CoralFISH

Ecosystem based management of corals, fish and fisheries in the deep waters of Europe and beyond

Welcome to the CoralFISH newsletter

Issue 3: September 2010

This is the third issue of our newsletter intended to inform interested parties of the progress of the project in addressing some of the key policy issues related to the sustainable exploitation of deep-sea resources.

CoralFISH is a unique collaboration between margin scientists, fisheries biologists and fishermen from ten countries. It represents an important first step towards improving the science base for the implementation of an ecosystem approach to fisheries management in the deep-sea.

Following an excellent field sampling season the bulk of CoralFISH field data collection objectives have been met. This issue of the newsletter is therefore devoted to articles that describe some of the campaigns, specifically those of the Azores, the Mediterranean and Norway.

Work is continuing apace to finalise a CoralFISH habitat classification scheme and provide a standard video annotation system to ensure that partners in different regions analyse their data in the same way. This is an important first step to facilitate the development of monitoring tools in preparation for the implementation of the Marine Strategy Framework Directive. A workshop for CoralFISH partners and interested HERMIONE researchers will take place in Brussels on September 30th.

A number of CoralFISH scientists attended the FAO expert workshop in Busan, South Korea in May, on the status of the implementation by Regional Fisheries Management Organisations (RFMOs) of the United Nations General Assembly Resolution 61/105 aimed at preventing damage to vulnerable marine ecosystems from bottom fishing in the High Seas. A report by Alex Rogers: The Implementation of UNGA Resolutions 61/105 and 64/72 in the Management of Deep-Sea Fisheries on the High Seas, describes some of the major shortcomings in the implementation of UN General Assembly resolutions (http://stateoftheocean.org/pdfs/61105-Implemention-finalreport.pdf). Of relevance to CoralFISH is the lack of habitat mapping programmes instigated by RFMO's to improve the management of vulnerable marine ecosystems such as corals, and the almost non-existent uptake of habitat suitability modelling as a tool to provide some management objectivity in data poor areas. The latter is an area of active research in CoralFISH and the work of two CoralFISH scientists and collaborators will be featured in the next newsletter.

CoralFISH coordinator Anthony Grehan is introduced to the EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn by Prof. Terry Smith, Vice-President for Research, NUI Galway.

Finally, earlier this year, I had the opportunity to brief the new EU Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, during her visit to Galway, on the work of CoralFISH. The Commissioner will attend the EurOcean 2010 Conference (Ostend, 12-13 October 2010) where the importance of marine science in effective maritime policy making and the key role it will play in the path towards economic growth and recovery in Europe will be the major topic (www.eurocean2010.eu).

As always, I wish all CoralFISH participants, our sister projects, and all those working to improve management of deep-sea resources and biodiversity, every success over the coming months.

Anthony Grehan CoralFISH

Inside this issue:

CoralFISH has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 213144. Articles in this newsletter reflect the views of the authors and the EC is not liable for any use that may be made of the information contained herein.

Mid-Atlantic mariners: CoralFISH cruise in the Azores

Some participants pose in front of the ROV *Luso*: scientists, ROV crew, the captain of NRP *Almirante Gago Coutinho* and the chair of the APEDA fishermen association.

In August, a deep-sea research team from IMAR/DOP – Univ. of the Azores were on a CoralFISH cruise that targeted two seamounts in the Azores archipelago . The flanks of the Condor and Açor seamounts, located 21 & 35nm respectively from Horta, were surveyed at depths between 200m & 1500m using the Portuguese ROV *Luso*. The 28 hours of new video footage (bottom time) that was collected will help to investigate the statistical relationships between abundance and diversity of fish and deep-sea habitats, particularly those hosting corals. The ROV surveys followed the same trajectories as longline sets previously conducted in the areas, allowing the new seafloor information to be related to the fishery data . The two multibeam systems available on NRP *Almirante Gago Coutinho* were also put to good use, as a total seafloor area of 9,750km² surveyed during transits and periods where the ROV was on deck.

ROV *Luso* sampling epifauna of a large primnoid gorgonian (*Callogorgia verticillata*) at the Condor seamount.

