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SEVENTH FRAMEWORK PROGRAMME

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SUMMARY

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INTRODUCTION

This newsletter describes the results of the BENTHIS project achieved in 2014. To maximise the impact, the texts and figures are distributed via social media (Facebook, LinkedIn, newsletter mailing list) and the website in different formats. In this document the basic texts and figures are presented.

High-resolution mapping of European fishing pressure

For the first time, scientists have created high-resolution maps of fishing pressure in the North-east Atlantic, Mediterranean and Turkish waters. These maps provide a common knowledge base to all stakeholders and are needed for an ecosystem approach to fisheries management (EAFM). The level of detail goes beyond that of previous information based solely on fishermen's logbooks that is not well suited for quantitative estimation of seafloor impact (swept area and impact severity) of the different gears and trips. The BENTHIS team has developed a method to overcome this information deficiency of official statistics.

Individual logbook observations from 13 countries were assigned to 14 different functional gear groups ('BENTHIS métiers') based on target species and gear type information. Relationships between gear dimensions and vessel size (e.g. trawl door spread and vessel kW) for each métier were used to assign quantitative information of bottom contact (e.g. width of gear) to each logbook trip. The extended logbook data were combined with high-resolution activity data (VMS: satellite data). In this way the total sea bed area swept by a fishing gear over the three year period was estimated for each 1x1 minute grid cell (1.9 km^2 at 56 °N). The analyses show that otter trawlers display highest intensities compared to seiners or beam trawlers. But which type of fishery has a greater impact?

The next step in BENTHIS will be to add information of impact severity on top of the area impact estimations and to overlay the fishing pressure maps with habitat maps. Such large scale high-precision maps, where estimates of actual area and severity of impacts are included, represent a new and important step forward in meeting the indicator and monitoring requirements of the ecosystem approach to fisheries management.

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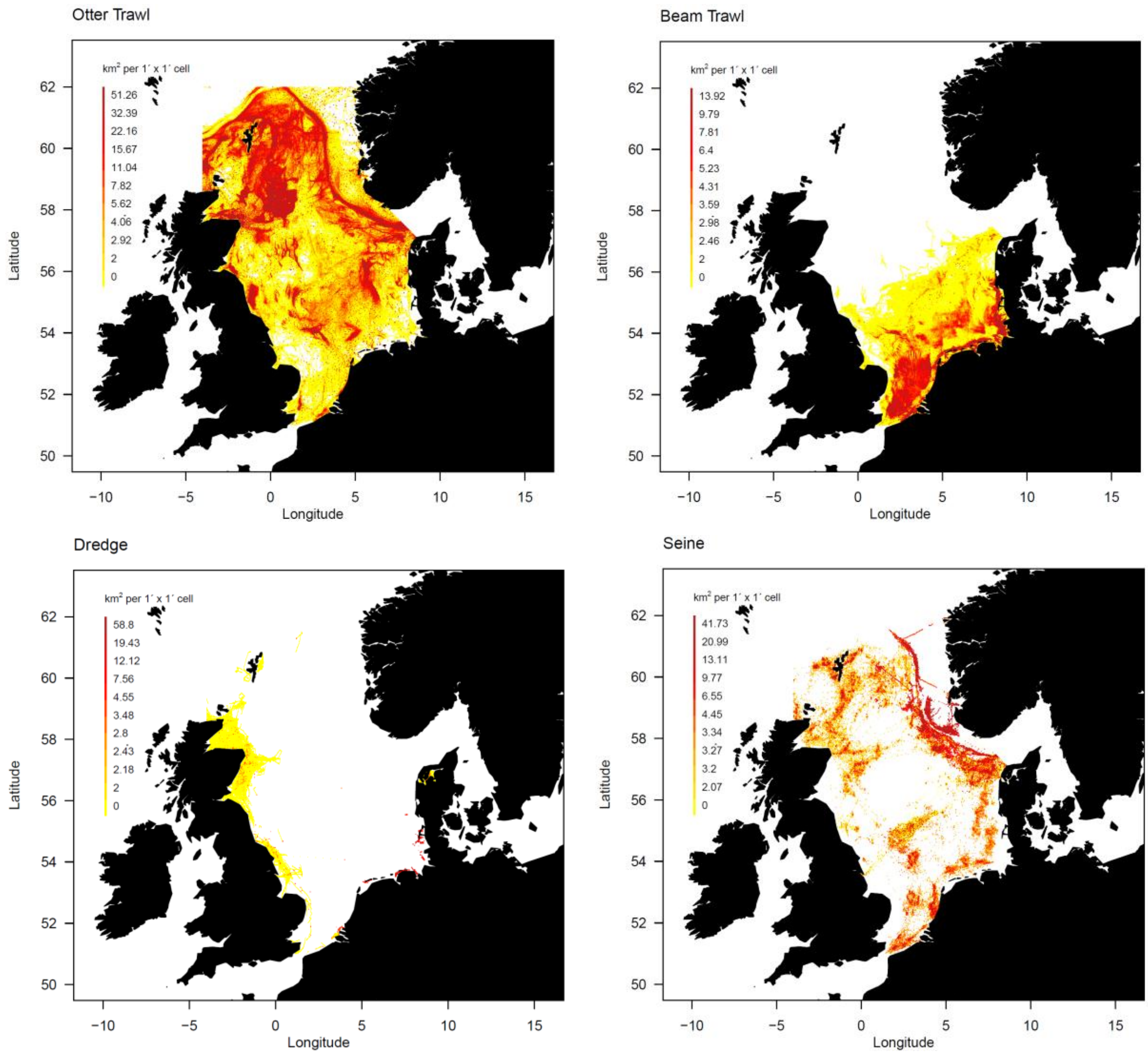

*Figure 1. Fishing pressure intensities expressed as total swept area from 2010-2012 in grid cells of 1*1 minutes (or 1.9 km^2) for four different gear groups: otter trawl, beam trawl, dredge and seine. Data from Norwegian, Swedish, Danish, German, Dutch, Belgian, English and Scottish vessels in the North Sea. If a grid cell is fished 1 time in 3 years, then the total area swept is approximately 1.9 km^2. A swept area of 51 km^2 means that the grid cell is swept 27 times in 3 years.*

Hot spots and hot times: new insights in the impact of bottom trawling

Fishermen keep telling scientists that they don't fish just anytime or anywhere. They tell us that these impact maps are wrong, only showing averages per year. No, they say, each fisherman will have his own preferred fishing grounds depending on the season. BENTHIS researcher Daniel van Denderen and colleagues dived into the data and modelled the implications for the seafloor ecosystem.

