CORALFISH-HERMIONE CRUISE REPORT

Cruise 64PE313, Galway-Lisbon,
16 Oct - 5 Nov 2009

Belgica Mound Province (CoralFISH & HERMIONE),
Whittard Canyon (HERMIONE)
and Galicia Bank area (BIOFUN)

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Cover page: carrier crab *Paramola cuvieri* taken with HighDef videocamera and flash.

1. INTRODUCTION

The principal aim of cruise 64PE313 with RV *Pelagia* of the Royal NIOZ was to conduct measurements and launch equipment for two FP7 EU-funded projects: CORALFISH and HERMIONE. A secondary purpose was to pick up moorings deployed in 2008 for the ESF-BIOFUN project during the transit to Lisbon.

The CORALFISH project (2008-2012) focuses on the mapping and the modeling of relationships between cold-water coral habitats, fish and fisheries. Cold water coral habitat with its elaborate 3D structure is generally conceived as rich fishing ground and nursery for juveniles. Fishing, on the other hand, constitutes a direct threat to the structure of the fragile coral reefs and many cases of reef destruction by fisheries have been documented. The NIOZ contribution to the CoralFISH project is concerned with development and calibration of methods for surveying the reef fish population and modeling of the carrying capacity of reefs for sustaining fish populations. Latter objective involves data collection on energy flow through the food web of the coral community including fish. In 2008 NIOZ organized a first CoralFISH cruise (Lavaleye et al. 2008) to the Hatton Bank where baited videos were deployed to estimate fish abundance and samples were collected for food web analyses. Hatton Bank lies outside European EEZ’s, and trawl fisheries here are largely unregulated especially in its deeper parts where the corals grow. The Hatton Bank is therefore considered as a threatened area. As a contrast the present cruise was directed to the Belgica Mound Province, which lies within the Irish EEZ and has been designated as Special Area of Conservation (SAC) involving a degree of regulation of activities.

The HERMIONE (Hotspot Ecosystem Research and Man's Impact on European Seas) project is the successor to HERMES (2005-2009). It is designed to advance, by means of integrating results from biological, chemical and geological studies, knowledge about the functioning of deep-sea ecosystems. Obtaining this knowledge is important because effects of climate change and other human impacts (fishing, resource extraction, seabed installations and pollution) likely change contribution of the oceans to the production of goods and services. The NIOZ contribution to HERMIONE covers two types of ecosystems: canyons and cold-water coral habitat. The topic concerned with cold water corals comprise the relation between physical habitat and functioning of coral communities. Results from the HERMES program indicate that cold water coral habitats are associated with mechanisms that can bring fresh organic matter to deeper water. First estimates from community respiration measurements in coral habitat show metabolic rates surpassing levels of the surrounding slope. This supports the contention that coral communities entrain elevated amounts of fresh organic matter. More data are needed to test the generality of these findings. The HERMIONE canyon topic focuses on particle transport through and biota within the Whittard Canyon, their activity and recovery potential. Canyon floors are typically sites where strong physical forcing occurs with erosion and deposition alternating in time and space. The distribution and functional types of animals inhabiting the canyon floor and walls can provide important clues about the frequency and magnitude of the particle flow through canyons.

2. CRUISE PROGRAM and RESEARCH AREAS

Following sections contain a description of the program and the work areas. Some general information about the cruise, i.e. the participants, the cruise blog, and the logbook can be found in the Appendices-1, 5 and 6 at the end of this report.

2.1. Cruise Track

The track of cruise 64PE313 is shown in Fig. 1 starting with departure from Galway on the 16^{th} October 2009 and arrival in Lisbon at the 5^{th} November. Three study areas were visited during the cruise: 1) Belgica Mounds, 2) Whittard Canyon, and 3) Galicia Bank. The sections below contain a map and the work program in each of the areas.

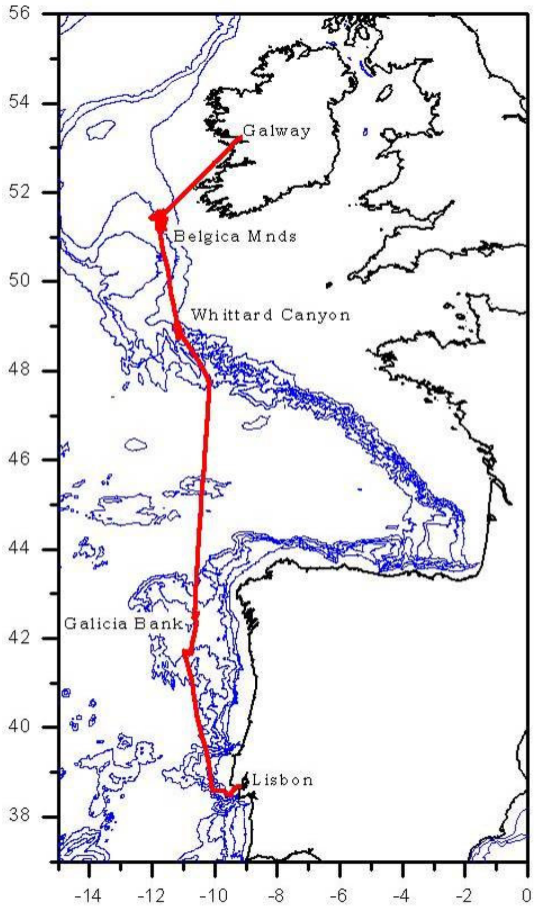


Fig. 1. track of Cruise 64PE313 (16Oct-5Nov09).

2. 2. Belgica Mounds

The Belgica Mounds are situated on the eastern side of the Porcupine Bight (Fig. 2). The coral communities in the Belgica Mound Province have been a target of many programs and cruises in the past decade, a summary of which can be found in Foubert et al. (2005). The area is designated as a SAC (Special Area of Conservation) by the Irish authority for which a research permit is required.