Gorgonian garden at 227m depth dominated by the yellow gorgonian *Dentomuricea* sp. on the Condor seamount.

From an ecological point of view, it is worth highlighting the "monospecific" coral gardens of *Dentomuricea* sp. observed on Condor's summit and the mixed assemblages of *Viminella flagellum* and *stylasterids* found on Açor. Dense aggregations of the glass sponge *Pheronema carpenteri* (also known as 'bird nests') were also documented in both study areas at depths between 800m and 600m, in addition to sponge grounds dominated by a variety of other species that require further dedicated collection and taxonomy work.

Deep-sea assemblage dominated by the glass sponge *Pheronema carpenteri* at the Açor seamount.

The southern reaches of the Açor seamount proved to be a very interesting study area with an abundance of tectonically-created vertical cliffs reaching heights in excess of 300m. The impact of fisheries on these cliffs was made apparent during the ROV transects, with lost fishing lines preventing ROV progression and concurrent observations of recently broken hydrocorals. Extensive areas of scleractinian rubble were also recorded in the debris deposited at the base of some of these cliffs. However, the lack of modern scleractinian colonies upstream from these deposits, together with the high erosion level of the scleractinian fragments observed, suggest that the coral die-off predates the establishment of the potentially impacting fisheries. Samples were collected for dating and identification purposes.

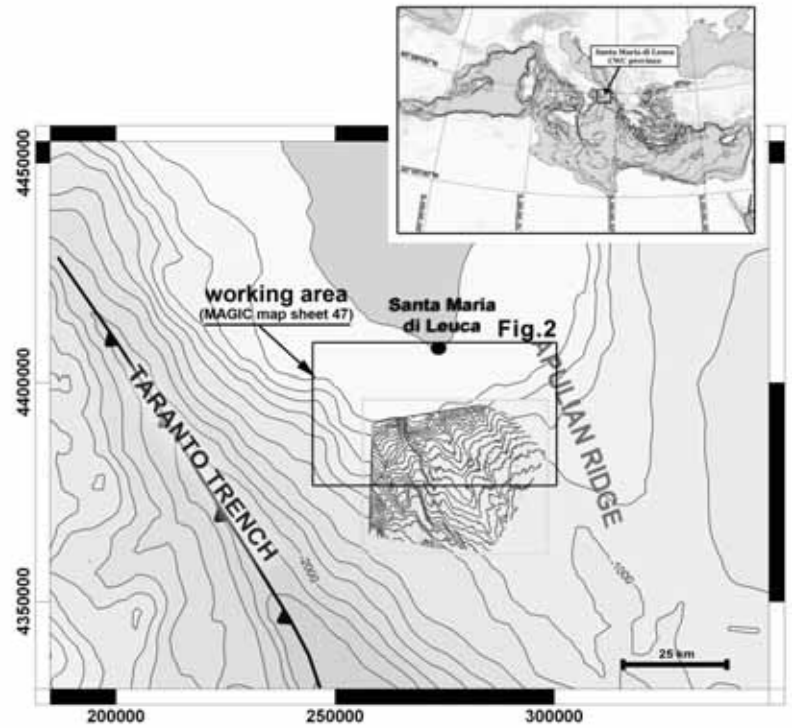
In addition to CoralFISH funds, the cruise was also supported by the Portuguese Task-Group for the Extension of the Continental Shelf (EMEPC), who provided the ROV Luso and its operational team. Two invited researchers from the Laboratório Nacional de Energia e Geologia (LNEG) assisted with the geological description of the sites and helped exploit the usefulness of the seafloor images for other disciplines.

Lost longline on the edge of a cliff on the Açor seamount.

While at the Condor seamount the cruise was visited by the Portuguese Secretary of State for Defence & Sea Affairs, the Regional Secretary for the Environment & the Sea and by the Chair of the Association of Producers of Demersal Fish of the Azores (APEDA), who represents the Azorean deep-sea fishing industry. The cruise received widespread coverage in the media, including national television and newspapers.

