 and was held in Rome (April, 2014). The minute of this workshop was provided as project deliverable D3.3. It was highlighted that in order to complete WP3 deliverable D3.4 on time WP3 must receive WP2 fishing pressure data well in advance of the D3.4 deadline.

Clearly significant results

It is well known that estimates of species richness is very much dependent on the unit area sampled in a given habitat or location. So the discovery of new species depends not only on the heterogeneity of the habitat but on how much of that heterogeneity is effectively sampled. This phenomena causes problems when trying to integrate samples from different surveys which have used different sampling methods as it is not possible to use any correction factor to derive a comparable estimate of species richness. However, it is less well known how trait data based upon common species data (in this case genera data) respond to changes in area sampled (e.g. number and type of samples taken).

During the Lowestoft workshop a comparative analysis of genera/trait area curves was performed. Such curves are produced by calculating the cumulative number of unique species and traits based upon the same sample data. The results of this preliminary analysis (Figure 3.1) reveal that traits appear to be relatively insensitive to the number of samples or extent of area sampled compared to species data. This potentially makes traits analysis a robust method for the integration of data sets derived from different types of sampling device or programmes using different sampling methods. We therefore conclude that traits based analysis should not be impacted by the different types of sampling devices used, but are more likely to respond consistently to changes in habitat conditions. This result was observed between different regional data sets.

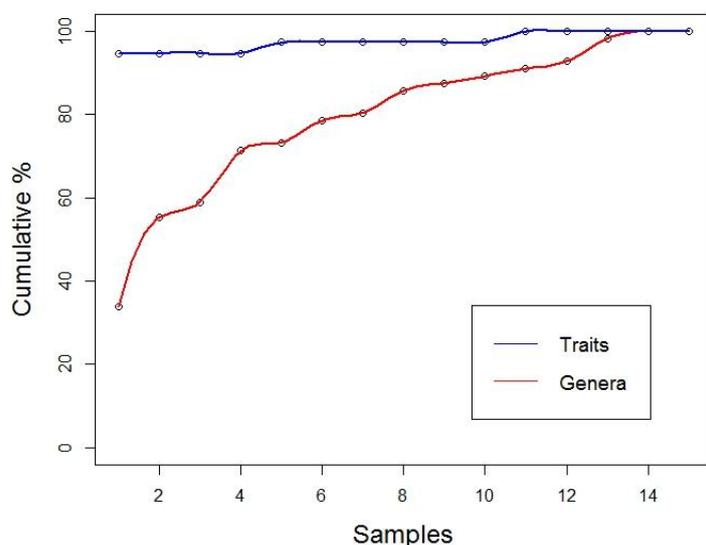


Figure 3.1. A comparison of species (genera) and traits area curves at a site off the island Crete in the Mediterranean. Note how 98% of the all the traits are discovered in the first sample whereas less than 40% of the genera are discovered. The genera area curve starts to level off after about 8 samples when more than 80% of genera have been sampled.

Deviations. No deviations

Failing to achieve objectives. No failed objectives

Task 3.2. – Modelling benthic ecosystem processes

Lead: CEFAS; Contributors: Bangor, IMARES, IFREMER, DTU-Aqua, IMR, HCMR, CFRI, OMU

Summary of progress

To underpin the delivery of D3.5 we are intending to analyse the relationship between habitat traits and the corresponding diets of fish through an analysis of their stomach contents. A database of fish stomachs has been compiled from existing data sources and databases and a selection process of key fish species (based upon the number of stomach samples and identifiable contents) has been undertaken. The diet data of the key species will be analysed using biological traits analysis and the resulting outputs assessed in relation to the habitat traits defined under Task 3.1.

Data on the fluxes of nutrients and organic carbon in sediments is being collected as part of the case studies (WP7) and in relation to WP4 tasks. The results of habitat specific flux results will then be assessed in relation to the biological traits analyses conducted under Task 3.1.

Clearly significant results. None

Deviations. No deviations

Failing to achieve objectives. No failed objectives

Task 3.3. – Integration

Lead: Bangor; Contributors: CEFAS, IMR, IMARES, HCMR, CFRI, OMU, IFREMER

The aim of this task is to integrate the findings from WP3 Task 3.1 and Task 3.2 with the results from WP Task 4.1 to establish a method for assessing the greatest and least fishing/habitat risk, this will be achieved through organising a workshop in Month 36.

Clearly significant results

None

Deliverables

Deliverable	Delivery date Annex 1	Actual date
D3.1 Minutes of workshop W1 en W1 (internal WP3 workshops)	31/08/2013	09/12/2013
D3.3 Minutes of workshop W2 on integration WP2, WP3 and WP4.	31/03/2014	02/05/2014
D3.2 Minutes of the internal workshop meetings	31/08/2013	02/05/2014

Deviations

There is possibly an issue with timing of D3.6 (Task 3.3) which is required in month 36, but the report is dependent on having first convened the integration workshop which is also required in month 36. We suggest that that D3.6 be deferred until month 48 to allow the workshop to held (month 36) and the then the delivery of the report to be made in month 48.

Failing to achieve objectives

No failed objectives

Use of resources

Participant	WP3	WP3
	Budget (pm)	Realised (pm)
SDLO	4.2	0.9
ILVO	0.0	0.2
CEFAS-DEFRA	17.5	8.6
BU	5.5	0.8
IFREMER	4.1	2.3
DTU-Aqua	2.5	2.0
IMR	3.0	1.9
HCMR	2.7	2.0
CFRI	2.0	0.6
OMU	4.0	1.1
sum	45.5	20.3
remaining person months		25.2

WP4 –EFFECT OF FISHERIES ON ECOSYSTEMS

Lead: Bangor University (Jan Geert Hiddink)

Bottom fishing affects seabed ecosystems in many ways. It directly changes the morphology of the seabed, resuspends sediment, releases nutrients, sends discards and offal to seabed ecosystems and kills and damages invertebrates. Over longer time scales, these direct effects and reductions in the abundance of benthic invertebrates result in chronic changes in the functioning of the seabed ecosystem such as changes in nutrient cycling, carbon storage and food availability to demersal fish. To ensure that seabed ecosystems are in a good state and minimize fisheries impacts, we need to be able to quantify and predict the large scale effects of fisheries on the state and functioning of these systems. WP4 will increase our understanding of the mechanisms through which fishing gears affect seabed ecosystems.

Work progress and achievements during the period are reported below.

Task 4.1: Predicting the physical impact by towed demersal gears from fishing gear characteristics

Lead: UNIABDN. Contributors: Mar Lab, IMR

Summary of progress

The work undertaken for Task 4.1 has been divided in two parts: laboratory experiments to complement the experimental full scale study undertaken by Marine Scotland Science and numerical study of the ground gear components used in the North Sea case study.

Future work planned

Future plans for task 4.1 include:

- looking at the scaling effect of the laboratory models and the influence of the water
- modelling the gear elements associated with other case studies and their comparison

A report that details a ranked list of components of a fishing gear that have the most physical impact and proposed measures to develop gears that are more environmentally friendly will be prepared for month 36 (D4.2)

Clearly significant results

Laboratory study: The models, which are mainly cylinders, are geometrically defined by two variables: the width (l_d) and the diameter (d_d). According to the relation between the diameter and the width, known as aspect ratio (l_d/d_d) three groups of models or geometrically similar families were set up. The first family is composed of models which have an aspect ratio of $3/2$, the second group of models has an aspect ratio of $3/4$ and the group of models composed of several narrow disks is characterized by an aspect ratio of $1/8$. As expected, the wider the disks are and the smaller the angles of the attack, the larger is the drag force generated on the sediment. The scaling associated with the disks suggests that it complies better for the aspect ratios of $3/2$ and $3/4$ than that of $1/8$. The results between the sea trials and those obtained in the laboratory are currently compared taking into account the fact that the conditions of the tests undertaken were not the same.

Numerical study: Numerical modelling of the gear elements has also been undertaken focusing on the gear elements employed in the North Sea Case study. The numerical modelling approach has been adopted using Coupled Eulerian Lagrangian approach within Abaqus software package. This technique demonstrated a high level of adaptability and ability to simulate seabed deformation during trawling processes. The validation of the numerical model developed was achieved with the laboratory experiments. Subsequently, the following elements were modelled and are currently analysed with the results obtained from the case study: (i) Pulse ground gear beam shoe; (ii) Tickler beam shoe; (iii) Pulse ground gear; (iv) Pulse electrodes

Deviations. None

Failing to achieve objectives. None

Task 4.2: Predicting direct bottom trawl impacts on organisms from biological traits

Lead: BU. Contributors: CEFAS, IMR

Summary of progress

This task aims at predicting the impact of bottom fishing on benthic organisms based on their biological traits. The magnitude of fishing impact will be examined for different benthic organisms occurring in different habitat types (e.g. depth, sediment type) and exposed to different types of bottom fishing gear (e.g. beam trawl, otter trawl, dredges). The use of biological traits means that the predictions from this model will be more widely applicable in situations in which no specific experimental studies have been undertaken. Systematic review methodology that follows a strict methodological protocol involving the critical appraisal of study methodology prior to study inclusion in the analysis is being used to search for primary scientific and grey literature relevant to the review objective. The FP6 COST-IMPACT database of direct effects of trawling on different benthic taxa as well as data from the BENTHIS case-studies on trawling impacts (provided that case-study data is available within time-frame of review) are also being included.

Future work planned

As part of the future work planned a database including study descriptors (e.g. location, sampling design), effect modifiers (e.g. habitat type, type of fishing gear, intensity of fishing disturbance), outcome measures (e.g. mean and variance measure for abundance, biomass and species diversity) will be extracted from each study retained after article screening. This database will be linked with the database of the biological traits of benthic organisms. It is envisaged that the final database of biological traits and study information will be finalized by the end of June 2014. Data synthesis involving meta-analysis and modelling in the R-package and preparation of deliverable D4.3 will take place thereafter (July – September 2014).

Clearly significant results

Progress to date on this review consists of:

- defining research questions and review protocol,
- article searching through several databases and search engines (including ASFA, Science Direct, ISIS Web of Science, googlescholar.com, scirus.com, cefas.defra.gov.uk, noaa.gov, fao.org. csiro.au)
- article screening of ca. 30,000 articles. During article screening pre-defined study inclusion criteria are being used to systematically remove articles that do not provide relevant data.

Deviations. None

Failing to achieve objectives. None

Task 4.3: Quantifying resuspension of sediment and nutrient release by towed demersal gears

Lead: Mar Lab. Contributors: CEFAS

Summary of progress

Marine Scotland Science (MSS) carried out sea trials on the RV Alba na Mara during the 3 -14 October 2013 in the Moray Firth, Scotland to investigate the physical impact of trawl gears on the seabed. A specially designed towed sledge was used to explore the hydrodynamic forces, the associated mobilisation of sediment and the geotechnical forces acting on different cylindrical components (groundgear disks, clump weights, etc.). Particular reference was given to the effect of size, weight, aspect ratio, towing speed, and whether a component is rolling or not.

Future work planned

MSS and CEFAS are planning to meet in May to coordinate their experimental approaches. MSS are planning further sea trials (i) to investigate the mobilisation of sediment behind netting panels and (ii) to investigate the release of nutrients into the water column behind towed gear components.

CEFAS are planning experimental work to resuspend a known quantity of sediment (informed by the experiments carried out by Marlab) in small incubation chambers and to monitor any changes in nutrient, carbon and oxygen concentrations over a period of time chosen to reflect the longevity of the sediment plume. The experimental set-up is now in place, and CEFAS plans to carry out these resuspension incubations in a temperature-controlled environment less than one hour after collecting suitable sediment cores for a number of scenarios:

- Changes in sediment type (sand, muddy sand, sandy mud and mud)
- Changes in the amount of sediment resuspended (SPM)
- Changes in the depth to which sediment is resuspended
- Varying timescales of the experiment – reflecting the longevity of the plume

Some preliminary experiments were due to be carried out in January 2014 on board the Cefas Endeavour. Unfortunately the survey was abandoned due to extremely bad weather. The main experimental work was due to be carried out on the RSS Discovery in May 2014. Unfortunately this cruise has now been rescheduled for 2015 due to technical problems with the ship.

Clearly significant results

The hydrodynamic drag coefficient values obtained were very similar to what is in the engineering literature. We also showed that while the weight of a component does not influence the amount of sediment mobilised, the towing speed does. This supports the view that sediment mobilisation is essentially a hydrodynamic process and that the quantity of sediment mobilised is related to the drag of the gear component. We showed that the contact drag per unit area is primarily related to weight per unit area exerted by a gear component. There may also be secondary effects related to towing speed, as there is an indication that as the contact drag decreases the speed increases, which may be due to the gear component penetrating the substrate less. There are also differences between rolling and fixed components.

Deviations. None

Failing to achieve objectives. None

Task 4.4: Quantifying food subsidies to the benthos due to discards and consequences for ecosystems

Lead: IFREMER. Contributors: IMARES, BU, DTU-Aqua, ILVO

Summary of progress

This work aims at estimating the fate of discards in the Bay of Biscay (ICES Area VIIIa/b); the proportion that is eaten by seabirds and the proportion that sinks down to the seabed and is likely to be utilized by benthic scavengers. In order to establish this four types of data are being combined: (i) discard scavenging

behaviour of seabirds, including discard categories that birds scavenge upon; (ii) seabird abundance data; (iii) ship followers data; and (iv) onboard observer data to estimate regional amounts of discards by categories established in (i). The procedure is applied to the French fisheries and seabird communities in the Bay of Biscay (ICES Division VIIIa and VIIIb), and requires seabird abundance and ship followers data. Discard consumption data were collected during the bottom trawl survey in the Bay of Biscay EVHOE 2013.

Data types are combined in a step-wise approach. First, data from existing and new field trials on-board the RV Thalassa are being compiled into discard consumption rates (DCR) indicating which discard items are swallowed, how many and by which seabird species. Discarded items are pooled on the basis of morphology, because edibility varies accordingly. Furthermore, discard consumption data of different seabird species will be pooled into bird categories according to (1) morphological similarities, such as size, (2) food preferences and (3) limited variability of discard consumption rates between species in comparison to variability between bird feeding categories. DCRs are assumed constant over time and space and provide the basis for the second step, i.e. computing the discard consumption success index (SI) (Furness et al., 2007). The attraction of scavenging seabirds to fishing vessels was assessed by the seabird scavenging index, relating seabird densities to the number of ship followers. Seasonal variability of the number of ship followers are included to account for differences in attraction to fishing vessels during breeding seasons. Attraction was highest for large gulls in April to September, followed by northern gannets during the rest of the year. Discard consumption rates of ship followers were estimated through an experimental trial on-board the RV Thalassa. Data gaps were resolved with estimates from literature, which served as a validation of our experimental estimates as well. Northern gannets consumed the highest proportions of discards with a strong preference for roundfish.

Future work planned

October 2014: D4.5. Report on the quantification of discard flow to the seabed, relative to natural food sources.

End of 2014: peer-reviewed publication entitled "Are discards a substantial food source for marine scavengers?"