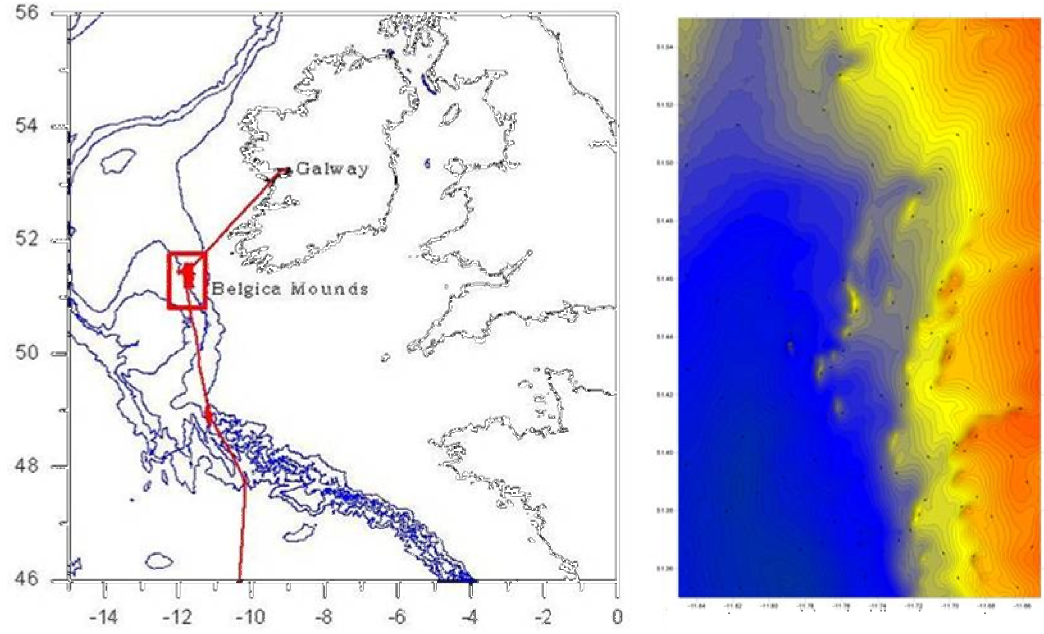


Fig. 2. Left-hand panel: overview of Irish continental margin with the Belgica Mound Province marked by a rectangle. Right-hand panel: bathymetric map of Belgica Mounds.

The combined objectives of cruise 64PE313 for Belgica Mounds were:

- Make detailed bathymetric maps of the Belgica Mound area using multibeam (see 4.1.1.)
- collect samples on and off coral mounds for the study of biodiversity, biomass and density of macrobenthos (see 4.1.2.)
- collect samples of macro-, epifauna, and fish on and off coral mound to study the benthic food web e.g. by stable isotope signatures (δ15N, δ13C) (see 4.1.3.)
- conduct respiration measurements on sediment cores and selected biota collected on and off mound (see 4.1.4.)
- collect video records from the seafloor on and off mound in order to count fish and relate their distribution to the habitat type (see 4.1.5.)
- conduct and compare different baited video experiments on and off mound to estimate fish abundance (see 4.1.6.)
- collect long-term records of physical parameters (current, temp, S) and particle fluxes in coral habitat (see 4.1.7.)
- collect long-term data on fish abundance in coral habitat by means of repeated baited experiments (see 3.7.)

2.3. Whittard Canyon

The Whittard Canyon, located 300 km south of Ireland, is a large branching canyon system intersecting the Celtic continental margin (Fig. 3). Following the HERMES studies of the Portugese canyons (e.g. Tyler et al. 2009), the Whittard Canyon has become a focus of the HERMIONE project. So far relatively few studies have been made of the Whittard Canyon i.e. a geochemistry study by Otto & Balzer (1998), a sedimentology study by Reid and Hamilton (1990), and benthic biology by Duineveld et al. (2001).

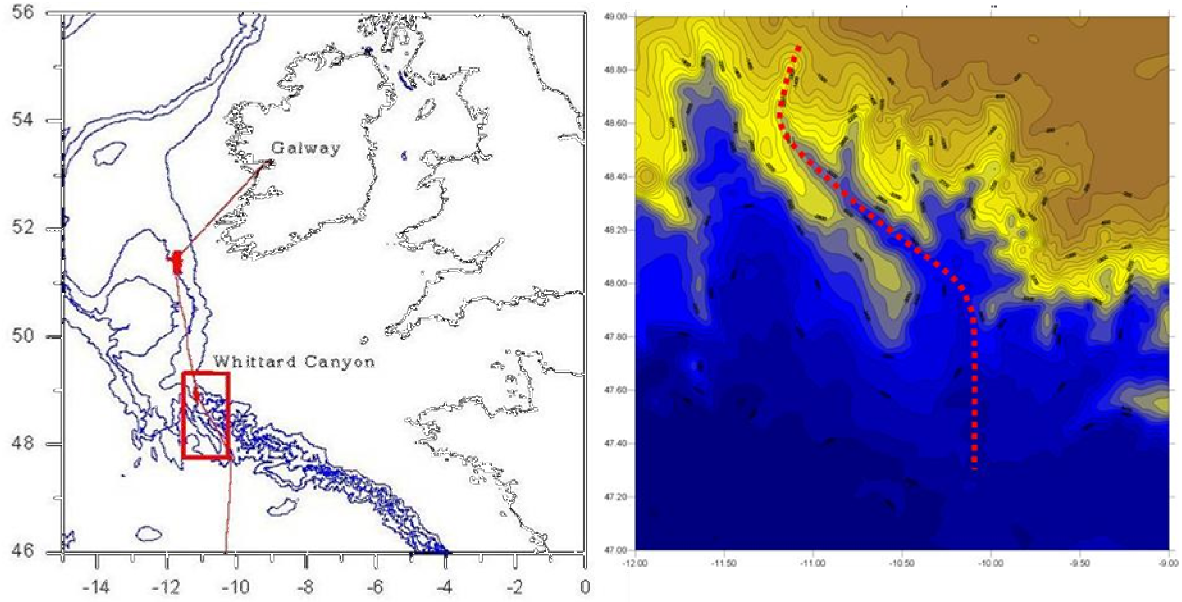


Fig. 3. Left-hand panel: overview of Irish continental margin with red line marking the cruise track and the rectangle marking the Whittard Canyon. Right-hand panel: detail of Whittard Canyon. Dotted line marks the westernmost branch.