To get a grip on the fishing patterns they analysed the beam trawl effort intensity at 90 stations in the Dutch North Sea for a period of 10 years. Some areas were trawled lightly or not at all, whereas others were trawled repeatedly in time. The fishermen were right: bottom trawling is highly aggregated and most trawling occurs in 'hot spots', as well as in 'hot times' and shows a clear seasonality as well. This is related to the behaviour of the fleet and migration patterns of the target fish species.

Now think of the implications for the impact. Van Denderen: "Many animals living in the seabed show seasonal patterns. For example, heart urchins bury deeper in winter and are then less vulnerable to trawling than in summer. Other species will be affected differently, depending on their characteristics. This means that benthos vulnerability to trawling at a certain location will vary seasonally due to changes in population structure and behaviour."

With that in mind, Van Denderen started modelling. "We found that the effect of repeated trawling in a short period of time, alternated with longer undisturbed periods, was very different from that of the same number of trawling events, but then randomly spaced in time. This means that species that need longer recovery times can still survive in certain patches."

The team also demonstrated that the recovery times for benthic communities are generally longest in the offshore stations, and shorter towards the Dutch coast, due to spatial patterns in trawling intensity. The work ultimately showed how trawl impact assessments may be improved by taking into account temporal aggregation and seasonality in fishery behaviour.

Contact: Daniël van Denderen <daniel.vandenderen@wur.nl>

Publication: *Van Denderen PD, Hintzen NT, van Kooten T, Rijnsdorp AD. Temporal aggregation of bottom trawling and its implication for the impact on the benthic ecosystem. ICES JMS (accepted)*

Trawling impact is habitat dependent

In the Dutch North Sea, BENTHIS scientists found a negative relationship between trawling intensity and species richness. The scientist analysed data on the biomass and species richness of the seafloor community at 80 stations on the Dutch continental shelf for a 6 years period. Data were related to the trawling intensity, sediment grain size and primary productivity.

"The negative effect of trawling on species richness is restricted to the relatively deep areas with fine sediments. No effect of bottom trawling was found in more shallow areas with coarse bottoms," says Daniël van Denderen.

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, instead of protecting areas that are most impacted by bottom trawls. The results are very important, because the Dutch government is currently preparing fishery closure measures in the North Sea. These results will help them to choose relevant areas.

Contact: Daniel van Denderen (Daniel.vandenderen@wur.nl)

Publication: 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. DOI: 10.1007/s10021-014-9789-x

Quantifying recovery rates and resilience of seabed habitats impacted by bottom fishing

How fast does the seafloor community recover after bottom fishing? Gwladys Lambert and her colleagues of BENTHIS' partner Bangor University analysed thousands of pictures of the seabed around the Isle of Man (UK). In this area, bottom fishing shows a patchy distribution in time and space. For each location Lambert knew the history of fishing events, including when fishing had taken place for the last time, usually weeks to months earlier. The team counted all crabs, sea stars, tube worms, shellfish and other species on the photos and analysed the data. In the end, they obtained a database with the species composition of different habitats and locations in different stages of recovery.

Recovery of abundance was estimated to take less than 1 year to more than a decade, depending on the species group, with faster recovery rates in areas with faster tidal currents, north and south of the island. The recovery of large species was faster when conspecifics were abundant within a radius of 6 km, suggesting an important role for maintaining local sources of recruits to repopulate impacted areas.

Lambert: "Our results show that if managers wants to minimize overall bottom fishing impacts in an area, trawling and dredging should be limited to more resilient areas that recover quickly, while unfished patches of seabed should be maintained to enhance recovery rates."

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Publication: Lambert GI, Jennings S, Kaiser MJ, Davies TW, Hiddink JG (2014) Quantifying recovery rates and resilience of seabed habitats impacted by bottom fishing. Journal of Applied Ecology doi: 10.1111/1365-2664.12277