CoralFISH (and MAGIC) in the Med

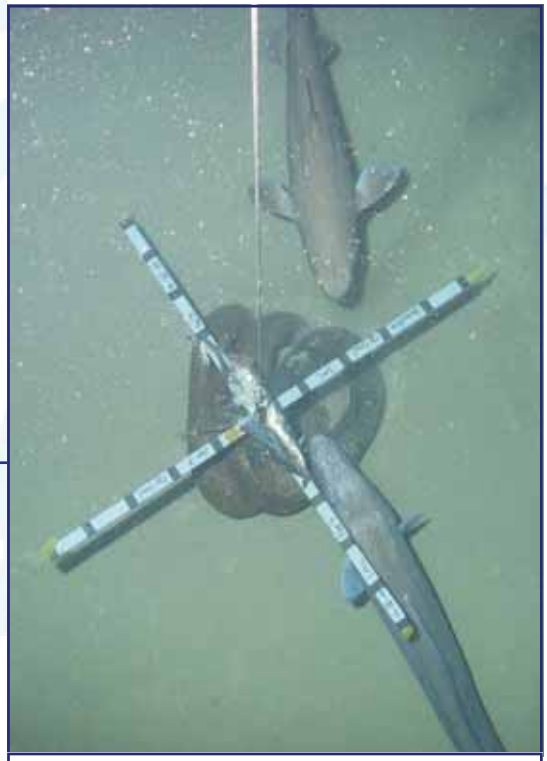
Successful deployments of benthic landers & new seafloor mapping data from the northern Ionian Sea



For almost 3 weeks in April 2010, the R/V *Universitatis* and its scientific team from the University of Milan, the University of Bari, the University of Aberdeen (Oceanlab) and the NIOZ (Royal Netherlands Institute for Sea Research) investigated the "Santa Maria di Leuca" (SML) cold-water coral province in the northern Ionian Sea (above). Thirteen researchers and twelve Italian students were involved in the research cruise.

One of the highlights of the cruise was the deployment of both the NIOZ and Oceanlab benthic landers (see article on Page 5 about the landers) at two representative sites "in" and "out" the SML CWC province. The acquired data will be used to assess the abundance of the fauna in the SML coral region and to compare the results between Mediterranean and Atlantic regions.. In this regard, the cruise was very successful, with 4 of the 6 planned deployments by NIOZ achieved: 2 upstream and near the coral area and 2 far off the coral area. In all deployments the bait (whole mackerel) was gone upon recovery of the lander: the video images showed that the largest part of the bait was eaten by giant conger eels (*Conger conger*). In some cases, small sharks took bites, but never finished the bait completely; the bait was also visited by large Carrier crabs (*Paromola cuvieri*) and deep-water shrimps (*Aristeus antennatus*) .

The NIOZ lander being retrieved after a successful deployment. The camera is indicated by the arrow, and the yellow spheres are the floats.



A Kitefin shark (?) *Dalatias licha* (top) and conger eel (*Conger conger*) face each other over the bait on Oceanlab's BRIL. The round objects are anchor chain links used as ballast.

Deep-water shrimp, *Aristeus antennatus*, are an important commercial species in the area.

Oceanlab's BRIL (Biogenic Reef Ichthyofauna Lander) autonomous lander was successfully deployed 5 times. It captured 3,849 images at the seabed, at depths of 642-673m (depth calculated via SeaGuard pressure and temperature sensors), and also in this case images showed that opportunistic scavengers attracted to the bait were dominated by Conger eels (*Conger conger*) at both stations

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(on and off coral area). Records documented that these large scavengers were able to consume almost all bait in less than an hour! Both on and off coral stations also other fishes appeared (Greater forkbeard (*Phycis blennoides*), Common mora (*Mora moro*) and the Kitefin shark (*Dalatias licha*)) and some of them were seen only in coral area (*Helicolenus dactylopterus dactylopterus* and the Gulper shark (*Centrophorus granulosus*)). Some of these identifications may change as further analysis that will look at the fish abundances between coral and non-coral areas is completed. The results from the landers represent the first direct information on coral-associated fauna in the SML coral province and will be compared with the data acquired by the new CoNISMa lander that was successfully tested and deployed in June 2010 (see Page 5)

The box-corer on deck. Chief Scientist Dr Alessandra Savini is in the light blue hat.