The objectives of cruise 64PE313 for the Whittard Canyon were to:

- collect long-term records on current speed and particle flux near the head and the mouth of the canyon by means of BOBO landers (1y deployment starting 2009). (see 4.2.1.)
- collect video records from the canyon floor for the analysis of benthic biodiversity

2.4. Galicia Bank

The work around Galicia Bank (Fig. 4) forms part of a 3y study on the relationship between the structure and functioning of benthic ecosystems in the Atlantic and Mediterranean (ESF EURODEEP-BIOFUN project). During the BIOFUN cruise in October 2008, two moorings were deployed at 1900 and 3000 m depth around Galicia Bank for a period of ~ 1 year in order to measure particle fluxes and physical parameters of the benthic boundary layer. Recovery of these moorings was scheduled for cruise 64PE313. Due to a technical failure, no video records could be made at the 1900 and 3000 m stations in October 2008. A new attempt to obtain video images from these stations was planned for cruise 64PE313 shiptime permitting. Finally optional baited lander experiments were planned to supplement 2008 experiments whereby vegetable bait was offered.

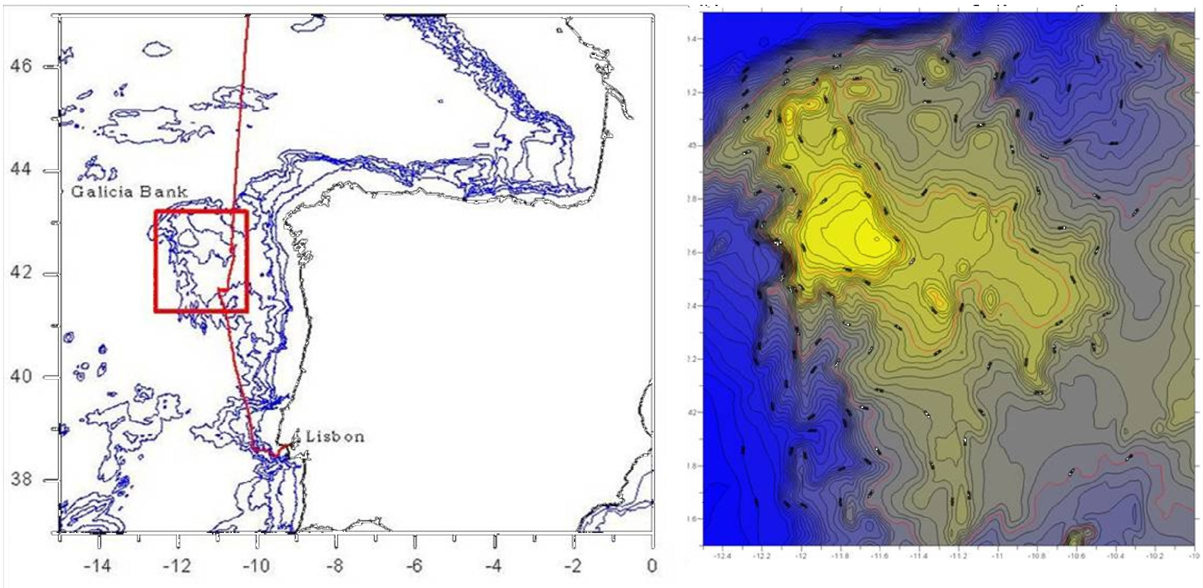


Fig. 4. Left-hand panel: overview of Iberian continental margin with red line and box marking the cruise track the Galicia Bank working area, respectively. Right-hand panel: detailed bathymetry Galicia Bank.

The objectives of cruise 64PE313 for the Galicia Bank were:

- pick-up mooring (see 4.3.1.)
- time permitting collect video records from the seafloor at depth 1900 and 3000 m and additional baited experiments (see 4.3.2.)

3. METHODS

3.1. Multibeam

During the cruise multibeam recordings were made of the Belgica Mounds using the hull mounted Kongsberg EM 300 multibeam echosounder on RV Pelagia. The system is a 30 kHz echo sounder with a 1^{o} opening angle for the transmitter and a 2^{o} angle for the receiver. The transducers consist of 135 beams covering max. 150^{o}. The transmit fan is split into maximum 9 individual sectors that can be steered independently to compensate for ships roll, pitch and yaw. The ships motion is registered by a Kongsberg MRU-5 reference unit and its position and heading by two GPS antennas. Motion and position is combined in a Seapath 200 ships attitude processing unit and send to the transmitter and receiver unit (TRU). The system is synchronized by means of a 1 pulse per second signal produced by the Seapath 200 which is sent to the TRU. Data from the receiver transducer and the ships attitude are combined in an acquisition computer (Kongsberg HWS 10). The sound velocity profile is calculated on basis of a CTD profile obtained with a Seabird CTD system. The sound velocity near the transducers in the gondola is measured by a Reson SVP 70 sound velocity probe.