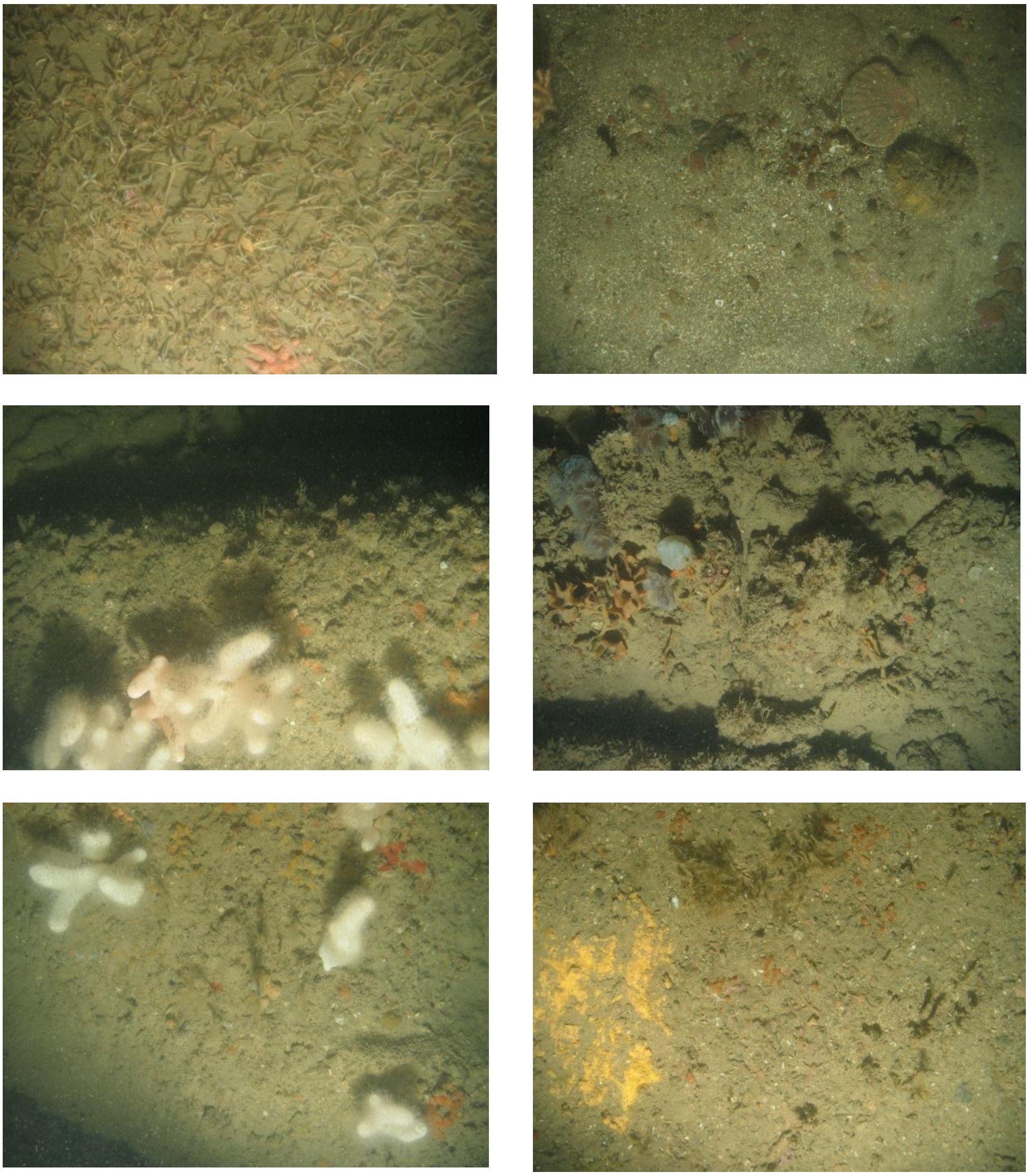

Figure 1. Pictures of the seafloor showing different seafloor inhabitants, such as brittle stars, clams, dead men's fingers and tube worms.

Winners and losers under fishery pressure: a biological traits approach

Usually habitats are classified according to their species composition: burying shrimps in combination with brittle stars in deep muddy waters, shellfish beds in the coastal zone, etc. BENTHIS scientist Andrew Kenny has a different approach: seafloor animals can be described according to their traits, they effectively represent "little packages of traits" which interact with their surroundings in different ways. Some species live a short time, others a long time, some are weak, others strong, some small, others large, some like to scavenge, or filterfeed. By using the traits, he explores the effects that fisheries have on different habitats.

Kenny: "For example, we see an increase in scavengers, predators, free living swimmers, short lived and smaller sized animals with an increase in fishing pressure. But not all habitats appear to respond in the same way. The average size of animals appears to be most reduced when fishing occurs in coarse sediment." His statements are not just based on a handful of samples. The samples data collated by the project partners amounts to more than 800 grab samples and 1000 trawls collected from the North Sea, Bay of Biscay, Norwegian Sea, Black Sea and Mediterranean. "For certain EUNIS habitat types bottom fisheries appear to cause an overall decline in the proportion of suspension feeders, such as the sand mason worm *Lanice conchilega* and changes are likely to have implications for the functioning of marine ecosystems."

To perform the analyses, the scientists reclassified the macrobenthic data according to a set of 10 biological trait categories. In addition, they collated environmental data describing the physical attributes of the seafloor, such as sediment particle size, depth, nearbed shear stress. These data in combination with the traits and fishing pressure data allow different combinations of habitat type, fishing pressure and biological traits to be explored and assessed using multivariate statistical analyses.

"We are now working on defining more realistic habitat categories based upon observed environmental data rather than using the EUNIS habitat classes," Kenny explains. " We also intend to assess the impacts of different gear types in terms of swept area, and investigate the relationship between the traits and ecosystem functioning. "

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More information on traits: D1.1 - http://www.benthis.eu/en/benthis/Results.htm

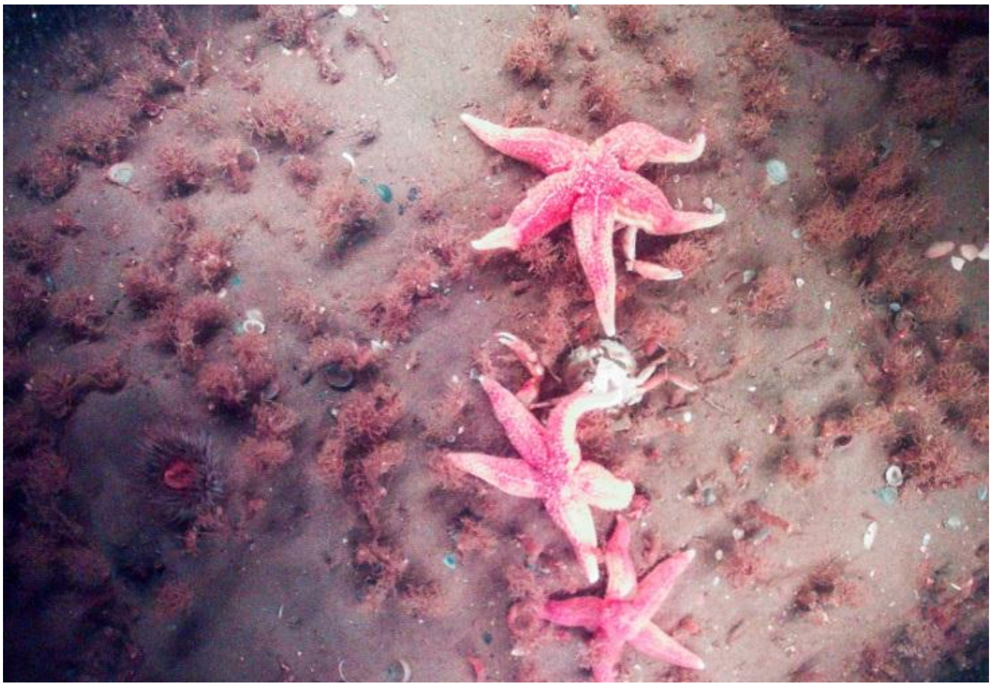

Figure 1. Sand mason worms (*Lanice conchilega*) and seastars (*Asterias rubens*)

Impact of fishing gear: how big are the footprints of trawls and dredges?

Otter trawls for flatfish, dredges for oysters, beam trawls for shrimp: the variety of mobile bottom fishing gears in Europe is huge. And they all have different dimensions and impacts, which causes headaches to researchers who want to compare their impacts on the sea bed and the benthic ecosystem. BENTHIS researcher Ole Ritzau Eigaard and his team therefore carried out an industry survey. They wanted to obtain a standardized methodology enabling the prediction of physical impact of individual fishing operations from standard logbook information of vessel size, gear type and catch.