The cruise also provided important sets of data on the nature of the seabed in the region, and samples of corals for genetic analysis – two other important aspects of CoralFISH. Since the cruise was carried out under the flag of both CoralFISH and the Italian MAGIC (*MArine Geohazard along the Italian Coasts*) project, ship time of the latter provided a huge set of multibeam data that greatly enlarged the area covered by previous swath bathymetric survey in this sector of the northern Ionian Sea. Approximately 900km^2 of multibeam coverage and a dense network of ~1100 nautical miles of chirp-sonar profiles have been acquired. The DTM (Digital Terrain Model) provided by the MAGIC project-multibeam echosounder (MBES) survey will be processed and studied by the same team involved in the CoralFISH project. Study of the new maps will allow identification of areas potentially colonised by cold-water corals, by increasing our knowledge of the geomorphology of this Mediterranean coral province. In addition, and also important for describing CWC settings, , the cruise acquired side scan sonar profiles of some key sites, represented by coral-bearing mounds. These coral-mounds were investigated by QUEST4000 and VICTOR6000 ROVs surveys carried out during past HERMES-related oceanographic expeditions (the R/V *METEOR*-M70/1 cruise and the MEDECO cruise from R/V *Pourquoi Pas?*).

The cruise also collected a number of seafloor samples for ground-truthing that will help in better describing different expression of CWC habitats in this coral province. Macrofauna samples obtained through boxcorer deployments "in" and "out" the coral province, will be used by NIOZ to estimate the density and biomass of the benthic organisms in a coral area and in a nearby non-coral area as well as for biodiversity comparison between Mediterranean and Atlantic regions. Most of box-corer deployments within the coral sites recovered living samples of corals and epibenthic associated fauna. These living epibenthic organims (in particular corals, symbiotic polychaetes and sponges) were collected from the core surface for genetic (IFREMER) and isotope (NIOZ) analyses. In particular, specimens of *Lophelia pertusa*, *Madrepora oculata* and *Desmophyllum dianthus,* along with samples of *Eunice norvegica* and tiny gorgonians, have been preserved.

Some recovered specimens of gorgonians and solitary scleractinians (*Desmophyllum* and *Caryophyllia*) were kept alive to attempt aquarium cultivation (CoNISMa). These samples are still alive and have been cultivated since April 2010 in a salt-water aquarium set up in a laboratory of the Dept. of Geological Science and Geotechnologies of Milano-Bicocca University.

Macrofauna was sampled by the use of an epibenthic sledge, a metallic frame with a mouth opening into a net, on muddy bottoms near the coral area (intermound area) and off the coral area. This will help in increasing knowledge on the suprabenthos biodiversity, mainly represented by cnidarians, sponges, annelids, molluscs, small crustaceans, echinoderms and small fish.

Madrepora oculata cold-water coral, retrieved using the box-corer

The chief scientists Alessandra Savini and Gianfranco D'Onghia would like to thank all the participants who worked hard (and had fun as well!) on-board. Most of the objectives of the cruise for both projects were met, despite some bad weather conditions at the start of the cruise. The chief scientists would also like to thank Prof. Angelo Tursi (President of CoNISMa) who greatly supported the "last minute" organization due to an unexpected change of the crew just at the beginning of the cruise.