3.2. CTD

During the cruise CTD casts were made across the Belgica Mounds and in the Whittard Canyon using a system consisting of a rosette sampler with 22 Noex bottles (12L), and a Seabird™ 911 CTD with auxiliary sensors for O_2, turbidity (Seapoint) sensor and fluorescence (Chelsea Aqua 3). During each cast, water was collected at the surface, at the chlorophyll maximum , and at the bottom. The water was filtered over pre-weighed GFF or CA filters for total SPM, C/N, and pigments.

3.3. Beamtrawl

On both Belgica Mounds and Galicia Bank we used a 3m beamtrawl rigged with 6 tickler chains and a net with 5x5 mm cod end to collect epifauna and fish. On the Belgica Mounds it was used in areas alongside the mounds to avoid damage to the corals and risking the gear. All hauls with the beam trawl were successful. Selected animals from the catch were frozen for stable isotope analysis.

3.4. Boxcorer

Boxcore samples were taken with NIOZ boxcorers which are equipped with a trip valve sealing the box. Cores were either 30 or 50 cm in diameter. Cores were collected for: 1) geochemistry in which case cut-off syringes were used as subcores, 2) incubation experiments for which acrylic core of 10 cm were inserted in the core sample (Fig. 5), and 3) biodiversity for which the top 10 cm of the boxcore sample was sieved over 0.5mm and stored on formaldehyde for later analysis. A total number of 16 succesful boxcore sample were collected on and off the Belgica Mound Province. The surfaces of the boxcore samples were photographed (see Appendix 3).

Fig. 5: Boxcore sample with inserted incubation cores and syringes for organics.

3.5. Respiration experiments

Respiration rates of selected organisms and samples of the sediment community were measured in incubation vials. All incubations were carried out in a temperature-controlled laboratory at bottom water temperature (10°C). Cores were placed into a core holder (Fig. 6). The cores were sealed with a lid containing an o-ring. Each core lid contained a magnetic stirrer with a stirrer motor (stirring was continuous throughout the incubation) and a hole for insertion of a PRESENS™ optode and temperature probe sealed and held in place with bitumen sealant. Whilst the optode was not in place a rubber bung was used to seal the hole. One core from each incubation was continuously monitored and logged using the PRESENS™ Oxyview software, readings were logged every 5 seconds. Cores that were incubated simultaneously were monitored and readings recorded manually every few hours with the optode. Start and end times and readings were noted for calculation of oxygen uptake rates by the sediment community. At the end of the incubations, a water sample was obtained for validation of end point oxygen concentrations by means of a Winkler titration (see Appendix-2 for method) and the total volume of the overlying water was measured.

Fig. 6. Left-hand panel: Incubated coral rubble with associated epifauna. Right-hand panel: incubated cores in core holder, presens optode and temperature recorder is in core in the RH corner.

3.6. Fish bait experiments

One of the objectives of CoralFISH is to compare methods to assess fish abundances. A common method to estimate fish abundance is by using the approach time of fish to a bait which is usually attached to a camera set-up (photo/video) deployed onto the seafloor (see Priede & Merret 1998). In this cruise we compared 2 types of benthic landers equipped with cameras for bait experiments

One system, operated by NIOZ (Fig. 7), consist of a triangular frame with floats and ballast holding a programmable recorder and battery pack in a custom made titanium housing connected to 2 digital video handycam (Sony), and LED Multi-SeaLite Matrix videolight source. Bait (whole ungutted mackerel) is attached to one side of the frame. The NIOZ lander sits on the seafloor during the experiment.

The other system is built and operated by OceanLab (Aberdeen) and consists of a frame containing photocamera, flash, battery and releasers (Fig.7) .

Fig. 7. Left-hand panel: the NIOZ lander used for baited experiment. Right-hand panel: the OceanLabsystem with the ballast and bait in the foreground.

The frame is kept suspended 2 meters above the seafloor on mooring line with buoyancy, i.e. eight 17 inch glass vacuum spheres, connected to the top of the frame. (Fig. 8). The ballast which is hooked on the releasers drops on the seafloor and holds the bait. The camera and flash look downward with a wide angle onto the ballast and bait. At the upper end of the mooring is a dhan buoy with a flag, strobe and radio beacon to aid in spotting the lander once at the surface. A pellet buoy is attached to the dhan buoy via floating rope that allows the mooring to be grappled and the lander recovered.

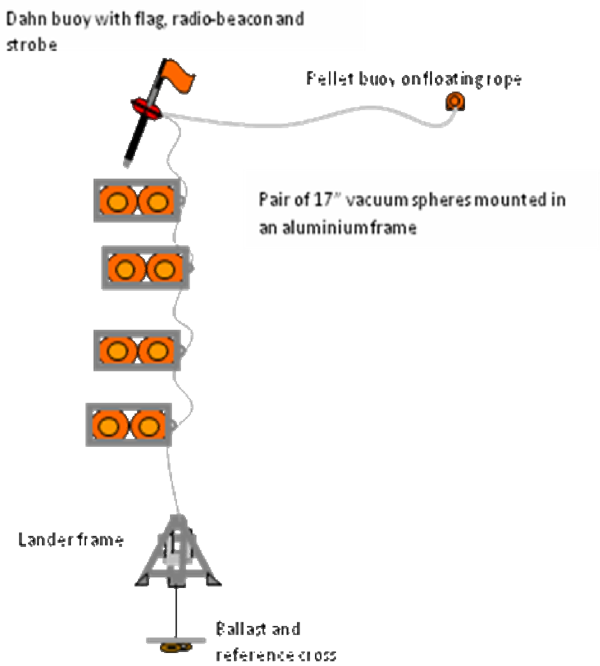


Fig. 8. Basic diagram of Oceanlab's CoralFISH lander indicating components of the complete lander during deployment.