Clearly significant results

None

Deviations. None

Failing to achieve objectives. None

Task 4.5: Quantifying the large scale effect of chronic bottom trawling on ecosystem functioning

Lead: BU & CEFAS. Contributors: IMARES, DTU-Aqua

Summary of progress

This task will quantify the effect of chronic and large scale bottom trawling on benthic ecosystem functioning in several different habitat types. A research cruise on the RV Prince Madog will take place between the 27th of June and the 6th of July 2014 to carry out infaunal sampling and biogeochemical measurements along a fishing effort gradient in cohesive and non-cohesive sediments. Discussions regarding the logistics of equipment availability and equipment provider, the type of data collected during the cruise and data processing and data analyses post fieldwork were held between Bangor University and CEFAS during the BENTHIS annual general meeting in Rome (31st March / 1st April 2014). Sampling will

take place in the north of the Irish Sea on a Nephrops fishing ground off the Cumbrian coast (muddy sediment) and on a scallop dredging fishing ground off the Isle of Man (sandy sediment).

Future work planned

Infauna samples, sediment samples and Sediment Profile-images will be processed by Bangor University. CEFAS will sample for the following measurements as proxies for ecosystem functioning - chlorophyll, porosity, organic carbon, pore-water nutrient, oxygen profile and respiration rate. Data processing is envisaged to be complete by November 2014. Bangor University will be responsible for data analysis and deliverable D4.6, which is due for September 2015. CEFAS will provide scientific input into producing the outputs and will be co-authors on this work.

Information from the 2014 cruise will feed into regional ecosystem models mapping changes in function with trawling at different regions, gears and implications for regional changes in functions with altered trawling distributions or management actions. Fishing effort maps generated from WP2 will be used in this task. CEFAS are the lead on the regional modelling work, however CEFAS flagged up that insufficient financial resources might present difficulties for CEFAS to complete all the proposed modelling work in the original project proposal.

Clearly significant results. None

Deviations. None

Failing to achieve objectives. None

Task 4.6: Quantifying the indirect effect of fishing of prey availability for commercial fish species

Lead: BU. Contributor: IMARES

Summary of progress

Bottom trawl fisheries can negatively affect their target fish by damaging the food of these fish. This task will examine the effect of bottom trawl-induced reductions in food availability on the food intake of fish. This is studied over small spatial scales by sampling fish and their food across a gradient of commercial trawling effort. A survey in the Kattegat Sea was organized by Bangor University in August 2013. Multiple tows using a demersal otter trawl and grab were carried out at each station to collect fish and invertebrate samples. The length (to the nearest mm) and weight (to the nearest g) of a number of commercial demersal fish species will be recorded on board. Weight-at-length measurements will be subsequently used by BU scientists to estimate the condition of individual fish.

IMARES carried out a modelling study of the effect of trawling on the food for benthivorous fish like flatfish. The model comprised of a benthivorous fish and two food populations (benthos), susceptible and resistant to trawling. The ecosystem response to trawling depends on whether the abundance of benthos is top-down or bottom-up controlled. Fishing may result in higher fish abundance, higher (maximum sustainable) yield and increased persistence of fish when the benthos which is the best-quality fish food is also more resistant to trawling. These positive effects occur in bottom-up controlled systems and systems with limited impact of fish feeding on benthos, resembling bottom-up control. Fishing leads to lower yields and fish persistence in all configurations where susceptible benthos are more profitable prey. Our results highlight the importance of mechanistic ecosystem knowledge as a requirement for successful management

Future work planned

Differences in food availability will be examined over large spatial and temporal scales by analyses of weight-at-age of fish from survey time series. An ecological model of the interactions between benthos,

fish and trawl fisheries will be developed based on these analyses to predict the effects of bottom trawling on fish populations and fishing yields and this will feed into WP6.

Clearly significant results

A modelling study showed that trawling may enhance the food for benthivorous fish if the benthos is controlled by bottom-up processes (food competition) and fish prefer the species that are resistant to trawling. In other cases, trawling has a negative impact of food (van Denderen et al., 2013).

Deviations. None

Failing to achieve objectives. None

Deliverables.

WP4 deliverables (D4.1 – D4.7) are not until months 24 (September 2014) and 36 (September 2015), therefore no reports and publications have been generated until now.

Deviations

None

Failing to achieve objectives

None

Use of resources

Participant	WP4	WP4
	Budget (pm)	Realised (pm)
SDLO	5.7	0.7
ILVO	1.1	4.7
CEFAS-DEFRA	15.8	4.1
BU	18.6	0.8
UNIABDN	25.2	11.2
Mar lab	9.3	8.6
IFREMER	4.9	0.5
DTU-Aqua	3.2	0.0
IMR	0.5	0.0
sum	84.3	30.6
remaining person months		53.7

WP5 - ECONOMICS

Lead: LEI-DLO

The main objective of this work package is to provide a methodological framework to all case studies to perform economic analyses of management measures and to provide tools to be applied in the Case Study Tasks. To ensure the consistency of the economic analysis and match the heterogeneity of data in the case studies, the tools provided will be generic and flexible to allow the investigation of the effect of gear substitution without or with dynamic response from the fleet.

The WP progress follows the plan (see details by tasks). The WP5 partners have participated to three workshops focussing on the economic work during the first 18 months. The first workshop was organised during the first general assembly in June 2013 in Haarlem and focused on work plan and task division. The second workshop was half a day demonstration of the tool developed in 5.1 to interested partners and took place in parallel with the WP2-WP3-WP4 workshop in Rome, 31st March 2014. The third workshop was the workshop W3 on integration WP5 and WP6 held in Rome 1st April 2014.

The first two workshops were not planned in the DOW but we took advantage of the opportunities of general meetings and the presence of most partners to discuss progress, show available tools to partners from all case studies.

Task 5.1. Development of a framework for the analysis of economic performances of alternative fishing gears.

Task leader: IFREMER, contributors: CNR, UCPH, LEI

Summary of progress

The task 5.1 is the development of a framework for the analysis of economic performances of alternative fishing gears. This task is led by IFREMER. The model development is near completion, well on track for the delivery in October 2014.

Significant results

The model was shown to partners in workshop WP5 in Rome 31st March 2014 and in WP5-WP6 workshop 1st April 2014. Manuscript in revision: Guillen et al. (submitted).arine Policy.

Task 5.2. Short-term fleet adaptations and management.

Task leader: IMARES, contributors: IFREMER

Summary of progress

The task 5.2 is the development of a short-term fleet dynamic model simulating the adaptations of the fishing fleets to management. This task is led by IMARES. The model is available as an R package and will be applied in the North Sea case study, other applications are still unclear but not expected as the data availability is key to parameterise the model and some case studies have their own models.

Significant results

Manuscripts in preparation on the application of the model (Batsleer et al., in prep a, in prep b). Simple examples of how to use the model was presented in WP5-WP6 workshop, Rome, 1st April 2014.

Task 5.3. - Modelling investment in innovative techniques.

Task leader: LEI, contributor: UCPH, CNR, IFREMER

Summary of progress

This task started in month 9 and is divided into several steps. The first step was a literature review of real option theory in investment behaviour completed by CNR and circulated to other partners. The next step will be to formalise the real option theory with a discrete choice model to evaluate the potential investment in new gears. This task is well on track to deliver the Report on investment theory, its application in fisheries and the lessons on key factors influencing the investment behaviour (D5.4) in month 54.

Significant results. First draft of review of real option theory investment was circulated to all WP5 partners. The review was presented during the WP5-WP6 workshop

Deliverables

Deliverable	Delivery date Annex 1	Actual date
D5.1 Minutes of workshop W3 on integration WP5 and WP6	31/03/2014	13/05/2014

Deviations

None

Failing to achieve objectives

None

Use of resources

Participant	WP5	WP5
	Budget (pm)	Realised (pm)
SDLO	15.7	2.9
IFREMER	5.6	4
DTU-Aqua	0.4	0
UCPH	5.2	3.0
CNR	7	0.8
CFRI	2.9	0.8
sum	36.8	11.5
remaining person months		25.3

WP6 - MANAGEMENT

Lead IMARES (Gerjan Piet). Contributions LEI, ILVO, CEFAS, MarLab, IFREMER, MI, DTU-Aqua, IMR, CNR, HCMR, CFRI

This WP will develop innovative management tools and test their performance in achieving a sustainable fishery in regional case studies (WP7). Through the development of decision-support tools we intend to ascertain an optimal use of this scientific basis in the management context of the EU (Common Fisheries Policy and Marine Strategy Framework Directive as part of the Integrated Maritime Policy).

Task 6.1 Evaluation of possible management measures

Summary of progress

The approach of this review was discussed over several informal meetings between the two major partners IMARES (lead) and LEI and finally at the project meeting and WP workshops in month 18. This had resulted in a slight change in emphasis of the review from an evaluation of their historic performance to a review of the type of indicators required for such an evaluation. Reason for this is that when writing the proposal we assumed the indicators required for an evaluation of the management measures to mitigate the impact of fishing on the seafloor habitats and their associated communities would be further developed and it would be a fairly straightforward exercise to select the suite of indicators for BENTHIS to use in their evaluation of the management measures. Because this had not occurred we used this review to provide the basis for the development of the BENTHIS suite of indicators.

Clearly significant results

The Task 6.1 report now consists of a review of the existing indicators, the policy requirements and the various aspects of the benthic ecosystem and the services it provides that need to be considered when evaluating the performance of management measures aimed at mitigating fishing impact on the benthic ecosystem.

Deviations

The fact that the appropriate operational indicators had not been developed yet and the discussions that lead to this change in the focus of the review resulted in a small delay of approximately 2-3 months. The report will now be submitted in month 21.

Failing to achieve objectives

As indicated there has been a slight change in the objective of this Task to review and provide indicators for the evaluation of management measures. This has not hampered the selection of management measures within the project as this has occurred with involvement of WP6 as part of the WP7 case studies

Task 6.2 Development of decision-support tool(s)

The task 6.2 is the development of a decision-support tool. This task is led by LEI was presented by Sander van den Burg.

Summary of progress

This task aims at developing two tools to help the decision making process of two groups, fishers and managers. For the first a possible tool that could be provided to fishers would be (seasonal?) maps with the most vulnerable areas to help them decide where to fish in order to reduce their footprint. For the second, i.e. policy-makers, the tool would provide a framework to rank different management measures

based on multiple criteria covering ecological, economic and social aspects of the fishery. The weights given to each aspect of the system (ecological, economic and social) will be defined with the stakeholders by the local WP6 partner (LEI/IMARES for the North Sea, DTU-AQUA for the Baltic, IFREMER for the Western Waters and HCMR for the Adriatic).

Thus far only some initiating discussions have taken place.

Clearly significant results. No results to show yet

Task 6.3 Management Strategy Evaluation

Summary of progress

No work has been done on this task yet

Deliverables

Deliverable	Delivery date Annex 1	Actual date
D6.2 Report review management measures	31/03/2014	Delayed to month 21

Deviations

Delay of approximately 2-3 months in submitting deliverable D6.2

Failing to achieve objectives

A slight change was made in the objective of this Task 6.1. This has not hampered the selection of management measures within the project as this has occurred with involvement of WP6 as part of the WP7 case studies

Use of resources

Participant	WP6	WP6
	Budget (pm)	Realised (pm)
SDLO	17.3	3.1
ILVO	0.4	0.0
CEFAS-DEFRA	0.9	0.0
BU	1.0	0.8
Mar lab	0.4	0.0
IFREMER	3.0	0.6
MI	0.5	0.0
DTU-Aqua	3.6	0.0
IMR	0.6	0.0
CNR	0.3	0.0

HCMR	3.3	0.3
CFRI	0.5	0.1
SME01	0.1	0.0
SME03	0.1	0.0
SME05	0.1	0.0
SME07	0.1	0.0
SME08	0.1	0.0
SME09	0.2	0.0
Tecnopesca	0.1	0.0
SME15	0.1	0.0
SME17	0.1	0.0
sum	32.8	4.9
remaining personmonths		28.0

WP7 – CASE STUDIES

Lead CNR (Antonello Sala)

Introduction

The Case Study WP has the following objectives which will be studied in five regional European Seas:

- To assess the current trawling impact;
- To make an inventory of the options for mitigation;
- To collaborate with the fishing industry SMEs to study the biological and economic impact of alternative fishing gears;
- To collaborate with the fishing industry SMEs and other stakeholders to explore innovative management scenario's to mitigate effects of fishing on the benthic ecosystem and quantify the ecological and economic consequences on the fishery and related industries.

The WP is organized in five case studies each one approached with four tasks:

- Task 1: assessment of the current trawling impact
- Task 2: options for impact mitigation
- Task 3: testing alternative gears
- Task 4: Innovative management scenario's
- Task 5: local coordinating meetings

The regional approach allows us to closely collaborate with the fishing industry SMEs and other stakeholders to develop and assess the possibilities for mitigating the adverse impact of the current fisheries on the benthic ecosystem by technological and management innovations.

The activities carried out among the regional case studies focused mainly on the evaluation of possible option for impact mitigation and on the tests of alternative gears. Many feedbacks and suggestions on how to carry on the research activity came from regional case studies and stakeholder meetings held during 2013 and first months of 2014, whereby a tentative settle of possible actions were discussed and ranked.

A detailed activity report of each regional case study is below reported.

Deliverables

Deliverable	Delivery date Annex 1	Actual date
D7.1 Minutes of the Regional Case Study Meetings (RWP1)	31/01/2013	26/06/2013
D7.2 Minutes of the Regional Case Study Meetings (RWP2)	31/01/2014	Delayed
D7.5 Report of Workshop on integration Case Studies (W4)	31/03/2014	Delayed
D7.6 Report on trawling impact in regional seas	31/03/2014	Delayed
D7.7 Report on options for mitigation fishing impacts in regional seas	31/03/2014	Delayed

Deviations

Except for minor deviations in the date of submission the deliverables, and task in the Baltic Case Study, no major deviations occurred. The 2nd Regional Case Study Meetings are postponed in order to discuss the results of the field work scheduled in 2014. The minor deviations have not caused further delay in the progress of the work.

Failing to achieve objectives

See under case study task

Use of resources

Participant	WP7	WP7
	Budget (pm)	Realised (pm)
SDLO	27.1	10.2
ILVO	14.2	14.1
CEFAS-DEFRA	0.9	0.8
UNIABDN	9.6	3.2
Mar lab	1.5	1.5
IFREMER	38.0	14.9
MI	8.8	0.6
DTU-Aqua	20.9	2.1
AU-Bioscience	4.9	0.5
UCPH	5.3	0.0
SLU	8.9	1.1
IMR	0.9	0.0
CNR	41.4	16.0
HCMR	20.7	1.5
CFRI	20.9	5.6
SME02	0.8	0.0
SME03	1.1	0.0
SME04	0.8	0.0
SME05	1.7	0.0
SME06	2.1	1.1
SME07	1.7	1.5
SME08	2.0	0.9
SME09	4.2	0.37
SME10	2.0	1.15
Tecnopesca	14.0	3.0
SME13	7.6	2.0
SME14	7.2	1.5
SME15	6.4	0.7
SME16	6.5	0.7
SME17	2.2	0.2
OMU	15.0	3.6
sum	299.3	88.5
remaining personmonths		210.8

WP7.1 WESTERN BALTIC

Lead: DTU-Aqua (Rasmus Nielsen)

Task 7.1.1. Assess the current trawling impact

Summary of Progress

We are well in progress of 1) Listing important gears (& gear characteristics) used in the Baltic with benthic impact in cooperation with WP2; 2) Giving general overview of expected gear impact on the benthic environment by gear type in cooperation with WP2-WP5; 3) Producing tables of importance in use of gear types with benthic impacts with WP2 covering the total effort, landings/discards/catch composition by species, size selection, revenue, (& profit) by gear and métier and season in the whole W. Baltic Sea (EU STECF data); 4) To produce high spatial resolution maps with fishing pressure (effort) by gear type using VMS data of swept area by gear (demersal otter trawl, beam trawlers, demersal seines, dredgers) as pressure maps (given penetration depth according to infauna, epifauna) with WP2; 5) If possible also produce effort distribution by non VMS registered vessels by gear type, 6) Distribution of benthic habitats or substrates in regional seas (habitat and substrate type maps) with WP2-WP4; 7) Overview of distribution of fishery according to environment in regional seas, i.e. short description with comparison of main overlap in distribution between fishing effort (pressure) for different gear types / métiers and distribution of different habitat (substrate) types.