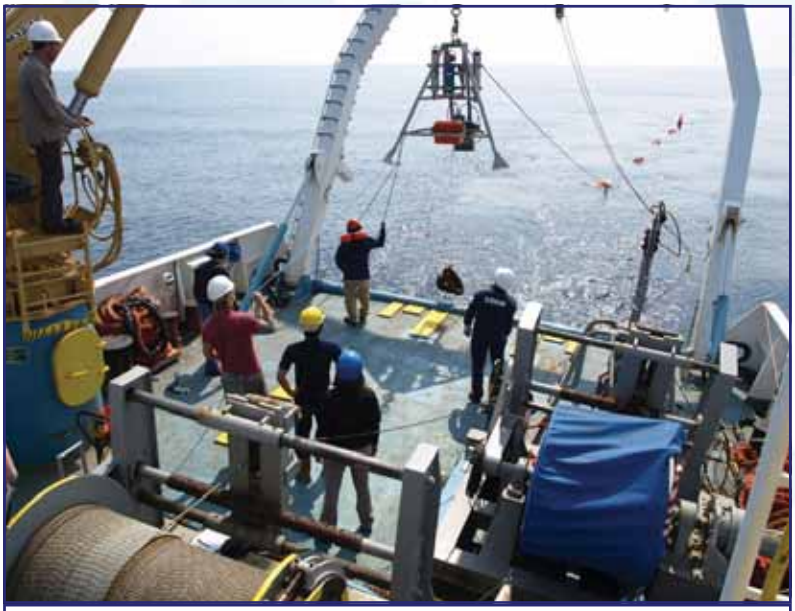
Focussing on the fish: using landers to record life in the deep sea

Not many people outside of deep-sea research would be familiar with some of the equipment used by CoralFISH scientists. Pieces of equipment such as the autonomous benthic landers are providing vital information on life in the depths, and this article gives an overview of one way of finding out just what goes on in the deep sea.

Three CoralFISH partners – CoNISMa, Oceanlab (University of Aberdeen) and NIOZ – have built landers to monitor the fish and other species near the seabed.

What is a lander?

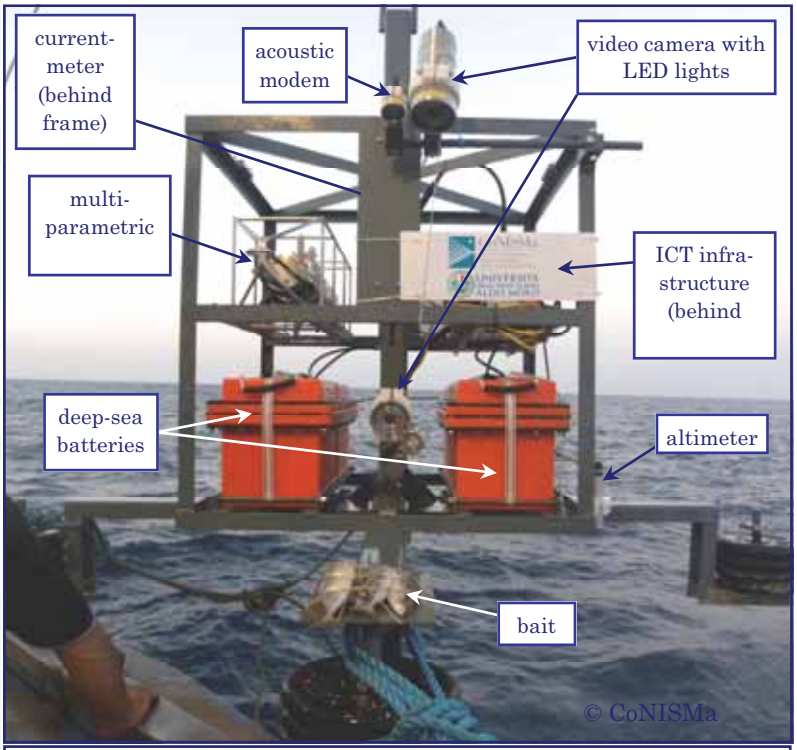
The basic lander consists of a frame, ballast and buoyancy (floats). It will also have somewhere to attach bait (often whole mackerel), a scale bar or other measuring device, a receiver connected to a release mechanism for the ballast, and some kind of signalling equipment connected to a mooring line above the lander to help with retrieval (e.g. a flag and a strobe light). The scientific equipment attached to the frame will usually include one or more cameras (still or video), and various probes or meters, depending on what measurements are to be taken.



Oceanlab's BRIL being deployed in the Santa Maria di Leuca Coral field in April 2010 from the R/V *Universitatis*. The mooring line carrying the floats is already in the water behind the vessel, and the ballast and bait are visible hanging below the lander frame.