The lander itself is an aluminium frame housing a Kongsberg digital stills camera, Kongsberg flash unit, Bennex Deep Sea Power and Light Battery (DSPL Battery), SeaGuard ADCP and CTD metre and two IXSEA acoustic releases.The Kongsberg digital stills camera is programmed to take an image every minute during deployment and store it on an internal compact flash card. Unless stopped the camera will continue to fire until its memory is full or the DSPL Battery fails. The battery tends to be the limiting factor and fails after about 29hrs. The cameras settings are manually set prior to deployment to have the correct focal length and shutter speed for the reference cross to be optimally captured. The AADI SeaGuard platform houses a Recording Current Meter (RCM) and also sensors for temperature, pressure and conductivity (salinity and depth area available as virtual sensors). The unit is programmed directly using a Windows biased interface and can take a full set of readings every 30seconds. This sample rate is usually reduced to conserve battery life. The data is stored internally on a removable Secure Digital (SD) memory card. The IXSEA Acoustic Releases allow the ballast to be dropped following an acoustic command from a surface unit. The yoke system on the lander frame means that only one release must fire to release the ballast, the other acting as a failsafe. These releases also allow the lander to be ranged either for exact location triangulation or to monitor assent. Two pieces of 1m low grade steel form the references cross. Each is coated with a non-reflective primer to reduce flash glare and marked at 10cm intervals. The ballast is attached to the cross and the cross to the lander's release hook via a 2m wire strop. This known distance allows the camera to be optimised for taking images in this plane. Pieces of light fabric on the edges of the cross indicate current direction and allow images to be related to the data collected by the SeaGuard. Standardised bait (one whole, un-gutted Mackerel – 500g) is attached to the centre of the cross and information such as station number and the date can be written along the arms of the cross.

3.7. FishObs - longterm fish observations

During the cruise a newly developed NIOZ fish observatory was deployed which consists of a tripod similar as the one in Fig. 7 with Benthos™ floats and double acoustic releasers, ballast etc. Each corner of the tripod can accommodate a HighDef video camera (Sony HDR-CX6EK) with flash, visible light and infrared illumination (LED). A programmable bait suspender made of a programmable Technicap carousel. A total of 12 of 24 bottles were filled with sardines in oil in order to allow for a bait exposure followed by a period without bait. This set-up is meant to do repetitive bait studies in order to follow seasonal patterns in scavenger abundances.

The NIOZ Fish observatory was deployed for a period of ~ 1 year at 784 m depth on top of Galway Mound (51^{o} 27.0972'N 11^{o} 45.138'W) equipped with one HighDef camera and 3 Infrared lights (Fig. 9).

Fig. 9. Left-hand panel: overview of fish observatory. Right-hand panel: detail of HighDef video camera pointed at carousel holding 12 vials with bait (oiled sardines). The scene is illuminated by 3 infrared LED lights (marked).

3.8. BOBO lander

For study of processes in the Benthic Boundary Layer of the Whittard canyon, 2 BOBO landers were deployed. BOBO is a tripod of ca. 4 m height with on top a floatation body (Benthos™ glass spheres) and double acoustic releasers (Fig. 10). Ballast weights (120 kg) are attached to the underside of each of the three legs. The BOBO carries a sediment trap (Technicap™ PPS4/3 with 12 vials), a downward looking ADCP (RDI 1200), a Seabird™ CT and Seapoint™ OBS at 2 heights. A central processing unit is connected to the different instruments to simplify programming and data downloading. The parameters collected by BOBO are temperature and salinity, a near-bottom profile of current velocity allowing calculation of shear velocity, SPM in the form of optical and acoustic backscatter units, and vertical particle flux. Two BOBO landers were scheduled to be deployed near the head and the mouth of the canyon for the period of one year.

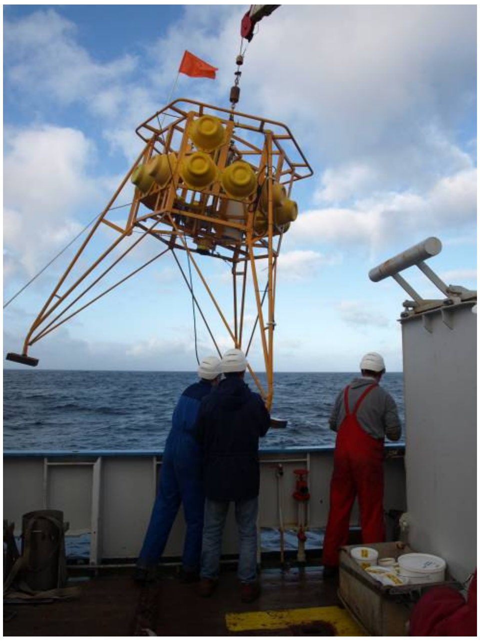


Fig. 10. BOBO lander being deployed in the Whittard Canyon.

4. PRELIMINARY RESULTS

4.1. Belgica Mounds

4.1.1. Multibeam maps (M. Bergman, G. Duineveld)

During the cruise a detailed multibeam map was made of the Belgica Mound province using the hull mounted Kongsberg system (Fig. 11). The XYZ data were screened and used to construct geo-referenced maps for GIS ArcView and OziExplorer. Latter maps were used for navigation and planning. Backscatter data from the multibeam will be used to construct habitat maps.