Sea trials will be carried out in August–September 2014 in Kattegat in three areas subject to different fishing intensity (Aalbaek Bay, S. Kattegat, and Øresund) at depth of 25-30 m (16-18 m) (Fig.7.1.1). Vessels involved are one Nephrops OTT (FN370), and one Danish Naval Home Guard Vessel. A twin-rigged Nephrops trawl with shortened sweeps will be deployed to reduce swept area and minimize seafloor impact from these. Benthic impacts is planned to be tested in a BACI design using sediment profile imaging (SPI) and core samples (haps corer) for measures of sediment grain size composition, SPI index values, pigment profiles (HPLC), depth of H₂S free zone, and species abundance, biomass and diversity and biological traits composition. Depending of the weather conditions side scan sonar & UW video recording may be used. If possibly, laser profiling will be carried out to evaluate the physical impact of different trawl elements.

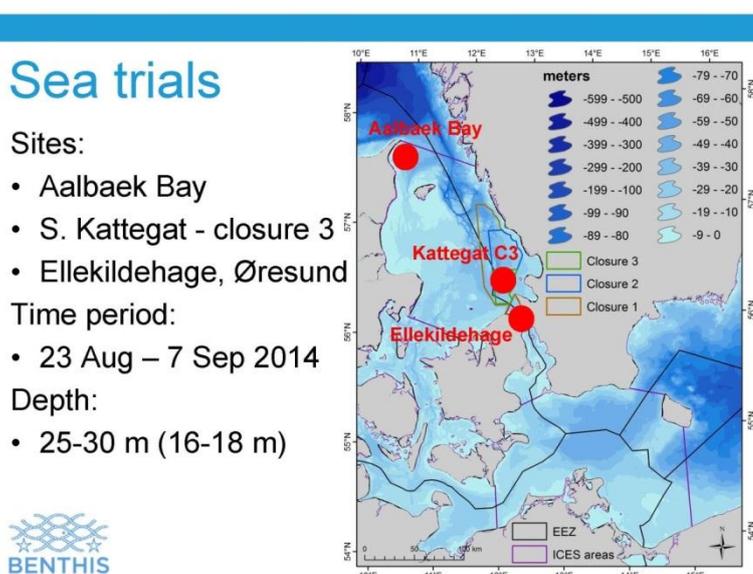


Figure 7.1.1. The three Kattegat areas in which test trials will be carried out: Aalbæk Bay (open to trawling), S. Kattegat C3 (closed to trawling since 2009), Ellekildehage-Øresund (closed to trawling since 1920s).

Clearly significant results. none

Deviations. none

Task 7.1.2. Options for mitigation

Summary of Progress

We have completed 1) A review in, collaboration with broad stakeholder groups including the fishing industry, on technological and management alternatives to mitigate fisheries impacts on the benthic ecosystem in the Baltic; 2) Presentation of relevant new technologies to be tested in experimental fishery in the Baltic case study and possible management measures to a large group of Baltic stakeholders (30 representatives); 3) Stakeholder feed-back with a) questionnaires and b) specific suggestions for 3-5 mitigations to be further investigated as suggested by the stakeholders; 4) Selecting and developing innovative fishing gears for mitigation; 5) Planning of sea trials during several case study meetings.

Clearly significant results.

From the stakeholder consultation specific suggestions were made for 3-5 mitigations and technological developments to be further investigated in the case study. On this basis innovative fishing gears for mitigation has been developed (see Task 7.1.3). The sea trials have accordingly been planned testing the mitigations under the above sub-case studies.

Deviations. none

Task 7.1.3. Testing alternative gears

Summary of Progress

The experimental fishery and survey design has been developed for each of the 4 experimental fishery sub-cases to test alternative fishing methods (with WP2-WP5):

a). Nephrops trawl fishery ;

The main experimental fishery trials will be conducted in second half year of 2014: (i) Nephrops trawl fishery trials, Kattegat, August 2014; (ii) traditional Nephrops twin-trawl with benthic doors and 2 different sweep lengths: Aalbæk Bay, Northern Kattegat - standard Nephrops trawl fishery area (open); Sweep lengths – Standard (74 m), Short (10 m); (iii) Southern Kattegat, Short term closed area; The Sound, Long term closed area; (iv) Physical and biological benthic impacts? Lighter bottom impact because of smaller gears and lighter bottom gear? (v) Higher catch efficiency / Cost Benefit Analyses (CBA) / energy efficiency? (vi) Less by-catch and discard of fish because of changed herding?

b) Creel fishery trials in Kattegat 2014-2015

Nephrops creel fishery trials in Kattegat ultimo 2014 – primo 2015 with different modifications of creel set-up (see below): (i) Experimental fishery to follow up on pilot investigation results on fishery at soft bottom in standard Nephrops trawl areas compared to usual creel fishery at harder sediment types; (ii) Overlapping fishery between Swedish commercial Nephrops trawl fishery with standard trawl and Swedish creel fishery in northern Kattegat; (iii) Attachment points of the creels (top instead of center point), shelters in the creels; (iv) Change in Catch rates (Catch per Unit of Effort, CPUE)? Discard reduction? Economic efficient/sustainable (CBA)? Reduced bottom impact (also when heaving 40 creels)?

c) Mixed cod trawling in the western Baltic.

Cod fishery trials in western Baltic Sea with pelagic and benthic doors, medio-ultimo 2014: (i) Pelagic Doors; (ii) Efficiency of the different doors in different areas; (iii) Smart fishing (certain areas, effort

allocation); (iv) Physical impacts from desk-studies of standard trawls given gear specifications; (v) Changed physical impacts with pelagic doors with respect to sweeps and footrope? (vi) Change in catch rates and discard? Reduced fuel consumption (energy efficiency)? Economic efficient / sustainable (CBA)? Reduced bottom contact (doors, sweeps, foot rope) and Benthic impacts? (vii) Benthic physical impacts will be monitored as a desk study using results from measurements with laser analyses of footprint from similar gears and with specific information about gear properties.

d) Mussel dredging in the Belt Sea

Blue mussel (*Mytilus edulis*) dredging trials with light twin mussel dredge in the Belt Sea (western Baltic), summer-autumn 2014: (i) Light / Heavy mussel dredge; (ii) Smart fishing – incl. video monitoring in advance of fishing to monitor: a) higher density areas b) higher value mussels. Improved catch efficiency? Reduced benthic impact? Increased energy efficiency? Impact of management regulations based on width of the gear in relation to efficiency?

Clearly significant results

Pilot investigations with creels on soft (muddy) bottom showed: (i) Camera monitoring indicated that the creels sank very much down into the sediment; (ii) The bait attracted *Myxine* scared the *Nephrops* in the creels => some escapement; (iii) Catch rates about 180 g/creel per day; (iv) CBA: Daily profit about 3800 DKK per day; (v) CBA: Comparable trawl fishery for trawlers < 12 m about 3050 DKK per day, i.e. comparable; Larger trawlers have higher profit;

Results of pilot investigations of pelagic trawl doors in the western Baltic cod fishery: Some initial trials with certain pelagic doors and settings have already been tested. The initial results indicate that there seems to be area differences in the efficiency of the doors. Further testing is needed to say anything conclusive.

Results of Pilot Investigations of Dredging blue mussels, *Mytilus edulis* (i) Ecosystem impacts of mussel dredging: a) removing structural seabed elements, b) inducing re-suspension of sediment, c) reducing filtration capacity; (ii) Reducing fishing impacts => development of new Light Dredge with stakeholders; (iii) Tested against a standard dredge on commercial vessels using different exp. setups; (iv) Results from use of light dredge: a) the weight of sediment retained and re-suspension of sediment at the surface were lower, b) the drag resistance was significantly lower indicating a reduction in energy transfer to the sediment, c) catch efficiency increased – reducing area of impact and reducing fuel consumption - and accordingly increasing economic efficiency; (v) Sea floor tracks made by the two dredges could not be distinguished by use of a side-scan sonar and the tracks were still detectable two months after fishing.

Deviations. none

Task 7.1.4 - Innovative management scenario's

Summary of Progress

Data: Provision of data for within the case study completed (w. WP2, WP5); Data on effort (logbooks, VMS, swept area); catch, landing and discard composition (incl. discard data by gear); revenue, cost and profit; fuel consumption (some); additional data for CBA.

Models / Methods + Impact predictions: DISPLACE IBM Bio-Economic and Energy efficiency model developed (MSE simulation model with high spatio-temporal resolution on vessel basis); Simple method for CBA developed (with WP5) to (i) to evaluate impacts of up-scaling of gear technological mitigations on metier and fleet specific basis (impact predictions); (ii) to evaluate impacts of effort re-allocation scenarios and fishing closures in relation to either high intensity areas or only keep fishery in high intensity areas (and reallocate fishery or close low intensity areas) (impact predictions). Bio-economic evaluation of management measures relevant for the case study and gear specific innovations. Closures and effort re-allocation scenarios (including smart fishing); Emission regulations reducing effort; Maybe discard ban; Gear specific measures and gear innovations (e.g. mitigations pointed at wrt. catch,

economic and energy efficiency), Evaluation of standard fishery compared to gear innovations. Catch rates and composition: landings, discards, total catch (changed discard included here) – individual vessel basis scaled up to metier and fleet and spatial explicit? Economic efficiency: Revenue, costs, profit from IBM bio-economic models or simple CBA on individual vessel basis scaled up to metier and fleet and spatial explicit? Energy efficiency (fuel consumption)?

Clearly significant results. None

Initial results on evaluation of closure effects and contribution of closed areas to good environmental status in the Kattegat – benthic communities in relation to fishery (with WP3 and WP4), Task 7.1.4:

Seafloor integrity is one of the 11 descriptors for determining Good environmental Status (GES) according to the Marine strategy framework directive. The directive also states that Marine protected areas are an important contribution to the achievement of GES. In that perspective, the permanent closure, i.e. the SE area (crossed in Fig. 1 below) in the Kattegat is an area that fully protects bottom habitats and the associated organism from abrasion by bottom trawling which is one of the pressures that affects the status of the seafloor. The intention of this study is firstly to evaluate the performance of the pressure indicator of bottom trawling, i.e. satellite positioning of fishing vessels (VMS) as an indicator of seabed status in the Kattegat utilising the improved state of the art modelling of trawling pressure under development in WP2 of the BENTHIS project. Secondly, the aim is to evaluate the potential recovery of benthic community in the permanently closed area following the establishment of the closure in 2009.

Benthic habitats are patchy on different scales and so are the use of the ecosystem e.g. fishery by bottom trawling. The topography and substrates of Kattegat overlaid by positions of active bottom trawlers is a good example of that as shown in Fig. 7.1.2

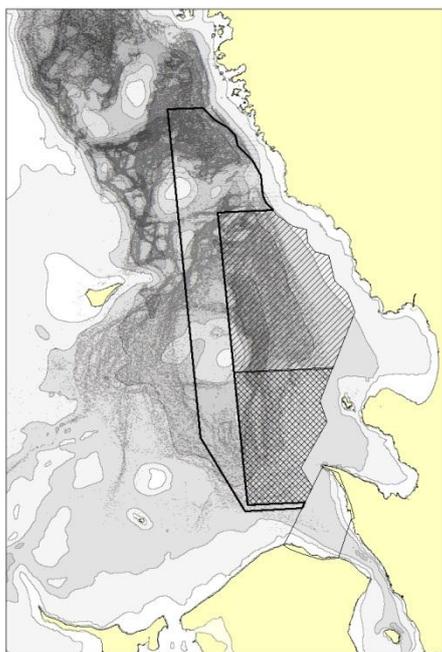


Fig. 7.1.2. Depth contours and Swedish and Danish bottom trawlers positions as indicated by hourly VMS positions (black dots). The crossed area is completely closed to fishing activities since 2009. The other outlined areas are seasonal and partial closures for unselective fishing gears.

To evaluate the potential recovery of benthic organism from bottom trawling and trawling impact on the areas, a grid 1 X 1 km was constructed and the sum of trawling positions from fishing vessels satellite positioning (VMS) within each cell during the years 2004-2007 (Swedish vessels) and 2006-2007 (Danish vessels). A stratified sampling design was then applied to the trawled areas to allocate 16 benthic grab sample stations to be taken in each part of the closure. Eight samples within each area were allocated to either high trawling frequency (>30 positions) or low trawling frequency (0-10 positions). The samples of benthic infauna are taken in May 2009-2011 and in 2014 using a Smith-McIntyre grab (0,1 m²). In 2014 sediment profile images will as well be collected to complement the analysis. The putative effects on

species will be tested against the factors area and year and age, using multivariate approaches. Data distribution graphs will be used to visualize potential associations and proportional significance of each variable (species) to explain the association pattern

Deviations. none

Task 7.1.5: To valuate fishing impact on feeding patters of a selection of benthivorous fish

No activities have been carried out under this task so far.

Deviations: There is a delay in relation to Task 7.1.5 “To evaluate fishing impact on feeding patterns of a selection of benthivorous fish.” However, these analyses are only a very minor part of the case study work, and no other case study work - or any other work package work - is dependent on those analyses. Consequently, this delay will not have consequences for any other project part. As it has been questioned how efficient such analyses will be, i.e. whether it will be possible to obtain any useful results and any useful information from such pilot investigations and analyses given the limited resources available for this in the case study additional discussions on those investigations need to be taken before starting potential data sampling. It will be discussed that the resources for this task probably can be better utilized in Tasks 7.1.1-7.1.4.

Deviations

There are no major deviations from the planned work in the Baltic case study. The only delay is in relation to the minor case study Task 7.1.5 “To evaluate fishing impact on feeding patterns of a selection of benthivorous fish.” However, these analyses are only a very minor part of the case study work, and no other case study work - or any other work package work - is dependent on those analyses. Consequently, this delay will not have consequences for any other project part. As it has been questioned how efficient such analyses will be, i.e. whether it will be possible to obtain any useful results and any useful information from such pilot investigations and analyses given the limited resources available for this in the case study then additional discussions on those investigations need to be taken before starting potential data sampling.

Failing to achieve objectives

The work to achieve the planned objectives of the case study is well advanced and in progress as planned. We have no expectations of the objectives will not be met under the Baltic case study.

Use of resources

The use of resources has been as planned. The major use of resources under the case study will be in second half year 2014 where the major bulk of experimental fisheries under the case study will be carried out.

WP7.2 NORTH SEA

Lead: ILVO (Hans Polet)

Task 7.2.1: Assess the current trawling impact

Lead: IMARES. Contribution P03, P04,P06,P07,P08,SME's

Summary of progress

This task is closely related to the work carried out in WP2 and consists mainly in collecting data for and delivering data to WP2 according to a pre-described methodology and in a pre-described format. As such, data have been delivered for gear characteristics of fishing gears used in the North Sea. This has been done for beam trawls, otter trawls, seines, gill nets etc. VMS data on fishing activities in the North Sea have also been delivered according to the standard format. A text has also been delivered on trawling impact in the region.