First the team conducted a number of industry consultations using questionnaires and interviews, during which more than 1000 questionnaires were filled. From this information, they defined 14 distinct towed gear groups in European waters; 8 otter trawl groups, 3 beam trawl groups, 2 demersal seine groups, and 1 dredge group. These roughly correspond to the métier groupings of EU logbooks that fishermen need to fill in.

For each gear type, the BENTHIS team collected detailed information on the individual components, such as doors, sweeps, beam shoes and the ground gear. In this way, the footprint per gear and gear component could be determined. Seafloor penetration of the same components was estimated based on a review of the scientific literature. In addition, the relationship between vessel size (kW or total length) and total gear width/size (door spread, beam width, dredge width and seine rope length) was estimated for each gear group. As expected, the bigger the ship, the bigger the gear.

As the EU logbooks currently do not hold any information of gear dimensions, this achievement is a large step forwards in meeting the monitoring requirements of descriptor 6 (seafloor integrity) of the Marine Strategy Framework directive. The next step for the team is to combine the outcome of the gear analyses with European, Norwegian and Turkish logbook and VMS data to produce large scale high-precision maps showing estimates of area and severity of fishing impacts.

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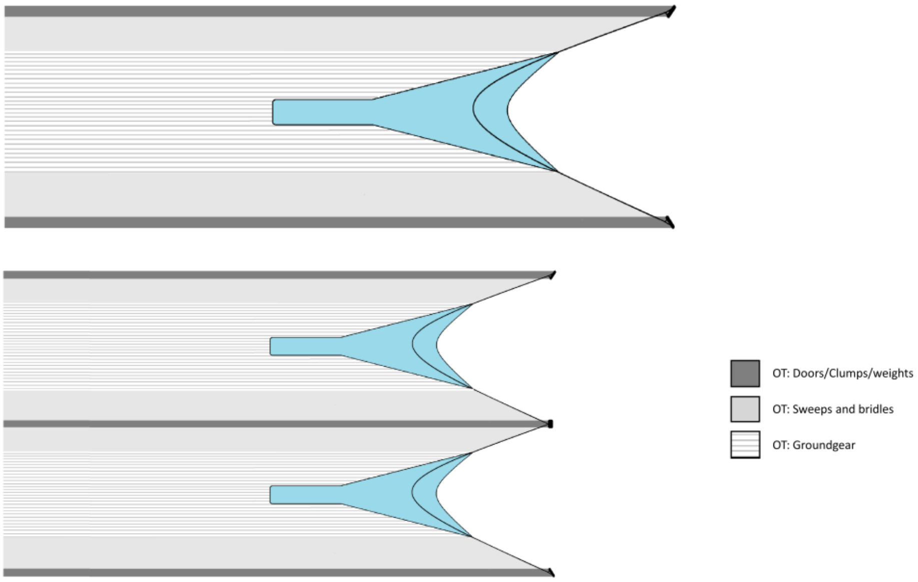

Figure 1: Seafloor footprint of a single otter trawl (top) and a twin-rigged otter trawl (bottom).

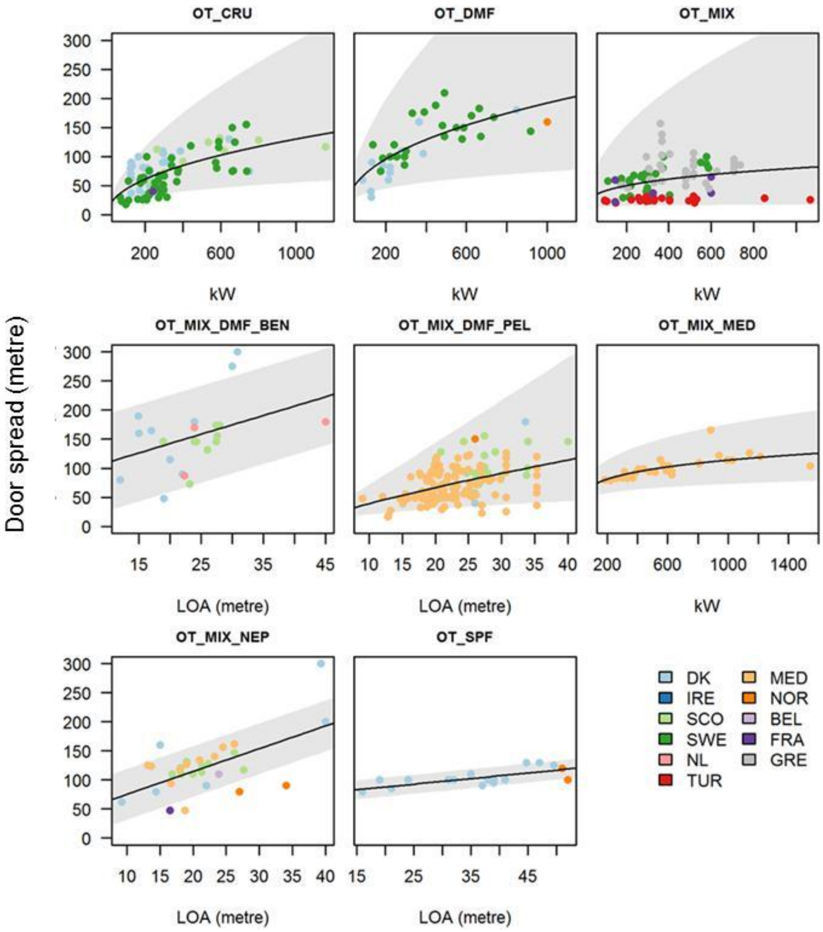

Figure 2. Relationship between total gear width (door spread) and vessel size (kW or overall length) by BENTHIS metier for otter trawlers (OT).

Sediment remobilisation governed by hydrodynamic drag and not by weight of the gear

Many people think that the bigger the weight of the fishing gear, the bigger the impact on the seafloor. BENTHIS researcher Barry O'Neill has found that this is not always the case: and when looking at the amount of sediment put in to the water column, it's the hydrodynamic drag of the gear that is the most important factor, not the weight.

The BENTHIS 'drag team' used a specially designed sledge to measure the hydrodynamic and the contact drag on different components of the fishing gear that are in contact with the seabed (Figure 1). These include the ground gear, which is made of rubber discs and chains and protects the net from the seafloor; and the otter boards, which spread the fishing gear and ensure it fishes close to the seabed (Figure 2). The sledge also measured the amount of sediment remobilised in its wake. The research team could adjust the weights of the gear components, so that they would obtain independent measurements for each combination of weight, tow speed (between 1 and 2 m per second) and component.