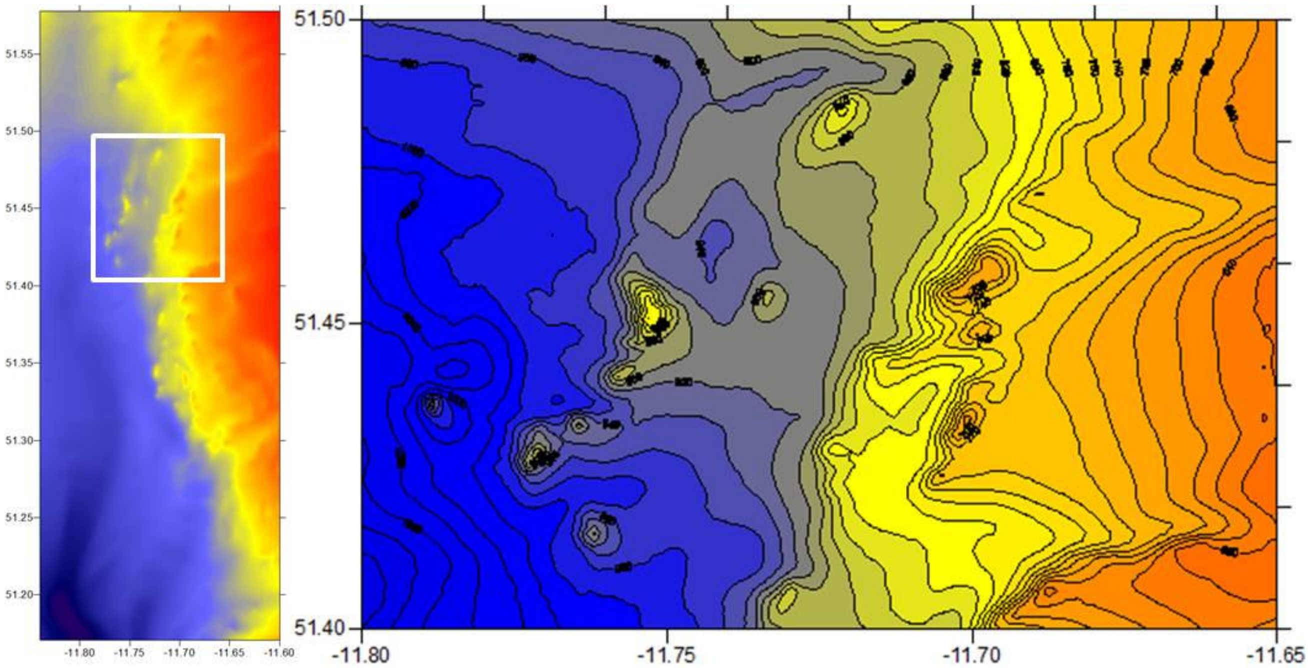


Fig. 11. Left-hand panel: map showing area that was surveyed with the multibeam. The actual work area is marked. Right-hand panel: principal work area.

4.1.2. Biodiversity, density and biomass of macrofauna (M. Lavaleye)

A total number of 6 boxcore samples were collected for analysis of macrobenthic density, biomass and biodiversity (Table 1). The samples supplement earlier boxcore samples from the area taken during cruise 64PE291 in 2008. Below is a map showing the positions of the 2008 and 2009 boxcore samples (Fig. 11). Cores were positioned in a cross mound pattern to contrast mound and off-mound. The core samples were sieved and stored (5% formaldehyde) for later analysis in the laboratory. Photographs of the boxcore surfaces are shown in Appendix-3.

Table 1. Position of boxcores collected for biodiversity

Station	Instrument	Date	Latitude	Longitude	Depth
6	Boxcore small	10/18/2009 09:47	51.45445	-11.77658	986
12	Boxcore large	10/18/2009 17:42	51.45547	-11.75228	816
32	Boxcore large	10/21/2009 17:48	51.45440	-11.75335	836
38	Boxcore large	10/22/2009 17:49	51.45885	-11.74168	932
44	Boxcore large	10/23/2009 15:06	51.45658	-11.72343	900
65	Boxcore large	10/26/2009 15:05	51.45157	-11.75252	786

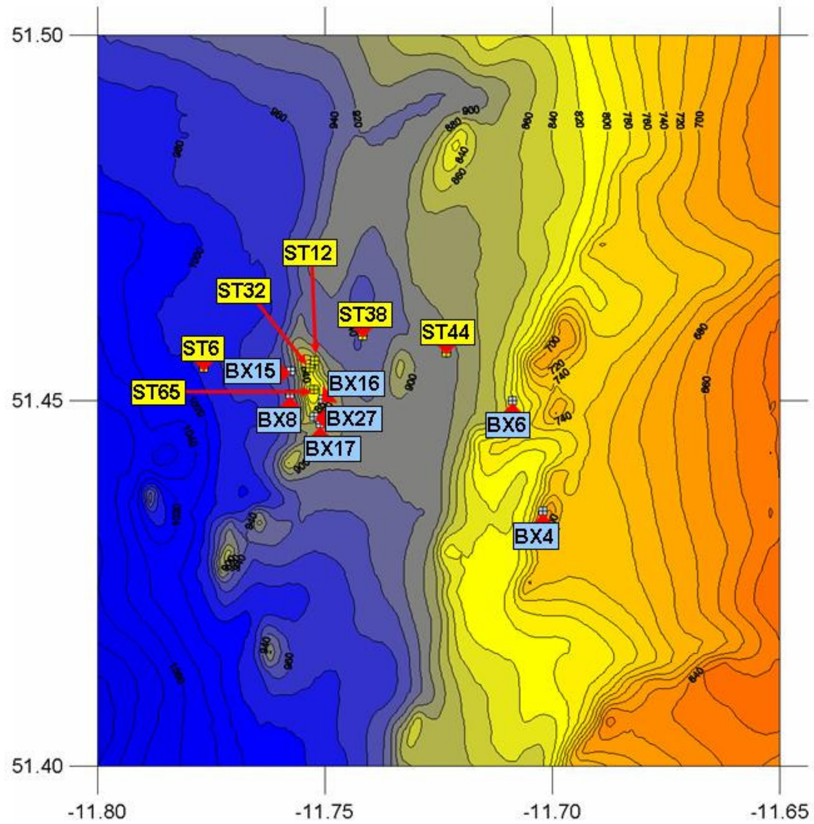


Fig. 11. Positions of biodiversity boxes taken in 2009 (yellow labels) and in 2008 (blue labels).