Where does a lander work?

The lander is dropped from the sea's surface onto or near the seabed, where it is weighted down by the ballast attached to it, but held upright by floats. It is left there for a set amount of time, and then a coded acoustic signal releases the ballast, and the lander floats to the surface for retrieval.



The CoNISMa lander on an early mission in June 2010. The lander has the capability of working at down to 1200m depth for 48 consecutive hours.

How does it work?

Prior to deployment, monitoring equipment attached to the lander is programmed to record at specific time intervals for the duration of the experiment. The scent of the bait attracts scavenging animals within view of the camera, allowing for identification of species in the area. The scale bar allows estimates of the size of the scavengers to be made, and the current meter will allow the scientists to estimate how far the smell of the bait has been carried, and from this estimate the abundance of species in the local area. When the time comes to retrieve the lander, an acoustic signal is sent which causes the ballast to be released, and the floats raise the lander to the surface. Back on deck, the memory cards etc can be retrieved from the equipment and the analysis of the scientific data started.

Why is a lander useful?

Landers are relatively simple pieces of equipment, and require little vessel time compared to the amount of time for which they collect data. Once it has been deployed, the lander is collecting data on its own (hence autonomous), while the research ship can continue with other work

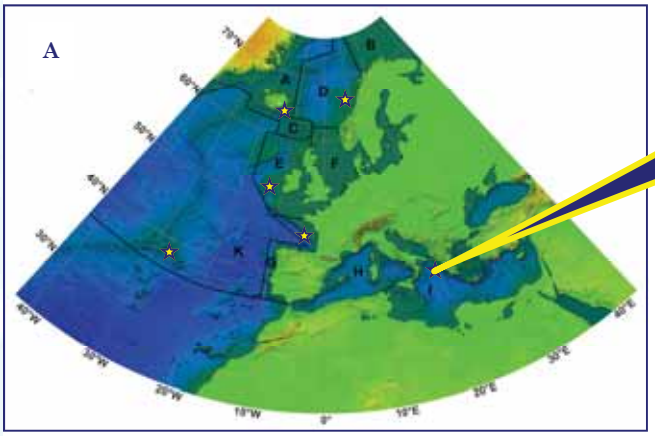
What scientific equipment is attached to the lander?

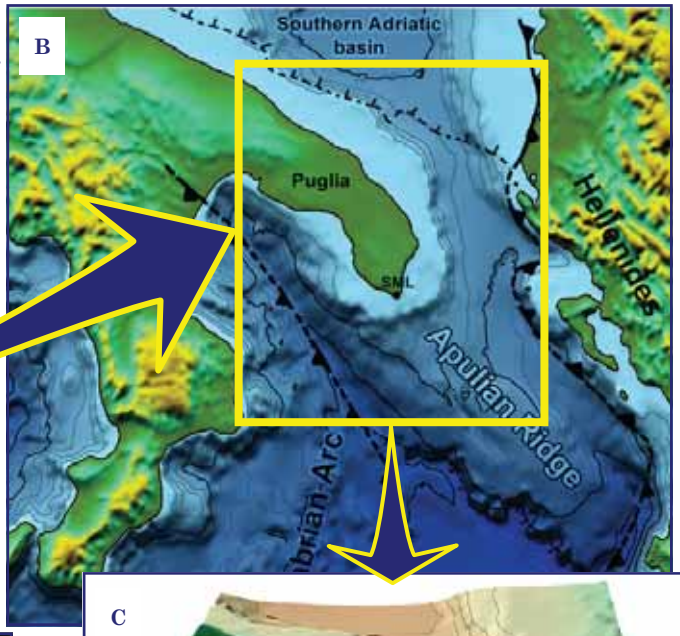
The technical equipment attached to the frame depends on what monitoring is required. CoNISMa's new lander rests on the seabed, and has 2 digital video cameras with 2 LED lights; an electronic compass, inclinometer and altimeter; a multiparametric probe measuring pressure, temperature, conductivity (salinity), oxygen, pH and turbidity (an indication of plankton content); a currentmeter, and an acoustic modem for communications with the surface. The Oceanlab BRIL (Biogenic Reef Ichthyofauna Lander) floats above the seabed and is fitted with a downward-facing time-lapse camera, a CTD device (recording the environmental parameters salinity, temperature and depth), and a current meter. Some of the NIOZ landers have a timed bait release option, as well as white light and infrared imaging options. One of their landers is spending a year underwater in the North Atlantic to record seasonal changes.