IMARES studied how trawl disturbance intensity relates to benthic species richness, and how the relationship is mediated by total benthic biomass, primary productivity, water depth, and median sediment grain size in the boxcore samples routinely collected on the Dutch part of the North Sea (BIOMON). The manuscript reporting the results of the study has been submitted for publication (van Denderen et al. 2014a).

IMARES conducted a study on the temporal autocorrelation of trawling events on the scale of benthic samples. Most studies have assessed trawling at fine spatial scale on an annual basis, largely ignoring the temporal pattern within the year. In this study the temporal patterns in beam trawl effort intensity at 90 stations of the Dutch continental shelf of the North Sea was analysed for a period of 10 years, at a fine temporal (per week) and spatial (110 by 70 meter) scale using Vessel Monitoring by Satellite (VMS) data. The manuscript reporting the results of the study has been submitted for publication (van Denderen et al. 2014b).

Clearly significant results

Data collection and delivery according to plan.

A negative relationship between trawling intensity and species richness is found, which is also negatively related to sediment grain size and primary productivity, and positively related to biomass. Further analysis of our data shows that the negative effects of trawling on richness are limited to relatively speciose, deep areas with fine sediments. We find no effect of bottom trawling in shallow areas with coarse bottoms. These condition-dependent effects of trawling suggest that conservation of benthic biodiversity might be achieved by reducing trawling intensity only in a strategically chosen fraction of space, while allowing bottom trawl fisheries to continue in areas where there is limited effect on species richness (van Denderen et al. 2014a)

Beam trawling is aggregated in time and shows clear seasonality, which is related to the behaviour of the fleet and migration patterns of the target fish species. The seasonality in trawling intensity will affect impact on, and recovery of the benthic community. This implies that annual average trawling intensities may not show a clear relationship with the degree of disturbance of the benthic community, because part of the impact of trawling is determined by the timing and temporal aggregation of trawling events. Ultimately, our work shows that whenever high resolution data from VMS is available, it is important to make maximum use of it, as the fine temporal scale includes information which may be highly relevant to accurately predict trawling impact on the benthic community (van Denderen et al., 2014b).

Deviations. None

Failing to achieve objectives. None

Task 7.2.2: Options for mitigation

Lead: E. Vanderperren (ILVO), Contributors: P01,P02,P03, SME's

Summary of progress

A review report on different options for mitigation in the region has been delivered. A short overview of these options was presented. The options for mitigation in the North Sea, as an alternative to the present day flatfish directed fisheries, are in principle manifold but few of them are easy to implement. It is, however, very clear that electric pulse fisheries for flatfish as well as for brown shrimps have successfully been implemented into the commercial fisheries. There also are indications that these alternatives have benefits in terms of discards and seafloor impact.

Within BENTHIS a manuscript was finished on a comparative study of the catch profile of a pulse trawl and a conventional beam trawl (van Marlen et al., 2014).

Clearly significant results

The two types of pulse trawling (flatfish and shrimp) have been selected to be studied in the BENTHIS projects as alternatives for the traditional beam trawl fisheries. The comparative study of the catch profile showed that the pulse trawl was more selective in catching sole and had a lower bycatch of undersized fish and benthos.

Deviations. None

Failing to achieve objectives. None

Task 7.2.3: Testing alternative gears

Lead: IMARES; Contributors: P02,P03,SME's

Summary of progress

ILVO, IMARES and SME07 carried out a sea trial in June 2013 comparing the pulse trawl as an alternative with the traditional tickler chain beam trawl as used by the Eurocutter segment of the fleet. The sea trial was carried out by a commercial vessel, made available by SME07, and two research vessels Simon Stevin (through ILVO) and ISIS (through IMARES). For each of the experiments, the contract foresees that direct mortality will be studied. As such, sampling with a benthos dredge according to a BACI scheme must be carried out. Because such an experiment requires that several days are spent at sea, it was decided to use the time at sea to expand the experiment so more information could be collected that can be used to validate the models developed in the generic work packages. Following extra tasks were scheduled: (i) SPI (sediment profile + fishing gradient); (ii) Resuspension with sediment sledge; (iii) Penetration depth with laser; (iv) Multibeam for alien fish tracks + penetration depth; (v) Catch comparison; (vi) Injuries (IIM); (vii) Stomach content (scavenging); (viii) Box corer (depth distribution, traits); (ix) Gear characteristics for model on physical impact.

The trials for 2013 – Eurocutters were successfully carried out. Preliminary results have been presented and reported. Some samples and data are still under the process of analysis.

Future sea trials are scheduled with a large beam trawler (June 2014) and a shrimp trawler (2014-2015).

Clearly significant results

A significant difference in penetration depth was detected for the pulse trawl compared to the traditional flatfish beam trawl, although no difference was detected in trawl path mortality in the preliminary analysis.

Deviations. The field experiment to estimate trawl track mortality caused by the pulse trawl, scheduled for the 2nd year, has been advanced, and has been carried out in June 2013. The collaboration with a national project in the Netherlands, a 2nd field trip is scheduled for June 2014.

Failing to achieve objectives. None

Task 7.2.4: Innovative management scenario's

Lead: Jan Jaap Poos (IMARES); Contributors: P02,P03,SME's

Summary of progress

This task is in an early stage. Coordination with WP5 and WP6 has taken place during the project coordination meeting in Rome, April 2014.

The discarding decisions of a pulse and conventional beam trawler were compared using a simulation model (Dynamic State Variable Model) parameterised for the North Sea beam trawl fleet targeting plaice, sole and cod. It was shown that the high fuel costs promotes the transition towards the pulse trawl that is more energy efficient (lower fuel cost) and catches a lower proportion of discards. The manuscript is expected to be submitted in the summer of 2014.

Clearly significant results

A Dynamic State Variable Model on the effort allocation and discarding decisions is parameterised for the pulse and the conventional beam trawl operating in the North Sea.

Deviations. None

Failing to achieve objectives. None

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Task 7.2.5: Effect of bottom trawling on the food for flatfish.

Lead: IMARES; Contributors: P03,P04, SME's

Summary of progress

In the spring of 2014, a start is made with the analysis of (i) the relationship between the trawling intensity and the condition factors of sole and plaice as recorded during the annual beam trawl surveys carried out in the southeastern North Sea; (ii) the relationship between trawling intensity and the benthic community composition and the abundance of food for plaice and sole.

Clearly significant results. None

Deviations

None

Failing to achieve objectives

None

Use of resources

Participant 1 claimed less personnel costs than the actual work they carried out. The lesser claim is caused by new national procedures around co-financing. Because of that the person months worked in matching projects for BENTHIS are not yet claimed. These costs will be claimed in the next period using an adjustment Form C.

The budget for labour of VLAGEW-ILVO has been used for about 80 % of the total budget because of the high work load for the sea trials. ILVO, however, ascertains that the contractual work will be carried out, if necessary with national budget.

WP7.3 WESTERN WATERS

Lead: IFREMER (Pascal Laffargue)

The Western Waters case study comprises of three different components dealing with (i) the Nephrops fishery in the bay of Biscay (lead IFREMER, Pascal Laffargue), (ii) the scallop and Nephrops fisheries in the Irish Sea (lead MI, Dave Read) and (iii) Shelf Slope (lead IMR, Lene Buhl-Mortensen). The progress and activities will be reported for the different components separately.

Task 7.3.a Hake & Nephrops mixed fisheries in the Bay of Biscay / “Grande Vasière”

Lead : IFREMER (P7) P.Laffargue. Contributions: SME09 (L.Treguier), SME10 (Y.Didelot)

Fisheries: Hake/NephropsOTB / OTT

Habitat: Circalittoral mudflats, Mud-dwelling crustaceans, Hake nursery

Alternative gears and/or management strategy: enlighten gear, traps, Spatial distribution of activity

Task 7.3.1. Current impact of fishing

Summary of progress

An inventory of gears utilized in the hake/nephrops fishery has been carried out. Data were collected from skipper interview, netmaker interview and already existing datasets (Obsmer and TECTAC datasets). Those data have been transmitted to WP2.

Access to VMS data has been granted from French fisheries administration and data obtained in March 2014. As far as obtained dataset are not in a standardized format (tacsat/eflalo), an effort has already been done to modify those dataset in order to fulfil requirements of project work plan and analysis to produce standardized fishing effort maps has begun.

We performed a synthesis of available dataset for Ifremer to cover benthic fauna of case study area. Benthos data mainly comes from trawling samples collected from fisheries surveys (Evhoe and Langolf surveys). Those dataset exclusively cover demersal and epi-megafauna. Those data will be utilized to fulfil requirements for WP3 workplan.

Moreover, new dataset came from collected data in May and September 2013 during dedicated surveys (FEBBE 1 & 2). Those surveys covered all benthic compartments. Samples analysis will continue in early 2014 and that new dataset should help us to better define trawling impact processes in the Nephrops fisheries system. A thesis supported by Benthis project and started in November 2013 will be mainly engaged in those analysis (Alexandre Robert Thesis). Moreover, a first analysis of functional traits table from megafauna dataset showed the main functional groups occurring in the bay of Biscay.

Discards maps have been realized for the whole bay of Biscay region. That work will participate to WP4 objectives. Moreover, in order to evaluate the discard flow to the benthos, a collaboration with ILVO (Jochen Depestele, Eric Stienen) has been engaged about the level of discard consumption by birds. To enhance knowledge about discards consumption rate, new data have been acquired in the northern part of the Bay of Biscay during the Evhoe survey (in autumn 2013).

A thesis (B.Mengual) dedicated on trawling gears physical effects started in the end of 2013. Developed approaches will couple in situ made observations and hydrodynamic modeling. Results from that thesis, only slightly financed by the project but very helpful for Benthis, will especially help us to better estimate the level of sediment processes due to fishing as compared to natural part.

To estimate current and new gear impact, a modeling framework is being implemented. That gear model will help us to better identify pressures induced by the gears on the bottom and to evaluate gain from gear modifications.

Task 7.3.2 Options for mitigations

Summary of progress

Three options for mitigating trawling impact on Nephrops fishing grounds of the Bay of Biscay will be tested during Benthis project: two technicals and one management options. The first of them will focus on replacing current trawling gear with less impacting one by reducing otter-board contact with the bottom ("jumper" boards). The second will test the viability of replacing part of the trawlers with Nephrops traps fishery. Finally, we will test for effects of spatial management strategies in order to reduce footprint of trawls while balancing with fishery viability.

Task 7.3.3 Sea trials

Summary of progress

FEBBE 1 & 2 surveys ("Fisheries Effect on bay of Biscay Benthic Ecosystem") have been performed onboard the Ifremer RV/Gwen Drez in the northern part of the bay of Biscay from 22 May to 1st June and again from 20 to 29 August. Those surveys took place in a series of 4 surveys scheduled during the Benthis project for the "Grande Vasière" area ("GV") in the bay of Biscay. Those two first surveys have been financed on national own fund while following one will be on Benthis budget. The aim of those two first surveys was to evaluate habitat features and benthic-demersal community structure and functioning under trawling pressure gradient in the main area for Nephrops fisheries in the GV. From observations and collected samples, further biological analysis will include in deep analysis of trophic network under fishing pressure. Five scientists and 6 crew members participated to each one of those fieldworks. Data were collected on more or less 20 stations for each survey. In order to get all needed biological, hydrological and physical data, we deployed onboard a set of sampling and measuring instruments:

multi-corer: vertical profile of physico-chemical sediment structure (granulometry, organic matter, ...), day-Grab: endo and epi-benthic macrofauna to meiofauna sampling and analysis, 2m beam trawl: epi-benthic macro to megafauna invertebrate and fishes sampling and analysis, otter trawl: epi-benthic and demersal invertebrate and fishes sampling and analysis, neuston net: amount and composition of organic matter in the water column, WP2 plancton net : zooplankton amount and composition, CTD: water column temperature and salinity profile.

Future work planned

Gears test will be performed during two dedicated surveys organized for the Benthis project (FEBBE 3 & FEBBE 4). Those surveys aimed at quantifying the trawling effect on sediment and benthic community structure by comparing "classical" vs modified gears. Those sea trials will be performed in may and october 2014. Both surveys will utilized a set of tools in order to evaluate bottom impact, sediment resuspension processes and fauna impact of current vs modified gears.

Those surveys will be completed by an "auto-observation" protocole designed to be utilized onboard the vessels of fishermen partners during the Benthis project period. The protocole has already been defined involving a close collaboration of fishermen partners (SME09 and SME10). That protocole will provides data on efficiencies of the new gears in terms of captures, economic viability, fuel consumption...

Task 7.3.4 Management scenario evaluation

For the economics part (links with the WP5), first implementation of the framework and its dedicated tool developed for WP5 (SENSECO-IAM) has been realized for western waters areas. Implementation has been realized from DCF transversal and economic data by metier. It mainly aims at analyzing economic consequences, for fishing fleets or vessels, of the adoption of new gears in combination or substitution to the current gears.

A spatial explicit modeling framework will be utilized to evaluate alternative management scenarios and or modifications of gears. We will especially test for the consequences of closing areas and/or modifying gear on the fisheries dynamic. First steps for parameterization of modeling tools (ISIS-Fish) have been performed to test spatial and temporal effects of closed areas or fishing gears modifications. It mainly

covered the parameterization of the exploited populations and the fishing fleet. Moreover, exploration of model optimization methods is going on.

Regional case study meeting

The first regional case study meetings (RWP1) have been held in Lorient the 25/10 (with scientists only) and the 29/11 (with scientists, professional partners and some fishermen representatives). Those two dates were organized to ensure the best participation both for scientists and professional fishermen involved in Benthis project. Some fisheries organization representatives participated to the second meeting. Agenda included a general presentation of Benthis project and main schedule (WP, tasks and deliverables) and administrative aspects (especially financial specificities dedicated to SMEs). Specific objectives and approaches linked to case study were presented too. We especially discussed about main data review and collection strategies as well as alternative gears choice and organization of the field surveys that will take place during the first two years of the project. Kickoff meeting organization and participation were discussed too.

The second regional case study meeting (RWP2) has been held in Brest (France) the 6th of February 2014. For each of the WPs and dedicated tasks, we presented an overview of the regional work done since the previous meeting. We presented work to be done and proposed a workplan for the next project's period. A specific session has been organized to prepare the Benthis field surveys in 2014.

Regional stakeholder event (RSE1)

The first regional stakeholder event (RSE1) has been held on April 23th in Nantes (France). 13 participants were present and most of the stakeholders groups were represented: fishermen association, government fisheries management, environmental NGO's, fishing technology industry, scientists. Discussion was organized about 4 main topics: ecology and impacts, innovative technologies, management economy and societal expectations. The generic questionnaire of Benthis project was proposed to be filled by stakeholders. However, nor stakeholders or contacted ones accepted to fill it out. They mainly stressed that questions were more political than impartial and feared used that could be done about such results. From discussions, it arose that deep modification of fishing practices and gears won't be supported by fishermen. Modifications of current gears components (e.g. trawl doors) proposed and tested in the Benthis project appeared to be of interest (reduction of cost combined with reduction of physical impact on the bottom).

Clearly significant results

Two publications involving BENTHIS have been produced during the reporting period. The first one, "taxonomic sufficiency of epibenthic macro and mega-fauna in scientific bottom trawl surveys" (Brind'Amour A., Laffargue P., et al, *Continental Shelf research* 72 :1-9, 2014) deals with utilization of epibenthic macro-fauna from scientific bottom trawl surveys that will help us to better utilize those data to cover Benthis objectives. The second one applied to BENTHIS project in a more generic way (Brind'Amour A, Dubois SF (2013) Isotopic Diversity Indices: How Sensitive to Food Web Structure? *PLoS ONE* 8(31): e84198. doi:10.1371/journal.pone.0084198). That publication will be helpful for the selection isotopic diversity indices. Those indices will be specifically utilized to identify trawling induced modifications to the foodweb.