O'Neill: "We found out that the amount of sediment entrained in the wake of the gear components is related to the hydrodynamic drag of the element rather than the weight or the degree to which the element penetrates the seabed. These results support our earlier observations in 2011 that the remobilisation of sediment by demersal fishing gears is essentially a hydrodynamic phenomenon. As the hydrodynamic drag of a gear element increases, there is an increase of turbulent shearing and a greater pressure drop in its wake, which leads to an increase of the sediment remobilised."

Although there are other factors involved, these results indicate that by developing more hydrodynamic gears the fishing industry could reduce benthic impacts and also save on fuel costs.

Contact: Barry O'Neill [mailto:B.Oneill@MARLAB.AC.UK]

More information: O'Neill F.G. and Summerbell K., 2011. The mobilisation of sediment by demersal otter trawls. Marine Pollution Bulletin, 62, 1088 – 1097. DOI: 10.1016/j.marpolbul.2011.01.038

Figure 1. The towed sledge on deck.

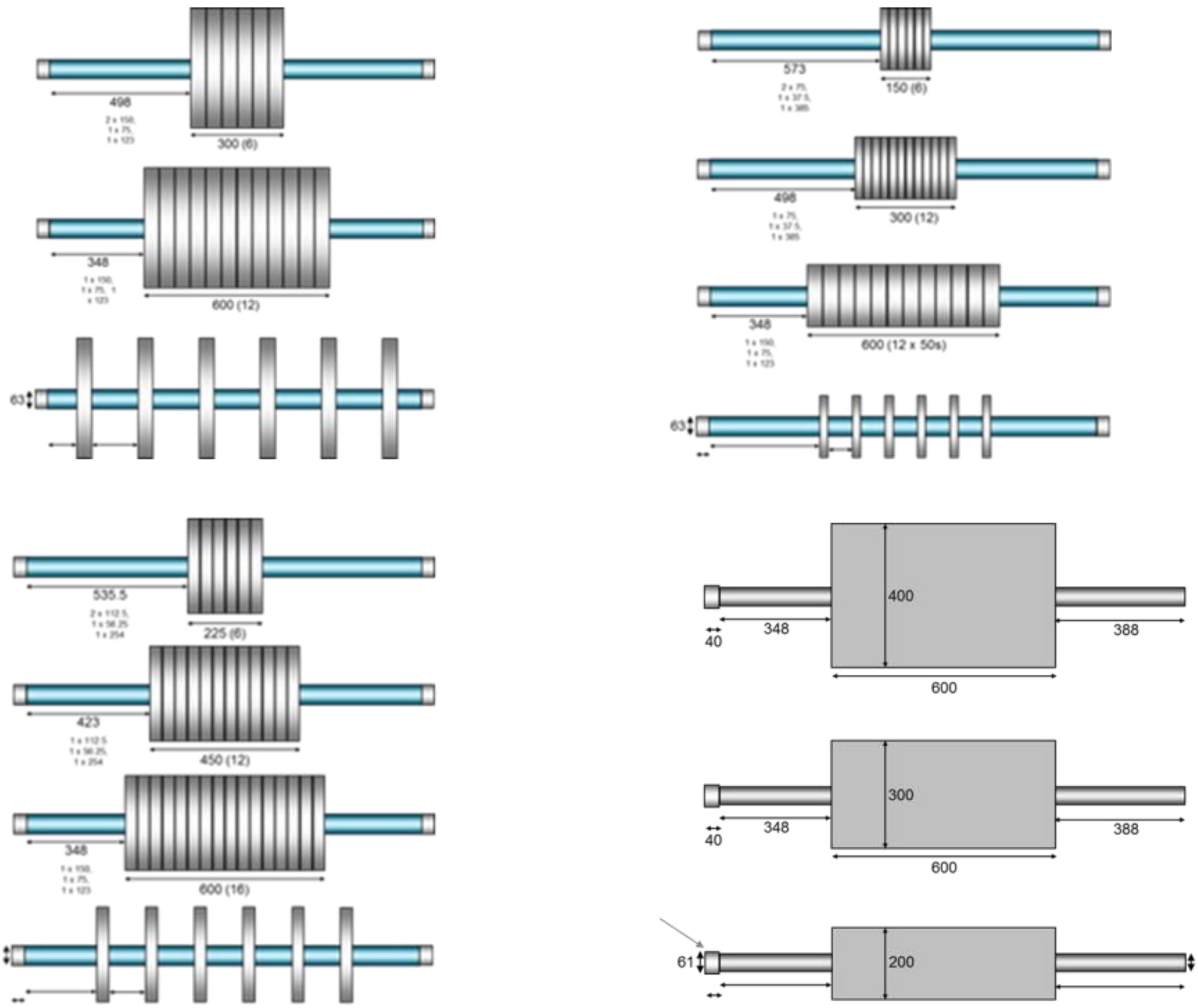

Figure 2. Illustrations of some of the trawl gear components that are in contact with the seabed that have been tested : cylindrical clumps, disc and rockhopper ground gears, and trawl otter boards.

Case Studies

Otter trawling: good or bad for flatfish and Norwegian lobster in the Kattegat?

There is a lot of discussion on the effect of Marine Protected Areas on fish and biodiversity. Fishermen and NGOs usually have very different views on the benefits of MPAs. The Kattegat, between Sweden and Denmark, is a unique area in the sense that both intensively fished areas, as well as a number of MPAs with different levels of (long term) protection are present. BENTHIS researchers wanted to know how these different levels of fishing intensity impact three species of flatfish (dab, plaice, long rough dab) and Norwegian lobster (langoustine) and their food.

Jan Geert Hiddink led the research team: “We found that the abundance and body size of the Norway lobster was much higher in the fully closed areas than in the intensively trawled areas,” he explains. “Apparently, closing areas helps these crustaceans to grow older and establish larger populations. In contrast, in intensively fished areas, the *Nephrops* were smaller, and less abundant, but their condition were highest. This suggests that intense fishing results in more food being available to *Nephrops* due to reduced competition with other organisms, compared to moderate trawling or no fishing.”

So what about the flatfish? Hiddink: “For the flatfish, the differences between the protected and fished areas in terms of abundance and body size were less clear, but preliminary results suggests that their condition was the highest at low levels of trawling. We think that low trawling levels lead to an increase in food production, by providing an advantage to smaller invertebrates such as worms that are not affected by the fishing gear.”