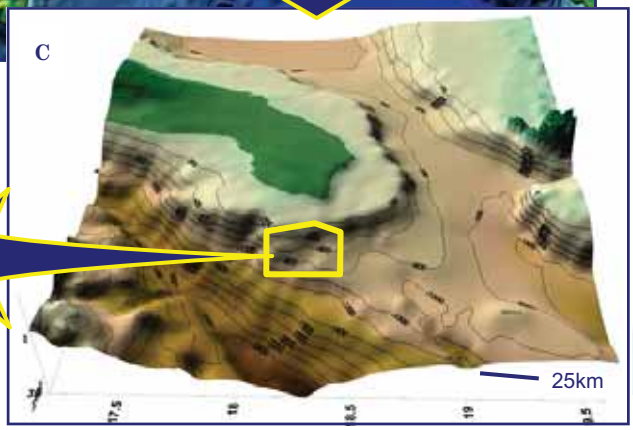
Mapping the depths: characterizing cold-water coral habitats

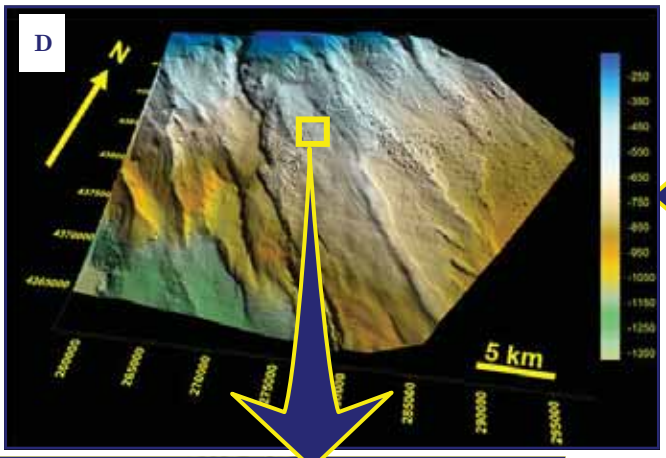
In order to help advise policy makers on the best way to protect CWC habitats, CoralFISH is surveying 6 regional study areas which represent different geological and geomorphic environments. The maps created from the data collected by these surveys can range from those covering large areas at quite low resolution (i.e. small scale maps) to those that are very detailed but are restricted in the area that they cover (i.e. large scale maps).

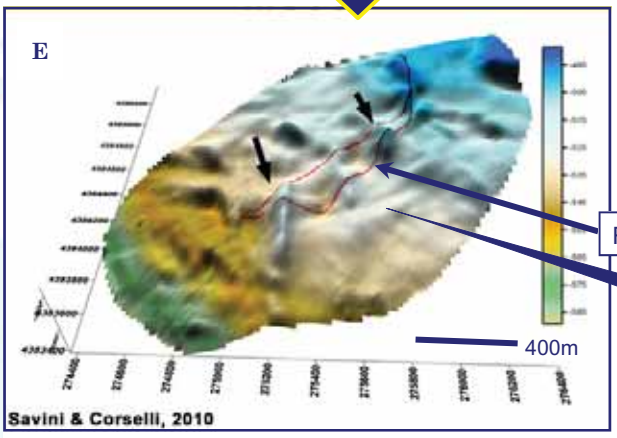
Below are examples of the data collected at different scales from the Northern Ionian Sea study region at macro-, meso- and micro- scales. Note how the information at different scales changes—from the large scale geological features of Fig B, through the more detailed images which show the nature of the seabed in Figs C&D to the images of the corals (Figs G&H) collected by the ROV (survey track marked in Figs E&F).