Deviations

none

Failing to achieve objectives

none

Use of resources

No exceptional deviations

Two surveys dedicated to collect data for the Benthis project (FEBBE1 & FEBBE2) have been financed on national funds. One dedicated thesis is half part financed by Benthis and half part by French "Pays de Loire" region". A second dedicated thesis is fully financed by "Bretagne" region.

Benthis project presentation to French fishermen committee and associations from local to national scale: National french committee (CNPMEM, Paris 17/05/2013, <http://www.comite-peches.fr/>); Benthic and Demersal species commission (CEBDGG/CNPMEM, Paris, Feb 2013, Nov.2013 & May.2013) ; « Pays de la Loire » Regional Committee (CRPMEM, Nantes); Aglia association - UEGC (AGLIA, Lorient, <http://www.aglia.org/>).

7.3.1.b: Scallop and Nephrops fisheries in the Irish Sea

Lead : MI (P8) - D.Reid

Fisheries: Nephrops trawling fishery

Habitat: Muddy habitats, 35-140 m

Region: Western Irish Sea (middle)

Alternative gears and/or management strategy: "Smart fishing" (spatial and temporal fishing strategy)

Fisheries: Scallop Dredge

Habitat: Sand/gravel seabeds in shallower waters

Participant: Local scallop association

Region: SE Irish coast

Alternative gears and/or management strategy: current dredge compared to Hydrodredge

Task 7.3.1 Current impact of fishing

The case study will investigate the efficiencies and reduced environmental impacts to be gained from integrating detailed seabed maps into fishing plotters and also from changes in gear type. During this period background data was collated on the fleet, fishing effort potential, gear characteristics and the distribution of fishing activity including mapping of VMS data and fishing tracks from vessels plotters. Multibeam backscatter acoustic data was processed from previous surveys and made ready for importation into the Olex plotting systems.

Task 7.3.2 Options for mitigations

Consultations were held with participating vessels.

Task 7.3.3 Sea trials

A trial to study changes in fishing performance using multibeam backscatter maps is planned for June 2014. Separately a trial comparing the efficiency, selectivity, catch composition and fuel consumption of two gear types is planned for summer of 2014 on inshore scallop fishing vessels

Clearly significant results

No results to date

Deviations

None

Failing to achieve objectives

None

Use of resources

Human resources to (i) map VMS data; (ii) compile fishing effort data for the scallop fleet; (iii) process multibeam backscatter data; (iv) importation of data to Olex plotting systems contact with Olex suppliers re file configurations consultation with vessel operators on the conditions for trials consultation with gear manufacturers

Travel: (i) Meeting Rome; (ii) Consultation Meeting Dublin

Task 7.3.1.c Shelf Slope

Lead : IMR (P13) Lene Buhl Mortensen

Participant: IFREMER (P7)

Fisheries: multispecies trawling gears (OTB, TBB) and passive gears (GNS, GTR, LLS, FPO)

Habitat: shelf to deep water areas (mainly on the continental slope) with a specific focus on Cold Water Corals habitats

Alternative gears and/or management strategy: analysis of spatial distribution of activity, gear ban

Task 7.3.1 Current impact of fishing

Summary of progress

A review and a summary of information on VME's have been performed for sub-CS4. Realized work mainly included fragile community distribution as compared to the fisheries effort in the same areas (Norwegian shelf and Bay of Biscay slope). Deeper analysis will be performed to evaluate interactions level between fisheries and those VME's.

Using VMS-data IMR has produced an overview of ongoing fisheries and indications of impact this includes: Map of trawling pressure and quantification of trawl marks.

Published report: Buhl-Mortensen L, Aglen A, Breen M, Buhl-Mortensen P, Ervik A, Husa V, Løkkeborg S, Røttingen I, Stockhausen HH. 2013. Impacts of fisheries and aquaculture on sediments and benthic fauna: suggestions for new management approaches, *Fisken og Havet* 2, 69pp

MR has mapped the occurrence of VMEs with video in Norwegian waters this includes: map of distribution of coral reefs and map of the distribution of threatened and declining habitats (OSPAR habitats).

Ongoing deliveries:

- Analysing effects from otter trawl on long lived habitat forming organisms and megafauna in general.
- MS in preparation: "Trawling impact on megabenthos and sediment in the Barents Sea: use of satellite vessel monitoring and video"
- Arranging a symposium on effects of bottom trawling and gear mitigation: ICES Symposium "Effects of fishing on benthic fauna, habitat and ecosystem function", June 16 - 19 2014, Tromsø, Norway.
- Epifauna/habitat relation analysis in WP3 to be compared with fisheries activity in WP4

Task 7.3.2 Options for mitigations

No specific results to date

We mainly aim at analyzing spatial distribution of activity and gear ban options.

Task 7.3.3 Sea trials

no sea trial planned for that sub-case study

Taks 7.3.4 Management scenario evaluation

no result to date

Clearly significant results

No results to date

Deviations

none

Failing to achieve objectives

none

Use of resources

no deviation

WP7.4 MEDITERRANEAN SEA

Lead: CNR (Antonello Sala)

The focus in this region is on the demersal otter trawl fisheries. Focus for Fisheries and Alternative Strategies are on i) Reducing unwanted catches in trawl fisheries by developing commercially acceptable selective gear designs for Mediterranean demersal fisheries and formulating guidance for future designs; ii) Shifting from traditional demersal otterboards to novel and semi-pelagic otterboards; iii) Development of viable alternative fishing methods (pots and traps).

Task 7.4.1. Assess current trawling impact

Summary of progress

Work is underway to assess the current trawling impact with a presentation made at the annual meeting in Rome. This work includes the cataloguing of demersal trawling gears, reviewing local information on their impacts on the seabed (sediments, physico-chemical properties, fluxes, macrofaunal and megafaunal communities), trawling effort, discards and landings. Original VMS-based impact maps have been produced (see maps below) and work is on-going to refine these into swept area impact maps using the WP2 VMStools programme and workflow. Whilst the project has detailed the provision of mapping outputs for the distribution of benthic habitats and substrates, there are no Mediterranean wide habitat maps or information and even at the local level this is largely absent. However, work is underway to use depth as a rough proxy for sediment type so that this can be overlapped with the VMS swept area maps to produce an Italian/Greek overview of the distribution of fishery according to environment. This work is aimed towards the regional sea contribution for the BENTHIS Deliverable 7.6 Assessing Trawling Impact in Regional Seas, which has been scheduled for finalization in June 2014.

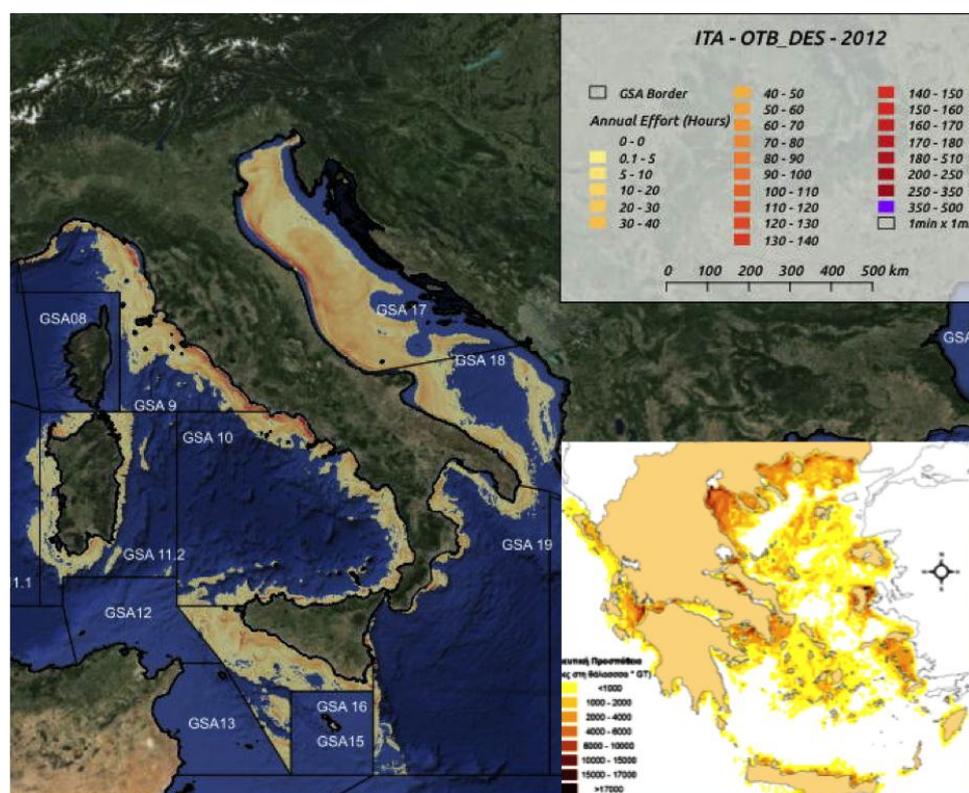


Figure 7.4.1. Examples of Italian and Greek first processing of VMS data for BENTHIS.

In addition to this deliverable work, further trawling impact assessment work is being undertaken following the WP3.1 investigation of links between benthic species traits, functions and habitat types. Extensive datasets from traditional benthic data survey (species abundance biomass) from previous trawling impact studies area being re-analysed with respect to traits (body size, morphology, fragility, longevity, reproduction, living habitat, sediment position, feeding mode, mobility, bioturbation mode and habitat modification ability) for both megafaunal and macrofaunal communities. During the reporting period, the faunal datasets were 'traitified' and analysis has begun to specifically pick out trawling impacts.

Clearly significant results

This task is at a mid-stage. D7.6 is scheduled for 6th June 2014, according GA held in Rome (31/03-03/04-2014).

Deviations. None.

Failing to achieve objectives. None.

Task 7.4.2. Option for mitigation

Summary of progress

A list of relevant mitigation technical measures that have successfully been tested and/or implemented in Europe have been compiled by means of a literature review according to D7.7. Technical measures listed have been evaluated by means of indicators like e.g. selectivity parameters, reduction of discards, reduction of seafloor contact, fuel consumption reduction, etc. Many of those potential actions have been discussed during the RSE1 meeting held in Ancona in March 2013. Stakeholders involved have been requested to list and comment possible advices and suggestions to reduce the benthic impact in Mediterranean fisheries. The debate aimed at assessing the views of the different stakeholders, the important questions, the most promising technological innovations, the most promising management solutions and what are the ecological and socio-economic consequences of mitigation measures. During round table discussions stakeholders were invited to promote at least three different suitable actions to reduce benthic impact.

On the basis of technical actions proposed by stakeholders a list of clusters has been created and stakeholders have been invited to express a preference from 1 to 3 for each one (see Table 1). Several technical modifications came from stakeholders and they have been included into six clusters as in Table 1. The majority of them are technical modifications and innovations, such as new otterboards or some modification in the ground rope. Also changing in fishing techniques were promoted, in particular it has been proposed to shift from towed gears to static gears.

Table 1. Scoring of the most relevant technical innovation aimed at reducing benthic impact.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Subtotal	%
1 Otterboards																											26	19.8	
2 Twine/Materials/trawl design																											25	19.1	
3 Shifting from trawl to seine																											19	14.5	
4 Corrent/coppers																											19	14.5	
5 Groundgear modification																											22	16.8	
6 Shifting to static gears																											20	15.3	
Total																										131	100.0		

Clearly significant results

This task is at a mid-stage. D7.6 is scheduled for 6th June 2014, according GA held in Rome (31/03-03/04-2014).

Deviations. None.

Failing to achieve objectives. None.

Task 7.4.3. Testing alternative gears

lead: CNR; main contributors: Grilli, Mori, University of Cataluña).

Summary of progress

One of the aims of the Task 7.4. Mediterranean Case Study is to shift from traditional demersal otterboards to novel and semi-pelagic otterboards. For this purpose, Grilli (SME13) and Mori (SME14) developed a novel series of otterboard design, under the scientific support of CNR (P14). In order to assess the physical impact reduction of novel otterboards, two traditional otterboards, from Grilli and Mori respectively has and novel otterboards, each door manufacturer involved (SME13 and 14) two different otterboard model has been tested, one traditional and one experimental. Traditional models are commonly bottom otterboards while the experimental models are floating, semi pelagic-based otterboards. The same novel otterboards have been tested in full scale during sea trials onboard the R/V "G. Dallaporta".

Clearly significant results

Tests on wind tunnel

At the University of Rostock, Rostock (Germany) wind tunnel, from 20th to 22nd October 2013 a total of five different otterboards models have been tested. A VF15 from Thyboron has been tested preliminary and considered as reference. In order to compare performances of traditional and novel otterboards, each door manufacturer involved (SME13 and 14) two different otterboard model has been tested, one traditional and one experimental. Traditional models are commonly bottom otterboards while the experimental models are floating, semi pelagic-based otterboards. The main goal of the novel otterboards development was the reduction of the benthic impact of bottom trawl fishery by means of the reduction of the contact of otterboard with sea bed. The wind tunnel data analysis was supported by Fernando Mellibovsky and Joana Prat from Universitat Politècnica de Catalunya, Spain. One of the main expected results achieved for the door manufacturer has been the floating behavior of the models, that have been assessed also by wind tunnel stuff during the tests. A detailed description of the work done can be found in the tests report in Annex 1. Report of otterboard measurements in the large wind tunnel.

Sea Trials

Information and results coming from data processing have been compared with full scale sea trials carried out in February 2014 on board the R/V "G. Dallaporta" (Ancona, Italy), under the scientific responsibility of CNR. Preliminary results about doors performances in terms of drag and lift coefficients have been presented at the Benthis general Assembly in Rome from 30th of March to 4th of April, during the Regional case studies meeting.

Another major objective of this work task is to develop viable alternative fishing methods. In Greece (HCMR), this work is in the advanced planning stage with the first sampling cruise organised for August 2014 in Heraklion Bay Crete to trap in 2 depth strata representing a "redfish" (red mullets and sparids) fishery at 90-120 m depth and a whitefish/shrimp fishery at 200 m depth. Contacts have been made with a Swedish company to acquire Norwegian fish pots. These will be fished just off the bottom on replicate longlines (using a similar protocol for the same trap design fished by CNR in Italy). Shrimp pots will also be fished in the whitefish/shrimp fishery area. During the end of this reporting period compact underwater

cameras (GoPro with deep water housings) are being acquired to record natural light behaviours between fish/invertebrate fauna and the pots/traps. Sampling will be undertaken in summer 2014 and winter 2015. At the same time comparable trawl sampling will be undertaken in close vicinity to the trap lines and catches by local net fishermen will be explored.

Deviations. None.

Failing to achieve objectives. None.

Task 7.4.4. Innovative management scenario's

Summary of progress

Work on this task has not yet started.

Clearly significant results

None.

Deviations.

None.

Failing to achieve objectives.

None.