The MPAs in the Kattegat may therefore provide a shelter for more natural populations of *Nephrops* and other benthic species. But life in MPAs is hard with more species competing for food and space. In fished areas, depending on the intensity, the circumstances may be beneficial for growth of flatfish and Norway lobster growth: food is abundant and competition less present. An interesting question rises now: do flatfish avoid areas with high densities of large *Nephrops*? Hiddink can tell the answer yet, but dives into his database to find out.

Contact: Jan Geert Hiddink
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Figure 1. Norway lobster Nephrops norvegicus

Figure 2. Measuring flatfish

Figure 3. The BENTHIS team taking measurements

Traps in the Aegean Sea: alternatives for trawling?

In the deep blue waters of the southern Aegean Sea (Greece) fish are traditionally caught using otter trawls, long lines and bottom nets. In the BENTHIS project, we are searching for alternatives to otter trawls, to reduce the impact of fishing on the seafloor habitat and community. BENTHIS fishery scientist Chris Smith, originally from the UK, has been living and working at the Hellenic Centre for Marine Research (HCMR) in Crete for over 25 years. He believes that baited traps could offer a good alternative to the traditional trawling: “From a theoretical perspective, the baited traps look very promising. They are designed to fish highly selectively, and they hardly damage the seafloor in comparison to trawling”.

He and his research team used two types of traps for the trials: one type of Norwegian cod pot that is deployed off-bottom and has a single entrance and a second on-bottom type with a double entrance. These traps have successfully been used in the cod fisheries in northern European waters. In August 2014 he and his team sailed out with the RV Philia. Chris: ”We fished for 24 hour periods over 10 days in two sites adjacent to commercial trawl fisheries, so that we could compare the catches.” The team focussed on a 70 m deep site over sandy mud characterized by red fish (sparids, red mullet) and a 200 m site with a muddy bottom characterized by white fish (hake, anglerfish) and shrimp. Cameras were installed to monitor the traps and fish behaviour inside and around the traps.

The results were a bit disappointing. Trap catches were very low although the video footage showed some degree of activity by smaller fish, mostly pickerel, that were able to swim in and out of the traps. Comparative trawl catches, fished alongside the trap lines, showed a high diversity of local fish and invertebrates, but with a high by-catch of undersized or non-commercial species. “On the basis of these first trials we will move forward with modifications and come up with some different designs”, says Chris. The new traps will be tested in the next set of trials in the coming winter.

Contact: Chris Smith <mailto:csmith@hcmr.gr>

Floated Norwegian fish trap off-bottom

On-bottom Norwegian fish trap

Deploying traps from the RV Philia

Trap catch, a gadoid and moray eel

Comparative trawl catch

The HCMR 2014 trapping team

SPI on board

In BENTHIS the SPI camera is used alongside a number of other sampling techniques to look at the changes in the sediment prior to and after fishing. The sediment profile imaging (SPI) camera makes use of a prism that is inserted into the seabed to take photos of the profile of the sediment. Based on colour changes in the sediment inferences can be made on the function of the seabed in terms of biogeochemical cycling.

Lorna Teal is responsible for the SPI work. She shows me a picture "Here you see light brown sediment, that means that it is oxidised. In this sediment nutrients will be recycled faster than in the grey or black sediment where no oxygen is found. We measure the depth of the colour change in the sediment from the images. This gives us some idea of the sediment structure and the amount of biological activity".

In the North Sea in June 2014 BENTHIS compared the impact of two types of fisheries, a pulse and a beam trawl. Teal: "We were able to take images within 2 hours following fishing, as well as 24 hours later and 48 hours later. We observed clear changes to the sediment structure directly after fishing where a layer of loose sediment appeared on the sediment surface and the colour of the sediment was mainly grey. As time went on the initial structure and colour of the sediment appeared to return back to the initial state prior to fishing." The researcher expects the full analysis and results to be ready in 2015.

Contact: Lorna Teal <lorna.teal@wur.nl>

BENTHIS SPI movie: http://youtu.be/8ifCeQOeikY

Beam trawl	**Puls trawl**
	
Sediment profile before beam trawl fishing (T0)	*Sediment profile before puls trawl fishing (T0)*
	
Sediment profile 2 h after beam trawl fishing (T1)	*Sediment profile 2 h after puls trawl fishing (T1)*

Testing novel otterboards for the Mediterranean

In the BENTHIS project we also test novel semi-pelagic otterboards: doors that keep the mouth of the net open during fishing. Traditionally, otterboards dig through the seafloor, causing a turbid sediment cloud that scare the fish into the net. The aim is now to develop novel boards, that partly hover over the seabed, to reduce their impact on the seafloor community. In Italy two companies, Grilli and Mori, started the development under the scientific support of CNR (Ref. A. Sala, E. Notti).

After the successful wind tunnel tests performed in 2012, the research CNR team now went to sea. Sala: "In February 2014 we carried out a first set of sea trials on board the research vessel 'G. Dallaporta' in Ancona, Italy. The aim was to verify the stability and operability of the experimental otterboards. We also compared them to the performances of traditional ones". For the techy readers: Sala and his team tested 5 different otterboards: the Thyboron VF15, used as baseline, 2 doors from Grilli (the traditional 'Grilli AR' and the experimental 'Grilli Fly') and 2 doors from Mori (the traditional 'Mori Z' and the experimental 'Mori Biplan'). The tests showed that the doors were stable and could be operated.

In June 2014 the team continued the research on board a commercial fishing vessel. Sala: "During this second set of sea trials, we focussed on the fishing gear behaviour with respect to the catchability. Furthermore, the point of view of the fisherman was essential to collect information from a technical and practical point of view."

The next step consisted of flume tank tests. Sala went to the Marine Institute, in St John's, Canada. In their flume tank the model otterboards were tested. The results were then compared to those of the wind tunnel tests. Notti: "The flume tank tests gave us good ideas for further modifications. We will now ask the manufacturer to adjust the otterboards, so we can perform another set of sea trails in October this year."

Contact: Antonello Sala <a.sala@ismar.cnr.it>

Otterboard windtunnel tests on YouTube:

- Thyboron VF15 Otterboard: http://youtu.be/IYd23ruG6yo
- Mori Biplan Otterboard: http://youtu.be/nRY6n1XEDoQ
- Mori Z otterboard: http://youtu.be/JazPQUb2syY
- Grilli AR otterboard: http://youtu.be/KA_lEeNWDM4

Effects of chronic bottom fishing on ecosystem functioning in the Irish Sea

Ever wondered what the impacts of bottom fishing are for those surviving the blow? In July 2014, BENTHIS took to the sea on board the RV Prince Madog, a state-of-the-art research vessel, to quantify the effects of chronic and large scale bottom fishing. The team, led by marine ecologist Marija Sciberras of Bangor University, studied the effects of fishing on the benthic ecosystem functioning in several different habitat types.