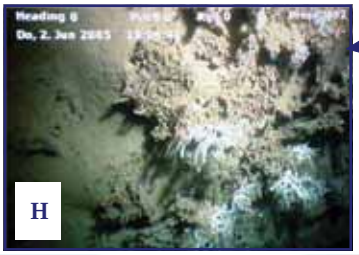








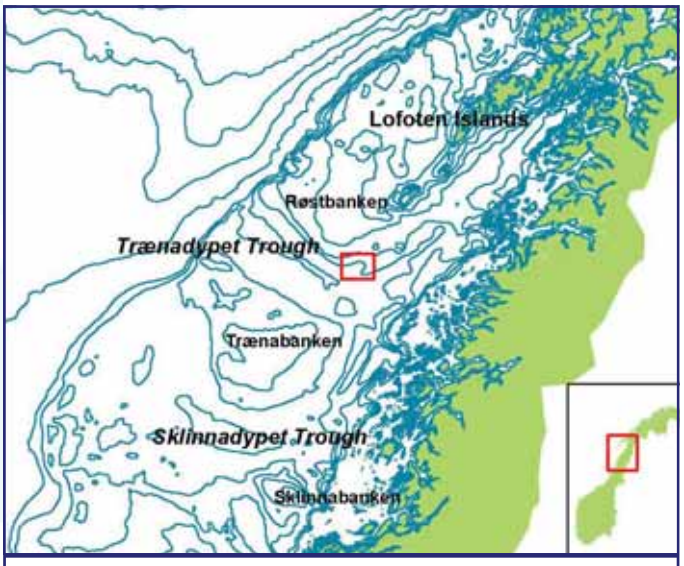




Images & design courtesy of Alessandra Savini, CoN-

A spongy seafloor: the Trena Deep Coral MPA, Norway

The underwater video collected during the two CoralFISH cruises to Trena Deep Coral Marine Protected Area (MPA) revealed previously unknown dense aggregations of large sponges surrounding the small *Lophelia* reefs in the entire 300km^2 area. This offered a unique opportunity to study the community structure of sponge aggregations in detail and to elucidate the role of sponge aggregations as preferred fish habitats. Snapshots were analyzed to determine the density of different sponge species and the patchiness in sponge cover within the MPA. For one transect an inter-calibration of sponge density measurements between underwater video sampling and bottom trawling was made.



The location of the Trena Deep Coral MPA (Trænadypet Trough) off the coast of northern Norway.

This information is highly valuable for giving relevant management advice regarding the interactions between fishing and vulnerable marine ecosystems.

The Trena MPA sponge aggregations are in numbers dominated by *Phakellia ventilabrum* and by species of the *Geodia* genus and in biomass by *Geodia* spp. alone. The average biomass of *Geodia* spp. in the MPA is 1.6kgm^{-2} with a maximum biomass of 13kgm^{-2}. The water processing capacity of tropical and temperate sponges is high (up to 24,000 litres of water per kg of sponge per day) and they are known to be efficient filter feeders. They can contribute significantly to the transfer of energy from pelagic to benthic habitats and are important components of benthic communities. Crude estimations for Trena MPA suggest that *Geodia* spp. sponges alone can filter a volume equal to the entire overlying water column (at a depth of 300m) in 8 days. This indicates that they could have an important ecological function on the continental shelf.

IMR scientists have initiated a collaboration with Prof. Sally Leys at the University of Alberta, Canada, and IMR has provided funding to carry out additional field and laboratory work this autumn to provide values on key biological parameters for the *Geodia* species dominating at Trena Deep. Pumping activity will be studied *in situ* with video and dye visualization methods using the IMR ROV *Aglantha,* while respiration and feeding activity will be measured in the laboratory. Combining these data with existing sponge abundance/biomass data from Trena will provide a first estimation of the role sponge aggregations play in the carbon cycling on the Norwegian continental shelf.

Massive Geodia spp. sponges are growing in high densities on the soft sediment.

Fan shaped Phakellia sp. sponges are growing mainly attached to boulders and cobbles lying scattered on the sea-bed.

For more information, contact the CoralFISH Project Office

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