Use of resources

No deviations

WP7.5 BLACK SEA

Lead CFRI (Mustafa Zengin)

Task 7.5.1: Assess the current trawling impact

Lead: CFRI. Contribution OMÜ, SME15 and SME16

Summary of progress

CFRI and OMU conducted a series of sampling studies to reveal the impact of bottom trawling on benthic macro fauna along Samsun Shelf Area (SSA) since January 2013. The major objectives of these field studies, which were held for the first time for the Black Sea Turkish coasts, are: (1) to describe the technical properties of beam trawls (algarna) used in the Turkish rapa whelk fishery; (2) to estimate the catch per unit effort in beam trawl fishery; (3) to study monthly variation in the by-catch of benthic and benthopelagic macro fauna (invertebrates and fishes).

We have collected data for WP2 and WP3 and conducted field surveys providing data for WP3 and fishing pressure mapping. Data were collected about the characteristics of beam trawls and otter trawls gears used in the Black Sea (SSA). Since we have no VMS data on fishing activities, we provide CPUE data for WP2 compatible with the standard format. For the tasks of WP3; information about sediment types in benthic habitat and biological traits of the most common invertebrates in this localities are derived from the survey samplings. The data about the stomach content of demersal fishes in SSA gathered from literature and have been sent to WP3 task leader.

Questionnaires (n=44) were used to collect information on bottom trawl nets for demersal fishery and beam trawl gears used for Rapa whelk fishery in SSA. The questionnaires were directed to fishermen in localities where these two types of fishing gears are intensely operating. The fishing ports and boat yards are the places we interviewed. We learned that there is only one professional net maker in Turkey. Therefore interviews were mostly made with ship owners/skippers manufacturing their own nets. The preliminary examination showed high numbers of artisanal fishing activities and the large variety of fishing gears used in the Black Sea. In SSA, fisheries have multi species targets and fleets are mostly operating within 12 miles from the coast for approximately 12 hours a day. Fishing fleet is characterized by small and medium vessels.

The fishing fleet exploiting demersal target species (whiting-red mullet-turbot) and rapa whelks was studied in order to quantify the potential impact on the benthic habitat. Surveys have been conducted with the commercial vessels operating in the Samsun. Physical characteristics and dimensions of the fishing gears are recorded, as well as the catch composition of individual trips and the size distribution of the landings and the discards by species.

Beam trawl fisheries: In the Rapa whelk beam trawl survey we used a standard fishing gear (single or double (algarna) as used by fishermen) with a commercial mesh of 72mm and a small mesh of 12 mm. Data were collected on the population parameters and stock size of Rapa whelks in the Samsun region (Yeşilirmak-Kizilirmak Shelf Area). We realized surveys in six different localities to examine differences in population structure in spring, summer and autumn and different benthic habitats and sediment size. The surveys were carried out during one week each month from June 2013 to March 2014 throughout SSA from fishing vessels of 6-15 m in size and 35-350 Hp engine power.

Bottom trawl fisheries: The surveys have been conducted with commercial fishermen using 40 mm mesh size codend. We recorded data on inter-specific relationships, basic population parameters for target species (whiting, turbot, and red mullet), and other benthic and benthopelagic macrofauna, discard and bycatch rates of bottom trawl fisheries in the Turkish Black Sea littoral

We have also presented the data collected from commercial trawl fishery in the Turkish Black Sea littoral, over a period of about 10 years between 2005/06 and 2013/14. The study area includes the near shore water of 3 miles where the fishermen operate illegally. The sampling is carried on monthly basis by two sizes of vessels (smaller than 18 m and larger than 18 m) those typical for Black Sea trawl fishery fleet. Seasonal samplings were carried out through depths of 30 and 120 m by using nets which are varying

between 400 and 900 meshes in demersal trawls. The values of these metrics were compared among the all macro faunal communities and seasonal effects were investigated.

Future work planned

- The field surveys will be continued during the upcoming fishing season; summer 2014 for rapa whelk fishery.
- The study of questionnaires will be completed to provide data for WP2 and WP5.

Clearly significant results

There are 942 vessels actively operating along Black Sea coast of Turkey. 486 (52%) of the total are bottom trawls and 456 (48%) are beam trawls.

The period of maximum landings (June-July) is synchronous with the closed fishing season (May - September) that is meant most of the annual catch is illegal. CPUE reaches its maximum in summer months.

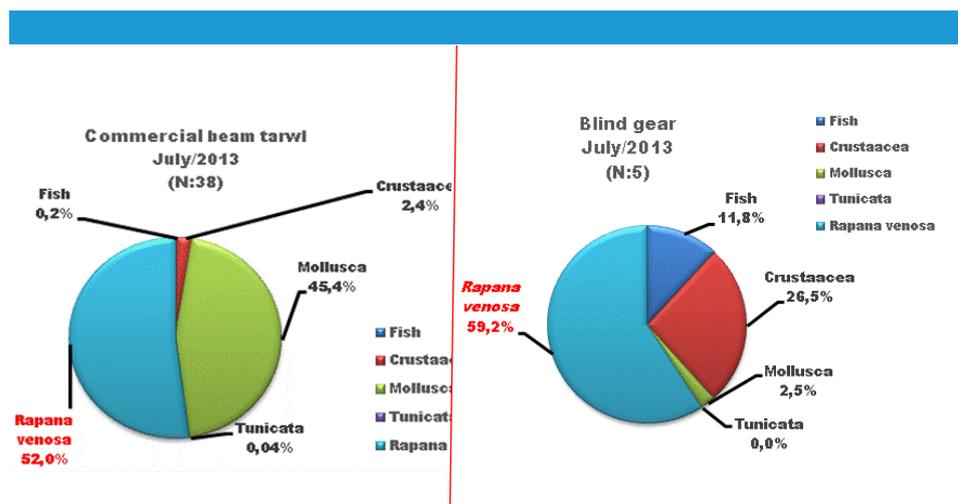
Bottom trawl fisheries. Declining trends for several metrics were observed over the examined period which was related to the deterioration of the community as well as the adaptive discarding practices. The composition and/or trophic level of discards in relation to the marketed catch is seemed to be indicative of the exploitation state of the demersal community: differences between the discarded and marketed fractions were high at the beginning of the fishing season (autumn), but the difference becomes more distinct at the winter and the end of the fishing season (spring). These changes could be attributed to alternative discarding strategies for certain species in response to increased cumulative fishing mortality. According to results obtained from whiting and red mullet fishery, the factors specifying the targeted catch and discard trends can be outlined as; yearly fluctuations in population, fishing period, depth of operation, accurate/ideal time closures, net design and implementations of selective mesh size, duration of operation, market effects (supply-demand relations). Though the rate of discard by weight seems less than of landings, the rate of discard by individual number is significantly high and cause great bio-economic losses.

Beam trawl fisheries. The abundance of macro benthic fauna is greater in summer months than in winter, spring and fall. The catch rate is increasing in this period. 70.3% of total catch is composed of Rapa whelk and 29.7 % is the bycatch species. The bycatch is including 4 taxonomic groups and 33 species. These are Mollusca 25.7%, Crustaceans 3.5%, fishes (generally juveniles) 0.2% and Tunicates 0.3% by abundance and represented by 9, 7, 16 and 1 by species number, respectively.

Deviations None

Failing to achieve objectives. No video recordings of the sea bed and benthos have been collected due to the sea condition and technical measures

Use of Resources. The budget assigned for the first period is used by nearly 90% of the total as the most of the equipment required for the surveys were purchased at the start of the work.



Bycatch rate of beam trawl



Task 7.5.2: Options for mitigation

Summary of progress

In collaboration with the fishing industry (SMEs), options for mitigating the effect of fishing is investigated within two kind of fishery method in SSA. One of them is the beam trawl operating for rapa whelk fishery and the other is bottom trawl targeting demersal fish species such as whiting, red mullet and turbot.

The modifications that will be made for beam and bottom trawl were assigned as follows.

1-Traps/pots:

Prof. Dr. Tosunoğlu suggested the trial of traps/pots that are widely used by fishermen in different coasts around the world as an alternative method to the traditional gear; algarna/beam trawl currently operating along SSA for rapa whelk fishery. The scope of this task is to check whether the pots may be an efficient alternative fishing method against beam trawl or not (Figure 1).

2-Algarna/beam trawl:

In algarna, it is decided to mount 'sledges' made of steel instead of shoes in traditional model to mitigate the impact on substrate. It will be technically designed by Dr. Kaykaç and will be produced by Mustafa Sadıklar (SME 15) by the mid of June 2014.

Two kind of algarna/beam trawl will be prepared equipped with 72 mm and 88 mm mesh size for experimental surveys. The legal mesh size for algarna gear is 72 mm in practice. It was applied as 90 mm until 2008. But, in some cases fishermen prefers the larger mesh size since it is more profitable to catch larger individuals. For this reason both of the mesh sizes will be tested to make any comparison for economy.



Figure 7.5.1. The pot which is widely used for the fishery of a species has same genus with *Rapana venosa* in Korea.

3-Bottom trawls

It is decided to make two kind of modification in bottom trawls to reduce the impact on benthic habitat. The first was to use the 'flying doors' in water column instead of dragging doors on substratum (Figure 7.5.2 and 7.5.3). The flying door that is suggested by Dr. Sala (CNR/ISMAR), Dr. Tosunoğlu and Dr. Kaykaç and the other equipment and devices will be transported from ISMAR, Ancona/Italy. The transportation will be carried out by Kemal Malkoç, by the support of Project partners for the legal and bureaucratic processes. The date for transportation will be decided after communication with Dr. Sala ensuring the arrival at least two weeks ago from the start of experimental surveys.

The second modification to be made in bottom trawl is about the type of mesh size in trawl codend. We are going to apply 40 mm square mesh and T90 (the attachment of diamond mesh to the bag by a 90 degree torsion) as gear material. Two designs will be realized in the codend. Kemal Malkoç will supply the gear material as well as the codend-cover method using one of the commercial trawl gears of the vessel required for experimental of mesh size selectivity.



Figure 7.5.2. The use of a) flying/pelagic doors in bottom trawls,

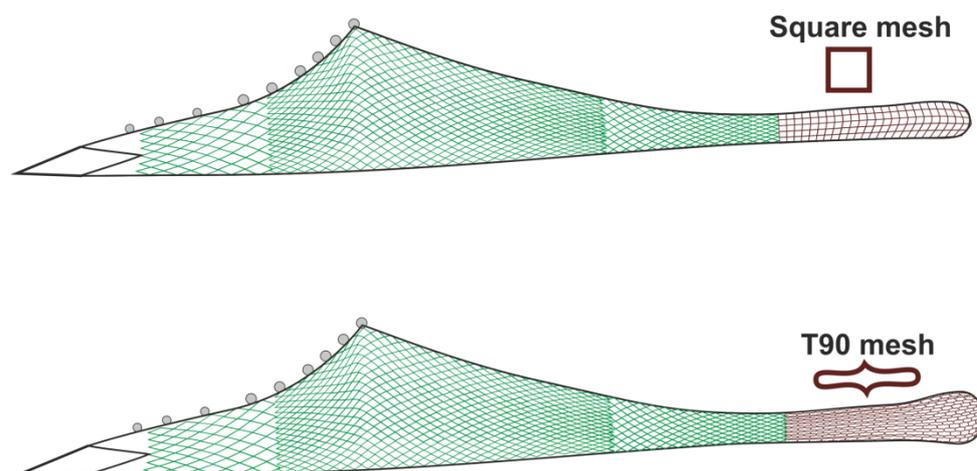


Figure 7.5.3. Different types of mesh in the bottom trawl codend

Task 7.5.3: Testing alternative gears

Summary of progress

The modified gears specified in Task 7.5.2 will be produced within the next two months by two SMEs, and gear trials will be realized within the next six months. The modified algarna will be tested by commercial algarna fishermen in SSA in July, 2014. The modified bottom trawl will be tested by a commercial fishing vessel belonging to SME15 in August-September.

Clearly significant results. None

Deviations. None

Failing to achieve objectives. None

Use of Resources. The production of modified gears and the cost of sea trials were planned to be supplied by the budgets of two SMEs within the relevant WP7.

Task 7.5.4: Innovative management scenarios

Summary of progress

This task is in an early stage. We need the results of gear trials for any progression in this task.

Clearly significant results.

None

Deviations.

None

Failing to achieve objectives.

None

Use of resources.

No deviations

WP8 – SCIENTIFIC COORDINATION, STAKEHOLDER INVOLVEMENT & DISSEMINATION

Lead: IMARES (Adriaan Rijnsdorp)

The success of BENTHIS will critically depend on an open and transparent communication between scientist and the fishing sector about research objectives, scientific approach and the interpretation of the results. This WP will provide the core structure for the information exchange within the project, as well as the structure to involve the fishing industry and other stakeholders to enhance the credibility of the work and disseminate the salient results to the fishing industry and (regional) management bodies.

The main aim of WP8 is to provide the core structure for the information exchange within the project, as well as the structure to involve the fishing industry and other stakeholders to enhance the credibility of the work and disseminate the salient results to the fishing industry and (regional) management bodies.

The success of this process will critically depend on an open and transparent communication between scientist and the fishing sector about research objectives, scientific approach and the interpretation of the results.

Specific objectives of the work package are:

- Scientific coordination
- Organize the communication among WPs
- Organize stakeholder input
- Dissemination

Syntesa has been responsible for organizing the stakeholder input and the work has progressed as planned the first year. The project stakeholder groups have been identified, selected and the communication activities have brought together the parties satisfactory - both at a regional and at an EU wide level.

Task 8.1: Project Workshops

Lead: IMARES; Contributors: all partners

Summary of progress

The two project workshops scheduled during the 1st reporting period have been successfully held.

The 4-day kick off workshop (P1) was hosted by IFREMER in Nantes (France) in January 2014 with the aim to discuss the project objectives and getting to know each other.

The 2nd workshop (P2) was hosted by IMARES in June 2013. The main aim was to discuss the results of task 1.1 and task 1.2 and the outcome of the regional stakeholder consultations. In addition a workplan for the regional case studies including priorities of technological innovations as well as management innovations were discussed.

The 3rd project workshop was hosted by CNR in April 2014. The main aim was to organise a number of workshops ranging from specific WP-workshops, workshop to discuss the collaboration between WP's and overall workshop encompassing all WPs..

Clearly significant results. Minutes of the workshops

Deviations. The 3rd project workshop in Rome (Thursday morning 3 April 2014) was not scheduled in the Annex 1, but was considered necessary to fine-tune the activities across the various work packages.

Failing to achieve objectives. None

Task 8.2: Stakeholder involvement and dissemination

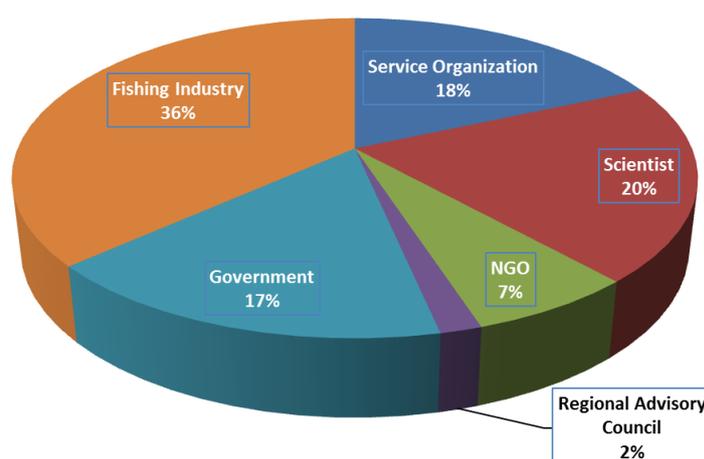
Lead: Syntesa (Olavur Gregersen).