Fishing can affect seabed ecosystems in many ways. It directly changes the morphology of the seabed, re-suspends sediment, releases nutrients, sends discards and offal to seabed ecosystems and kills and damages invertebrates, such as shellfish, crabs, sea urchins or anemones. Over longer time scales, these direct fishery effects result in chronic changes in the functioning of the seabed ecosystem such as changes in nutrient cycling and carbon storage.

First the team selected a number of stations along gradients of fishing intensity in both silty and sandy sediments in the Irish Sea. The selection was based on accurate GPS locations of fishing vessels (VMS data) and environmental datasets, such as sediment type, bathymetry, wave and tidal energy at seabed.

The sandy bottom study site was located at the west coast of the Isle of Man, which has been targeted by scallop dredgers since the 1960s. The Norway lobster (*Nephrops norvegicus*) fishing ground off the coast of Cumbria, UK, formed the silty bottom study site. Sciberras: "At each site we took 25 cm deep cores of the seafloor, using a boxcorer, which were sieved to collect the animals present. We also measured oxygen concentration, chlorophyll and organic carbon content of the sediment. In addition we used the Sediment Profile Imaging (SPI) camera. The pictures show if the sediment is anoxic or not, and it shows small buried animals, thus revealing the macrofaunal community structure. Together, these measurements provides insight in the ecosystem functioning."

The team had a great trip. "Thanks to a brilliant bunch of people from Bangor University and CEFAS and the helpful crew members of the ship our sampling ticked like clockwork and the campaign ran as smoothly as the sea during those 10 days – no sarcasm there, the sea was flat during most of the time - we were lucky with the weather!" Sciberras reports enthusiastically. "Currently, the sample processing is underway. The next step will be to relate the results to species traits, such as maximum age, size, or other characteristics, and to relate the SPI results with the box core results. On a wider scale, we look forward to incorporate our data in regional models, to investigate the changes in ecosystem function for different European regions."

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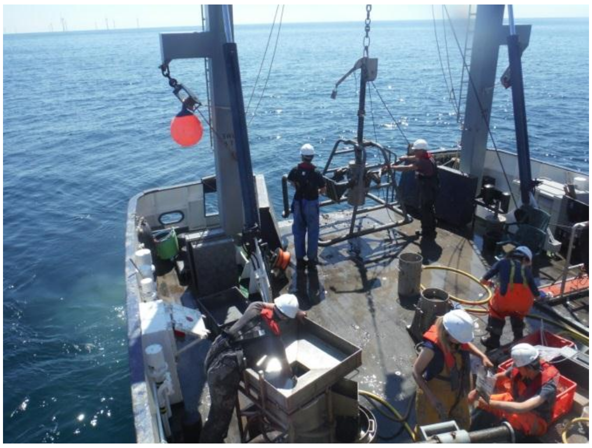

Figure 1. Sampling off the coast of Cumbria, UK, on board the RV Prince Madog provided by Bangor University

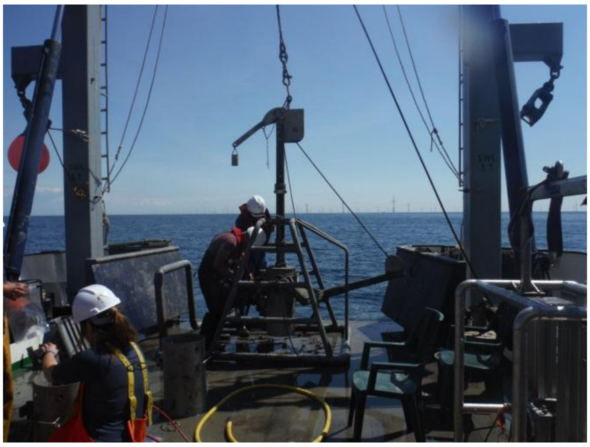

Figure 2. NIOZ box corer used to collect ca. 25 cm deep sediment samples to characterize the infaunal community and to measure sediment properties at the study sites

Figure 3. Collecting interstitial water from sediment samples for pore water nutrient analysis

Figure 4. Calibrating the Oxygen probe to measure changes in oxygen concentration with sediment depth

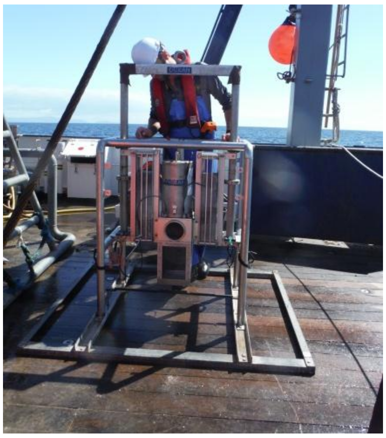

Figure 5. Sediment Profile Imaging (SPI) camera used to measure the apparent redox discontinuity layer as a proxy for bioturbation

Figure 6. The scientific crew from Bangor University and CEFAS during the July 2014 BENTHIS sampling campaign. On the foreground left pore water extraction.

Mitigation of effect of towed fishing gears in the Black Sea

In the Black Sea, in the Samsun Shelf Area, BENTHIS has conducted a series of experimental surveys to reduce the impact of beam trawls and bottom trawls on the ecosystem. The experiments were conducted in July and August 2014, using commercial fishing vessels. The research team used novel and traditional beam trawls for the Rapa whelk fisheries, to determine their effects on the benthic habitat. The novel gear had modified shoes which prevented their penetration into the substratum. The efficiency of these gears were discussed with stakeholders. In comparison with the conventional beam trawl, both bycatch and fuel costs were reduced.

A second series of experimental surveys consisted of selectivity trials, in order to reduce bycatch in the whiting (*M. merlangius euxinus*) and red mullet (*Mullus barbatus*) fishery. These are the most important demersal species of Black Sea ecosystem. For these trials, different cod-ends of nets were tested. The results still need to be analysed.