4.1.3. Food Web Studies (R. Jeffreys, N. VanHoytema)

Study of the Belgica Mounds foodweb involved sampling of organisms (Fig. 12) as well as their potential food-sources , e.g. suspended and sedimentary Organic Matter, zooplankton. Samples will be analysed with regard to their stable isotope signatures ($\delta^{13}C$, $\delta^{15}N$) and fatty acid profiles. Faunal samples were collected from boxcores and beamtrawls (Table 2 for positions). Appendix-4 contains a list of organisms collected for this purpose.

Sediment samples for organic chemistry analysis (stable isotopes/lipids/ pigments) were obtained from boxcores using cut off syringes. Three to five syringes were taken per boxcore and immediately frozen at -80˚C for processing and analysis at NIOZ (Table 2 for positions). Water samples were obtained from a CTD-rosette cast. Approximately, 3L of surface water (5 m below surface) and 5L of bottom water (10 m above bottom.) was collected from the rosette bottles and filtered over a 25mm GFF, immediately frozen at -80˚C for processing and analysis at NIOZ. Water was taken at the stations shown in Table 2.

Table 2: Stations where samples were collected for stable isotope and lipid analyses.

Station	Instrument	Date	Latitude	Longitude	Depth
16	Beamtrawl start	10/19/2009 09:18	51.43060	-11.77225	868
67	Beamtrawl start	10/26/2009 17:24	51.45688	-11.74201	933
5	boxcore	10/18/2009 08:39	51.45433	-11.77638	986
6	boxcore	10/18/2009 09:47	51.45445	-11.77658	986
7	boxcore	10/18/2009 11:07	51.45438	-11.75320	797
22-2	boxcore	10/20/2009 17:29	51.45382	-11.76558	970
32	boxcore	10/21/2009 17:48	51.45440	-11.75335	836
43	boxcore	10/23/2009 13:52	51.45422	-11.74145	924
44	boxcore	10/23/2009 15:06	51.45658	-11.72343	900
2	CTD	10/17/2009 11:34	51.45167	-11.77672	996
2	CTD	10/17/2009 14:40	51.45180	-11.77693	996
19	CTD	10/20/2009 10:51	51.45530	-11.72347	902
20	CTD	10/20/2009 12:00	51.45565	-11.74162	929
21	CTD	10/20/2009 14:07	51.46132	-11.76107	970
22	CTD	10/20/2009 16:32	51.45438	-11.76528	967
49	CTD	10/25/2009 08:52	51.45417	-11.67968	707
51	CTD	10/25/2009 10:33	51.45442	-11.70123	681
54	CTD	10/25/2009 13:35	51.45477	-11.73320	865
56	CTD	10/25/2009 15:23	51.45415	-11.75343	829

Figure 12. Typical species collected in the beam trawl, from top left to bottom right: Oreo, spiral black coral, *Bathynectus* crabs, starfish including *Porania* sp.

4.1.4. Respiration experiments organisms and sediment (R. Jeffreys, N. VanHoytema)

Megacores were obtained from boxcores for incubation experiments (Fig. 5). The aim was to ascertain if there were differences in sediment oxygen uptake rates between coral mounds and areas without coral mounds. Starting to the West of Galway Mound five locations were sampled including Galway Mound and finishing at Poseidon Mound. If a boxcore contained a coral framework e.g. live corals (on mounds) or dead corals (off mound) this framework including the epifauna e.g. ophiuroids was incubated in a large chamber (Fig. 6). Results of the incubation experiment with sediments are shown in Table 3 and those of dead and living coral framework in Table 4. Latter values have to be standardized to biomass (AFDW).

Table 3. Oxygen uptake rates obtained for each area.

Station	Area	On/Off Coral Mound	Depth (m)	Uptake Rate (O_2 µmol $m^{-2}h^{-1}$)
5	W. Galway Mound	Off	986	157
5	W. Galway Mound	Off	986	228
22-2	W. Galway Mound	Off	970	235
22-2	W. Galway Mound	Off	970	95
32	Galway Mound	On	836	255
32	Galway Mound	On	836	722
7	Galway Mound	On	797	253
7	Galway Mound	On	797	388
43	E. Galway Mound	Off	924	238
43	E. Galway Mound	Off	924	202
44	E. Galway Mound	Off	900	318
44	E. Galway Mound	Off	900	76

Table 4. Oxygen uptake rates obtained for live coral and fauna associated with coral rubble.

Station #	Area	On/Off Coral Mound	Depth (m)	Species	Uptake Rate (O_2 µmol $m^{-2}h^{-1}$)
7/8	Galway Mound	On	797	Coral rubble	40
32	Galway Mound	On	836	Coral rubble	139
32	Galway Mound	On	836	Coral rubble	73
32	Galway Mound	On	836	Coral rubble	150
16	Therese Mound	On	867	Madrepora	119
16	Therese Mound	On	867	Black coral	477
16	Therese Mound	On	867	Lophelia & Hydroid	553
67	E. Galway Mound	Off	933	Carrier Crab	1133

4.1.5 Videosurveys of the seafloor (M. Lavaleye, I. van den Beld)

A total of 5 videosurveys were made with the tethered videosystem across known and suspected coral mounds (Table 5). The tracks were extended tot cover mound and off mound features (Fig. 13).

Table 5. Start positions of the videosurveys made with the tethered videosystem.