Summary of progress

Task 8.2 includes an identification and selection of relevant stakeholder groups in the five regions specified in the project: Baltic Sea, North Sea, Black Sea, North Sea and the Mediterranean. A case study leader (from the project) has been appointed for each region and the five case study leaders are to liaise between the regional stakeholders and the project partners during the project period. The following groups were identified as relevant stakeholder groups from each region and the case study leader contacted and invited representatives to participate as stakeholders in the project process :

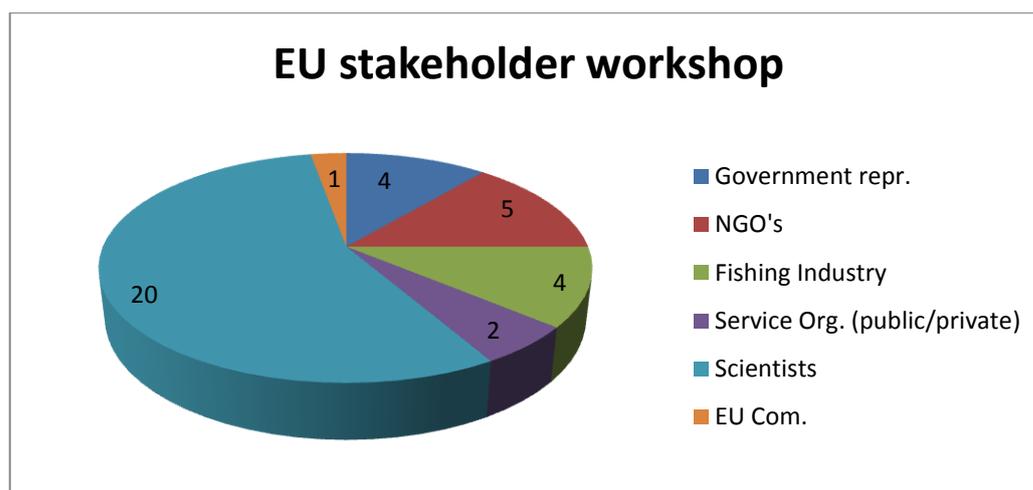
- State Governmental representatives
- Regional Governmental representatives
- NGO's
- Fishing industry
- Vessel owners, fishermen and related
- Gear providers
- Wholesalers and distributors
- Service organizations (legal, accountants, economics and related)
- Scientist

Stakeholder representation – 4 case study regions



The stakeholders from Western Waters did not wish to be identified and therefore the stakeholder representation illustrated, only refers to the four case study regions: North Sea, Baltic Sea, Black Sea and Mediterranean.

In addition to the regional stakeholder groups an EU-wide stakeholder group with more limited representatives from each of the five regions was established in month 8 as planned. At the first EU stakeholder workshop – SH1 – the following groups were represented:



In total 16 stakeholders participated from the various case study regions and all relevant stakeholder groups involved (fisheries, NGO's, policy representatives). The debate was facilitated by Olavur Gregersen (SME1) and Marloes Kraan and Martin Pastoors (IMARES). Reflections of the debate were given in the form of drawings (cartoons), which will be available for other dissemination activities of BENTHIS.

Clearly significant results

Stakeholder interactions highlight the difference in perceptions between stakeholders which will have consequences for our communication strategy and the way we organise the stakeholder interactions.

Deviations. None

Failing to achieve objectives. None

Task 8.3: Regional Stakeholder Events and dissemination

Lead: Syntesa (Olavur Gregerson); contribution other partners involved in case study

Summary of progress

The stakeholder interaction is organized around three Regional Stakeholder Events and during the first project period the RSE no 1 took place in month 7 and 8 (was planned to take place in month 6, delays were due to difficulties in getting the stakeholder groups together).

The methodology at the RSE1 was based on an open dialog work shop with a facilitated brain storm process. The following topics were discussed and clarified at the RSE1 in each region:

1. Improve the understanding of selected fisheries and related technologies (each case study separately).
2. Assess the effect of existing and novel technologies on seabed ecosystem.
3. Discuss possible consequences for the Industry – ecological and economic factors.
4. Ranking of potential initiatives – technological and/or managerial that mitigate possible negative effects.

In addition to this information a questionnaire was distributed among stakeholders invited to the RSE1. The purpose of the questionnaire was to gain insight into stakeholders attitudes regarding innovative technologies in a sustainable managed demersal fishery. Approximately 300 questionnaires were

distributed overall in the five regions and it provides a useful understanding of the specific stakeholder attitudes towards the main issues of the BENTHIS project.

The outcome from the RSE1 has been a summary of important topics from stakeholder discussions, survey results and an initial ranking of technologies and sustainable management tools for reducing negative impact on the benthic ecosystem in terms of the opinion of the regional stakeholders (input data for WP7).

The specific results of the RSE1 is analysed and summarized in the deliverable report D8.7 which was submitted in month 9 (was planned to be submitted in month 6 – delays due to delays in the regional sessions – see above).

In addition to the regional stakeholder events, an EU-wide stakeholder meeting was held in month 9 as planned. This meeting aimed at clarifying policy perspectives on benthic impacts, the BENTHIS ecosystem approach and defining terms as impact and how to measure impact. The results of EU-wide stakeholder meeting are summarized in the deliverable report D8.5 which was submitted in month 10 (expected to be submitted in month 9, delay due to the summer vacation 2013).

The output from the RSE1 together with the output from the EU-wide stakeholder workshop forms the foundation of the first stakeholder analysis in the BENTHIS project (D 8.5 and D 8.7).

Clearly significant results. RSE1 highlighted the difference in perceptions between stakeholders

Deviations. No deviations or objectives not achieved.

Failing to achieve objectives. None

Use of resources. All efforts are considered to be in line with Annex I and resources are considered to have been spent in accordance with the provision.

Task 8.4 Dissemination and External Communication

Lead: IMARES; Contributors: all partners

Summary of progress

The first activities after the start of BENTHIS were to develop the Project Website (www.benthis.eu) and Sharepoint site (accessible via project website) and a flyer. The website is aimed at dissemination of BENTHIS to the outside world. The Sharepoint is aimed to improve the communication within the consortium and to enhance the efficiency of the collaboration. The Sharepoint will allow us to share documents and exchange information. At any moment in time, the Sharepoint will provide an up-to-date overview of the deliverables and other documents. It has proved difficult to regularly collect news items to feed the website.

Website and Sharepoint are hosted by Wageningen-UR and care has been taken that the Website will remain available for at least 5 years after the end of the project. To carry out the dissemination task effectively and efficiently, Oscar Bos (DLO-IMARES) has been made responsible for maintaining the Website and the Sharepoint. Oscar Bos has been actively pursuing content for the Website and has attended the Rome project meeting in April 2014 to directly interact with the partners on this topic.

We have also set up a BENTHIS LinkedIn group (May 2014: 50 members) and a BENTHIS Facebook group (46 followers). Together with the WP leaders, we have written a newsletter that was distributed through a number of channels (BENTHIS newsletter subscribers, BENTHIS social media and website, IMARES twitter, ICES LinkedIn group, MedOBIS list). We also encourage fieldworkers and fishermen involved to provide video material.

Several partners have been active in presenting BENTHIS at various scientific meetings, in publications in scientific journals and presentations in popular media.

Clearly significant results

- BENTHIS website: www.benthis.eu
- BENTHIS Sharepoint: <https://teamsites.wur.nl/sites/benthis/default.aspx> (restricted access)
- BENTHIS LinkedIn group:
https://www.linkedin.com/groups?home=&gid=4792096&trk=anet_ug_hm
- BENTHIS Facebook page: <https://www.facebook.com/#!/pages/Benthis/405411256222122>
- BENTHIS newsletter 2013: <http://www.benthis.eu/en/benthis/show/BENTHIS-Newsletter-March-2014.htm>
- BENTHIS Flyer: http://www.benthis.eu/upload_mm/d/c/b/399ef52a-b151-4d37-9f80-1f9fb3fed632_Flyer-Benthis-internet.pdf
- Youtube: fun impression of BENTHIS fieldwork: http://youtu.be/11JlyV_vqo8

Scientific papers (peer reviewed)

- Bolam, S.G., Eggleton, J.D. (2014) Macrofaunal production and biological traits: Spatial relationships along the UK continental shelf. *Journal of Sea Research* (WP3)
- Brind'Amour A, Dubois SF (2013) Isotopic Diversity Indices: How Sensitive to Food Web Structure? *PLoS ONE* 8(31): e84198. doi:10.1371/journal.pone.0084198 (WP3)
- Brind'Amour A., Laffargue P., Morin J., Vaz S., Fovau, A. and Le Bris H (2014). Taxonomic sufficiency of epibenthic macro and mega-fauna in scientific bottom trawl surveys. *Continental Shelf Research* 72:1-9 (WP3)
- Van Denderen PD, van Kooten T, Rijnsdorp AD (2013) When does fishing lead to more fish? Community consequences of bottom trawl fisheries in demersal food webs. *Proceedings of the Royal Society. Series B.* 280, 20131883 (WP4)
- Van Denderen PD, Hintzen NT, Rijnsdorp AD., Ruardij P, van Kooten T. (2014) Habitat-specific effects of fishing disturbance on benthic species richness in marine soft sediments. *Ecosystems* in print (Task 7.2.1)
- van Marlen, B., Wiegerinck, J.A.M., van Os-Koomen, E., van Barneveld, E. (2014) Catch comparison of flatfish pulse trawls and a tickler chain beam trawl. *Fisheries Research* 151: 57-69 (WP7.2)

Scientific papers (in preparation)

- Bastardie F., Nielsen J.R., Eigaard O., Fock O. H., Jonsson, P., Bartolino V. (In Submission). How spatial planning constrains cross-border fisheries: the bio-economic DISPLACE evaluation on the Baltic Sea. (In Submission PLOS ONE)
- Batsleer J, Hamon K, Overzee HJM, Rijnsdorp AD, Poos JJ.(in prep) Influence of a discard ban on the transition towards more selective fishing gear. (Task7.2.4)
- Batsleer J, Poos JJ, Hamon K, Overzee HJM, Rijnsdorp AD (in prep) Highgrading in a mixed fisheries for flatfish. (Task 7.2.4)
- Frandsen R.P., Eigaard O.R., Poulsen L.K., Tørring D, Stage B., Lisbjerg D., and Dolmer P. 2014. Reducing the impact of blue mussel (*Mytilus edulis*) dredging on the ecosystem in shallow water soft bottom areas. *Aquatic Conserv: Mar. Freshw. Ecosyst.* (2014)

- Guillen, J., Macher, C., Merzéréaud, M., Fisas, S. and Guyader, O., 2014, The effect of discards and survival rate on the Maximum Sustainable Yield estimation based on landings or catches maximisation: Application to the nephrops fishery in the Bay of Biscay. in revision Marine Policy (Task 5.3)
- Van Denderen PD, Hintzen NT, van Kooten T, Rijnsdorp AD. (under review) The temporal distribution of bottom trawling and its implication for the impact on the benthic ecosystem (Task 7.2.1)

Presentations

- Bastardie, F., Nielsen, J.R. How spatial planning constrains cross-border fisheries: the bio-economic DISPLACE evaluation on the Baltic Sea. Oral presentation at the Baltic Maritime Spatial Planning Forum (Baltic MSP Forum), 17-18 June 2014, Riga, Latvia.
- Bastardie, F., Nielsen, J.R., Eigaard O.R., Fock O. H., Jonsson, P., Bartolino V. Supporting bio-economic evaluation of spatial planning constraining fishing activities: be quantitative, spatially-explicit, vessel-oriented, stochastic, and dynamically coupled to fish populations. July 7-11, Brisbane, Australia. Edited by Ann L. Shriver. International Institute of Fisheries Economics and Trade (IIFET), 2014
- Bolam, S. et al., (2014). Determining the impacts of trawling on benthic function in European waters : a biological traits approach. Abstract submitted to the ICES Symposium “Effects of fishing on benthic fauna, habitat and ecosystem function” Tromsø, Norway from 16-19th June 2014.
- Depestele, J. “Physical impact of beam trawl revisited: sediment resuspension and penetration of tickler chain and pulse beam trawling presented at the ICES Symposium “Effects of fishing on benthic fauna, habitat and ecosystem function” in Tromsø (Norway), 16th - 19th June 2014 [Task 4.1]
- Depestele, J., Rochet, M.J., Dorémus, G., Laffargue, P. and Stienen, E. “Spatio-temporal patterns in food subsidies provided by discards to scavenging seabirds in the Bay of Biscay” presented at the ICES Symposium “Effects of fishing on benthic fauna, habitat and ecosystem function” in Tromsø (Norway), 16th - 19th June 2014 [Task 4.4]
- Eigaard OR, Francois Bastardie, Michael Breen, Grete E. Dinesen, Pascal Lafargue, Hans Nilson, Finbarr O’Neil, Hans Polet, Dave Reid, Antonello Sala, Thomas K. Sørensen, Oliver Tully, Mustafa Zengin, Adriaan D. Rijnsdorp. “Estimation of seafloor impact from demersal trawls, seines and dredges based on gear design and dimensions” presented at the ICES Symposium “Effects of fishing on benthic fauna, habitat and ecosystem function” in Tromsø (Norway), 16th - 19th June 2014 [Task 2.1]
- Eigaard OR, Francois Bastardie, Niels Hintzen, Maciej Adamowicz, Rui Catarino, Grete E. Dinesen, Heino Fock, Hans Gerritsen, Manuel M. Gonzalez, Patrik Jonsson, Stefanos Kavadas, Pascal Lafargue, Mathieu Lundy, Genoveva G. Mirelis, Jørgen Hansen, Paulette Posen, Jacopo Pulcinella, Tomasso Russo, Antonello Sala, Chris Smith, Bart Vanelslander, Mustafa Zengin, J. Rasmus Nielsen, Adriaan D. Rijnsdorp. “High-resolution mapping of European fishing pressure on the benthic habitats” presented at the ICES Symposium “Effects of fishing on benthic fauna, habitat and ecosystem function” in Tromsø (Norway), 16th - 19th June 2014 [Task 2.1]
- Kenny, A. (2013). The importance of seafloor integrity in assessing and managing human activities. Presentation given at 9th SETAC European Special Science Symposium, Brussels.
- Lucchetti A, Angelini V, Pari S, Pulcinella J, Russo T, Sala A (2014) Trawl-turtle interaction: a pilot study in the Adriatic sea. Tromsø, Norway from 16-19th June 2014
- Mahévas, S. et Bertignac, M. 2013. Dynamique spatio-temporelle des flottilles démersales du golfe de Gascogne pour anticiper l'incidence d'une gestion spatialisée. 11ème forum de l'Association Française d'Halieutique. Bordeaux, France
- Mahévas, S., S.Lehuta, M. Bertignac, Y. Vermard and P. Marchel. 2013. Modelling fishermen behaviour is firstly a question of spatial and temporal scale. C:11. ICES Annual Science Conference. Reykjavik, Islande

- Mellibovsky F, Notti E, Prat J, Antonello Sala A (2014) Assessment of hydrodynamic performance and impact of otterboards in wind tunnel trials. Tromsø, Norway from 16-19th June 2014
- Pinnegar. J. et al., (2013). Ocean acidification and the possible loss of benthic invertebrates: would commercial fin-fish be affected? Poster presented at ICES ASC, 2013.
- Sala A, Brčić J, De Carlo F, Virgili M, Lucchetti A, (2014) Alternative fishing gears to boat seine fisheries: a performance and seabed impact perspective. Tromsø, Norway from 16-19th June 2014.
- Sala A, Prat J, Mellibovsky F, Notti E (2014) A predictive tool for otterboard design and performances evaluation. OCEANS'14 MTS/IEEE St. John's, Canada, September, 15-18, 2014 (paper)
- Sala A, Virgili1 M, Herrmann B, Brčić J, Lucchetti A (2014) An outlook of the sieving selection of striped venus clam (*Chamelea gallina*) in the Mediterranean hydraulic dredge fisheries. Tromsø, Norway from 16-19th June 2014
- Smith C., Kalogeropoulou V., Papadopoulou K.-N. (2014) The impact of trawling on the functional composition of coastal and shelf macrofaunal and megafaunal benthic assemblages in the Eastern Mediterranean. Tromsø, Norway from 16-19th June 2014.
- Tissière L, S. Mahévas, B. Trouillet, A. Brind'Amour and P. Petitgas. 2013. Gouvernance du golfe de Gascogne : quelle connaissance pour construire des scénarios de gestion et anticiper leurs conséquences sur la pêche de sole commune ? ,11ème forum de l'Association Française d'Haliéutique. Bordeaux, France.