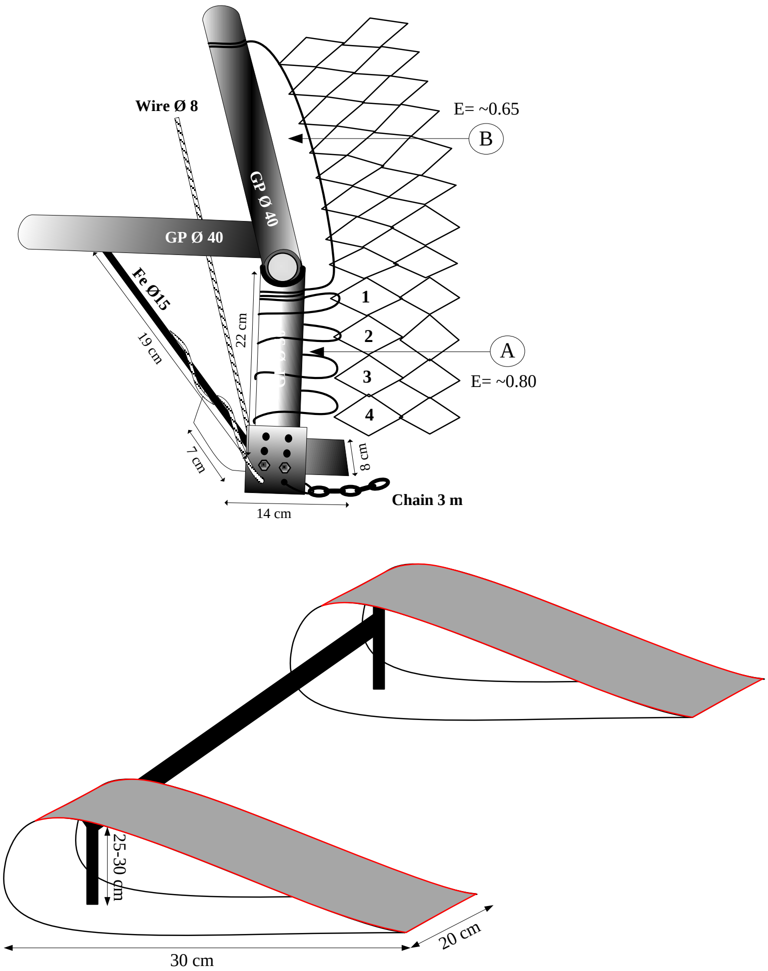

Figure 1. The technical drawing of the shoes (upper) in traditional beam trawl and the sledges (below) attached to the modified gear (H. Kaykaç, May, 2014)

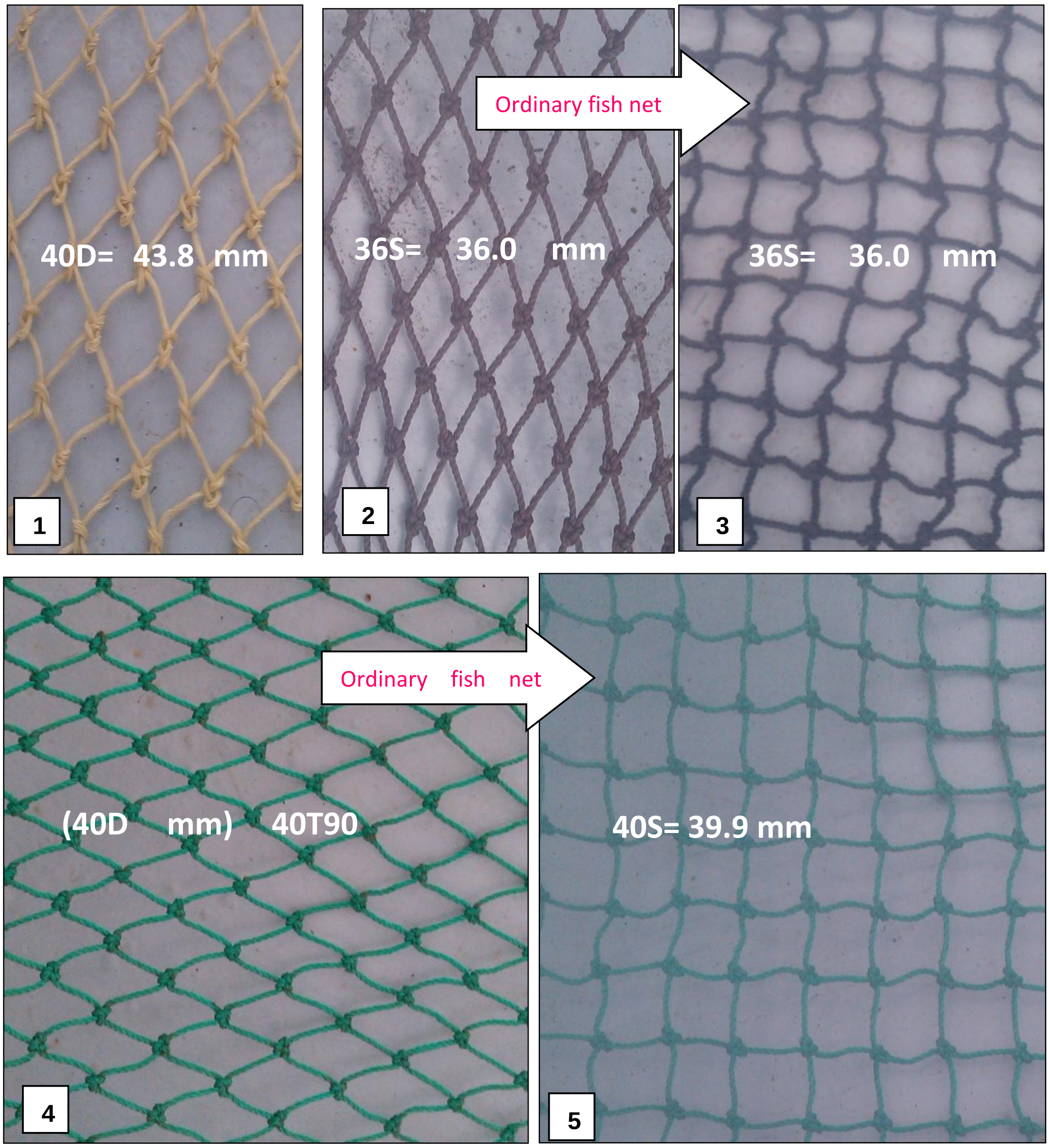

Figure 2. Four different type of mesh sizes and shapes used in the research surveys for selectivity trials.

Figure 3. Selectivity studies of the BENTHIS team on the board a commercial fishing vessel, August, 2014, Samsun Shelf Area. Its length 30 m, and motor power 1500 Hp.