Contributions to ICES Working Groups

- O'Neill, F.G. and Summerbell, K. "Recent Scottish trials on the physical impact of trawl gears" presented at the ICES Fishing Technology and Fish Behaviour (FTFB) working group, 5th – 9th May 2014 [Task 4.3]
- Antonello Sala, Ole R. Eigaard, Francois Bastardie, Niels Hintzen, Jacopo Pulcinella, Tomasso Russo, Emilio Notti, Stefano Cataudella, Adriaan D. Rijnsdorp "Relationships among Vessel Characteristics and Gear Specifications" presented at the ICES Fishing Technology and Fish Behaviour (FTFB) working group, 5th – 9th May 2014 [Task 2.1]

Deliverables

Deliverable	Deliverydate Annex 1	Actual date
D8.1 Reports of project workshops P1	31/12/2012	01/02/2013
D8.2 Reports of project workshops P2	31/12/2012	26/06/2013
D8.5 Report of Stake holder Workshop (SH1)	30/06/2013	27/09/2013
D8.7 Report of the Regional Stakeholder Events (RSE1)	31/03/2013	27/09/2013
D8.10 Project Webpage for external and internal communication	31/12/2012	07/03/2013
D8.11 Yearly Newsletter	30/09/2013	16/02/2014

Deviations.

None

Failing to achieve objectives.

None

Use of resources

Participant	WP8	WP8
	Budget (pm)	Realised (pm)
SDLO	7.6	4.1
ILVO	2.9	1.5
CEFAS-DEFRA	2.7	0.6
BU	2.7	0.8
UNIABDN	4.9	0.0
Mar lab	1.6	0.0
IFREMER	5.2	1.5
MI	1.0	0.0
DTU-Aqua	2.9	0.0
AU-Bioscience	0.9	0.0
UCPH	1.8	0.0
SLU	2.5	0.5
IMR	0.9	0.0
CNR	6.5	1.8
HCMR	2.1	0.0
CFRI	3.0	0.7
SME01	10.9	5.2
SME02	0.2	0.0
SME03	0.3	0.0
SME04	0.2	0.0
SME05	0.3	0.0
SME06	0.3	0.0
SME07	0.2	0.0
SME08	0.3	0.0
SME09	0.8	0.1
SME10	0.5	0.2
Tecnopesca	0.5	0.0
SME13	0.5	0.0
SME14	0.5	0.0
SME15	0.5	0.0
SME16	0.5	0.0
SME17	0.3	0.0
OMU	2.1	0.6
sum	68.1	17.5
remaining personmonths		50.6

WP9 PROJECT MANAGEMENT

Lead IMARES (Adriaan Rijnsdorp, Gerda Booij)

Consortium management tasks and achievements

The project manager Gerda Booij assisted several partners in filling in the Financial Statements, assisted in organising general meetings, administered the EC contribution regarding its allocation between Beneficiaries and ensured that all the appropriate payments were made to the other Beneficiaries without unjustified delay. She monitored obligations of the participants and transmitted the deliverables to the Commission. She prepared and submitted the first amendment to the Grant Agreement and monitored the progress of the project.

The project coordinator has organised the General Assembly meetings in Nantes (kick-off GA1) and Haarlem (GA2). The agenda was circulated well in advance of the meetings and the Scientific officer of the EU was invited. The coordinator chaired the meeting and was responsible for the minutes.

In month 18, a BENTHIS meeting was organised at CNR headquarters in Rome. Antonello Sala and his team acted as local organiser. The project coordinator together with Antonello Sala put together the time schedule of the Workshops and the WP-leaders drafted the agenda and were responsible for the minutes of the workshops. The meeting started with a parallel sessions of individual Work Packages to discuss the progress within each Work package (day 1), followed by two parallel session of a joint WP2, WP3 and WP4 workshop and a joint WP5, WP6 workshop. On day 3, the progress in the Case Study tasks (WP7) were discussed with particular emphasis on the interaction with the generic work packages. On the morning of the 4th day, a plenary session was held to present the results of the Workshops. The coordinator took the opportunity to also inform the partners of the project management issues.

Three Scientific Steering Committee Meetings were held back to back with the 1st and 2nd General Assembly Meeting and the BENTHIS meeting in Rome. The discussions focussed on the integration of the various activities carried out in the various Work Packages, in particular the generic Work Packages (WP2-WP6) and the Regional Case Study Tasks carried out in Work Package 7, and on issues such as joint publications and collaboration.

The coordinator attended the 1st Regional Stakeholder Event together with the task leader Olavur Gregerson and the Case Study task leader, in order to be able to learn from this experience and being able to fine tune the workplan of the other RSE's in the other Regions.

Coordinator has been in regular contact with Work package leaders to stimulate interactions between Work Packages.

The SME's 02, 03, 04 en 05 (participants 18, 19, 20 en 21) have not executed any activities for the project during the first period and have therefore not submitted a Financial Statement covering period 1

Problems which have occurred and how they were solved

During the 1st reporting period, no major problems have been encountered. The official starting date on October 1, 2012, came as a surprise as we were informed about a start in early 2013. This caused a relatively slow start-up and a slight delay in the Kick Off meeting. The backlog is caught up in the 1st period

Another problem is that the change of ICM for participant 6 had been processed by the Validation Team November 2013 but the Data Quality team did not yet make the correction in the CPM database. Therefore this participant has not been able to prepare their financial Statement for a long time. It seems that the synchronization between the database and NEF/CPM has not been done correctly. A temporary solution has been found. The legal officer will send an information letter to the Data Quality team to solve this problem.

The scientific officer left the project in May 2013. Since then, none of the deliverables have been evaluated and subsequently approved.

It proved not feasible to have a full plenary meeting with all partners, including the fishery company partners. This is partly due to the language barrier but is also related to the mismatch in interest. The structure of regional stakeholder meetings, and the European Wide Stakeholder meetings provide the suitable platform to organise the interactions between the scientist and fishing industry partners. Also the meetings dedicated to the field trials in each region, facilitate this interactions.

Changes in the consortium

After the start of the project, an amendment to the Grant Agreement was requested because of the change in legal status of ILVO and replacement of SME12 (participant 27) by TecnoPesca (participant 34).

Participant 2, "Vlaams Gewest", is representing the ILVO institute. The signed form in the contract mentioned "Vlaams Gewest". An amendment was needed to add ILVO as third party to Vlaams Gewest. The DoW (Annex I, part B) was modified accordingly.

The Commission has agreed on the request to modify the Grant Agreement on 03/12/2013.

List of project meetings, dates and venues

Month planned	code	Meetings	Date & place	
3	P1	Project workshop	21-25 Jan 2013	Nantes (Fr)
4	RWP1	Regional case study meeting Baltic	15 Jan 2013	Copenhagen (DK)
4	RWP1	North Sea	15 March 2013	IJmuiden (NL)
4	RWP1	Western Waters	25 Oct, 29 Nov 2012	Lorient (FR)
4	RWP1	Mediterranean	25 Oct, 21 Nov 2012	Ancona (IT)
4	RWP1	Black Sea	9-10 January 2013	Trabzon (TR)
6	RSE1	Regional stakeholder event Baltic	24/05/2013	Charlottenlund (DK)
6	RSE1	North Sea	27/04/2013	IJmuiden (NL)
6	RSE1	Western Waters	23/04/2013	Nantes (FR)
6	RSE1	Mediterranean	22/03/2013	Ancona (IT)

6	RSE1	Black Sea	30/04/2013	Trabzon (TR)
9	P2	Project workshop	3-5 June 2013	Haarlem (NL)
9	SH1	Stakeholder meeting	5 June 2013	Haarlem (NL)
9	GA1	General Assembly	3-5 June 2013	Haarlem (NL)
9	SC1	Steering Committee	4 June 2013	Haarlem (NL)
9	SHB1	Stakeholder Advisory Board	3 April 2014	Rome (IT)
11	W1	WP3 workshop	31 March 2014	Rome (IT)
16	RWP2	Regional case study meeting	pending	
18	SC2	Steering Committee	3 April 2014	Rome (IT)
18	W2	WP workshops	3 April 2014	Rome (IT)
18	W3	WP workshops	3 April 2014	Rome (IT)
18	W4	WP workshops	3 April 2014	Rome (IT)

Project planning and status

No major changes in the timing of the tasks and milestones of the different Work Packages and their components as shown in the Gantt chart are expected for the period between month 18 and month 60

Impact of possible deviations from the planned milestones and deliverables

Although there have been some deviations from the initial planning, in particular a modest delay in the submission of some of the deliverables, these delays did not have ramifications for planned milestones and deliverables in the 2nd reporting period. .

Changes in legal status

Any changes to the legal status of any of the beneficiaries, in particular non-profit public bodies secondary and higher education establishments, research organisations and SMEs;

As mentioned in the section on Changes in the Consortium, the legal status of ILVO was changed into a third party to Participant 2 , "Vlaams Gewest".

Timing of the (sub-) tasks and milestones of BENTHIS

Task description / milestones	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
Framework (benthos - fisheries im	P1		P2																	
Manuscript fishing impact benthic systems												W4								
Economic performance												W4								
Mitigation fisheries imapcts												W4								
Framework gear-seabed interactio	P1		P2																	
Sea bed classification	P1		P2			W1														
Impact trawling sea bed habitats	P1		P2			W1			P3											
Traits, functions and habitat types			P2			W1			P3											
Modelling benthic processes			P2			W1			P3											
Integration									P3			W4								
Physical trawling impact model	P1		P2			W1			P3			W4								
Benthic mortality model	P1		P2			W1			P3											
Geo-chemical impacts	P1		P2			W1			P3											
Food subsidies	P1		P2			W1			P3											
Trawling impact model on structure and functioning benthos						W1			P3			W4								
Report on fish, benthos, fisheries interactions						W1			P3			W4								
Framework economic analysis alte	P1		P2			W2			P3											
Fleet dynamic model	P1		P2			W2			P3			W5								
Investment model						W2			P3			W5					P4			
Review management measures	P1		P2			W2														
Decision-support tool						W2			P3			W5								
Management strategy evaluation									P3			W5								
Current impact of fishing	P1	RSE-1	P2			W3	RSE-2		P3											
Options for mitigations	P1	RSE-1	P2			W3	RSE-2		P3											
Sea trials						W3	RSE-2		P3			W4 / W5								
Management scenario evaluation							RSE-2		P3			W4 / W5			RSE-3		P4			
Project workshops (P1 - P4)	P1		P2						P3											P4
Stakeholder involvement			SH1																	SH2
Regional stakeholder events (X)		RSE-1					RSE-2								RSE-3					
Administrative and financial management			F-1			F-2			F-3			F-4					F-5			F-6
General Assembly (9, 18 or 27; 48)			GA-1						GA-2								GA-3			
Steering Committee			SC-1			SC-2			SC-3			SC-4					SC-5			SC-6
Stakeholder board			SHB						SHB								SHB			
Dissemination							ICES symposium													Concluding Symposium

Development of the Project website

The first activities after the start of BENTHIS was to develop the Project Website (www.benthis.eu). The website is aimed at dissemination of BENTHIS to the outside world. Website is hosted by Wageningen-UR and care has been taken that the Website will remain available for at least 5 years after the end of the project. To carry out the dissemination task effectively and efficiently, Oscar Bos (DLO-IMARES) has been made responsible for maintaining the Website. He has been actively pursuing BENTHIS colleagues for content for the Website. He attended the Rome project meeting in April 2014 to directly interact with the partners on this topic.

Co-ordination activities

The coordinator has been active to promote the collaboration with other projects, such as Biotriangle project, the Best Trawling Practice project and FP7-project DEVOTES.

Biotriangle project aims to promote the collaboration of scientist in Europe, New Zealand, Australia and Canada on the research relevant for the Ecosystem Approach to Fisheries Management. At a meeting in May 2012, the effect of fishing on the benthic ecosystem was selected as one of the priority areas. In the planning stage, a specific budget has been made available in the Management to support collaboration of BENTHIS scientist in Twinning activities with New Zealand, Australia and Canada. In June 2014, a 2-day Twinning Workshop is scheduled back to back with the ICES Symposium on Trawling Impact on the Benthic Ecosystem.

Best Trawling Practice BTP (<http://trawlingpractices.wordpress.com/>) Hilborn, Jennings & Kaiser have taken the initiative for this project to find common ground on the scientific knowledge regarding best practices of trawling. The aims of BTP overlaps with BENTHIS, in particular with regard to the mapping of the current trawling activities and the development of methods to assess the impact on benthic ecosystems. BTP however has a global coverage while BENTHIS restricts itself to the European waters. BENTHIS partners have participated in two meetings of BTP (May 2013, Seattle USA; November 2013, IJmuiden, The Netherlands). IMARES hosted the 2nd BTP meeting in IJmuiden (Netherlands), facilitating the interaction between BENTHIS and BTP. It has been agreed that the results of WP2 (mapping) will be used as input to the Best Trawling Practice.

DEVOTES (<http://www.devotes-project.eu/>) is a FP7 project that aims at improving understanding of human activities impacts (cumulative, synergistic, antagonistic) and variations due to climate change on marine biodiversity, using long-term series (pelagic and benthic). One of the tasks in DEVOTES is focussed on the study of benthic biodiversity in relation to anthropogenic activities, such as fishing activities. Active collaboration has been achieved since the responsible scientist Olivier Beauchard has attended the 2nd BENTHIS Workshop in June 2013. Since then three meetings have been held in IJmuiden to discuss the work and develop plans for a joint presentation for the ICES Symposium in 2014. (Tromsø, Norway).

Activities were undertaken to invite research institutes that are not participating in BENTHIS to join with the mapping task of WP2.

Deliverables

Deliverable	Deliverydate Annex 1	Actual date
D9.1 Minutes of the General Assembly	30/06/2013	26/06/2013
D9.4 Minutes of the Steering Committee meetings	31/05/2013	26/06/2013
D9.10 Minutes of the Stakeholder Board meeting	31/05/2013	June 2014

D9.13 First Periodic Activity and Management Report	30/04/2014	June 2014
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Use of resources

Participant	WP9	WP9
	Budget (pm)	Realised (pm)
SDLO	14.5	7.6
ILVO	0.5	0.0
CEFAS-DEFRA	1.0	0.2
BU	1.0	0.8
UNIABDN	0.0	0.2
IFREMER	0.5	0.0
DTU-Aqua	1.5	0.0
CNR	4.0	0.0
CFRI	0.5	0.1
sum	23.5	8.9
remaining personmonths		14.6