Station		Date	Latitude	Longitude	Depth	Remarks
37	Start	10/22/2009 15:06	51.42745	-11.76337	955	Therese Mound Digi + HD camera + flash
42	Start	10/23/2009 10:40	51.46178	-11.75998	948	Galway Mound Digi + HD camera with extra lamp
47	Start	10/23/2009 19:13	51.45970	-11.69437	702	Poseidon Mound
59	Start	10/25/2009 19:19	51.45423	-11.74800	870	Galway Mound
64	Start	10/26/2009 12:31	51.43663	-11.76010	954	Therese Mound

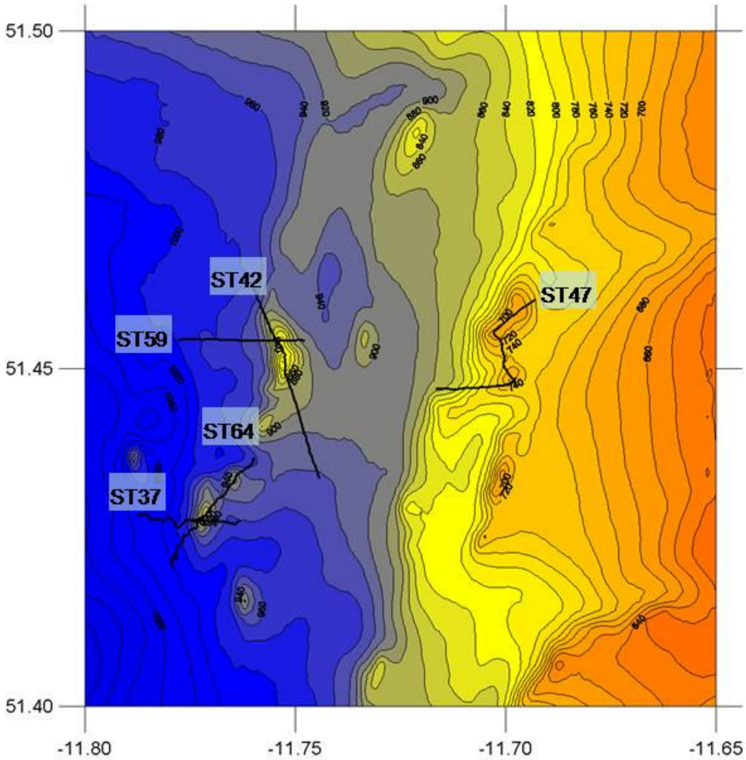


Fig. 13. Tracks of surveys made with tethered videosystem.

4.1.6 Baited camera experiments (I. van den Beld, M. Bergman, T. Linley)

The Abderdeen OceanLab lander was deployed in tandem with NIOZ' ALBEX lander. Both landers have inherent limitations and biases, it is hoped that by operating them in the same locations a more robust assessment can be made of these stations, playing on each methods strengths.

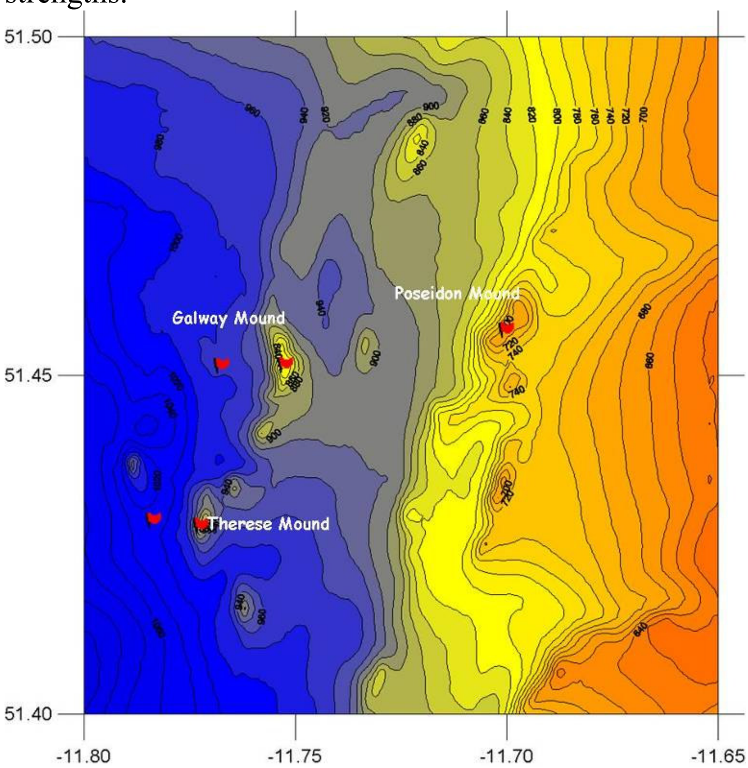


Fig. 14. Map showing study area in the Belgica Mound Province with red flags marking deployments of NIOZ and Abderdeen landers for fish bait experiment.

The landers were deployed at roughly the same 5 stations in order to make a comparison possible. Locations for the landers were selected to represent both on coral and off coral habitats (Table 6; Fig. 14). Typically this was achieved by deploying on a mound known to be colonised by reef forming coral and then at a station ½ a nautical mile from this site, at the base of the mound. Poseidon Mound was also investigated as an example of a mound that did not harbour coral, whether it is unsuitable or its larger size has made it vulnerable to fishing is not clear.

Abderdeen OceanLab lander baited experiments (T. Linley)
A total number of 6,311 images were captured at the seabed during deployments of the Aberdeen lander, at depths ranging from 685-1025m (depth calculated via SeaGuard pressure and temperature sensors). During the 1st deployment on top of the Galway mound, the lander appears to become lodged on the reef and the first images are not of the reference cross but the coral itself. It later becomes dislodged but it is likely that the first arrival is missed. The 2nd deployment off the Galway mound may need to be reclassified because the area still contained large amounts of coral rubble and some live colonies although it was off the main reef structure. The area was also more topographically complex than indicated from the multi-beam data and some of the images may not be suitable for analysis as a ledge obscures part of the image during the early deployment.

Table 6. Oceanlab lander deployment positions. Interval is sampling interval of the SeaGuard sensor.

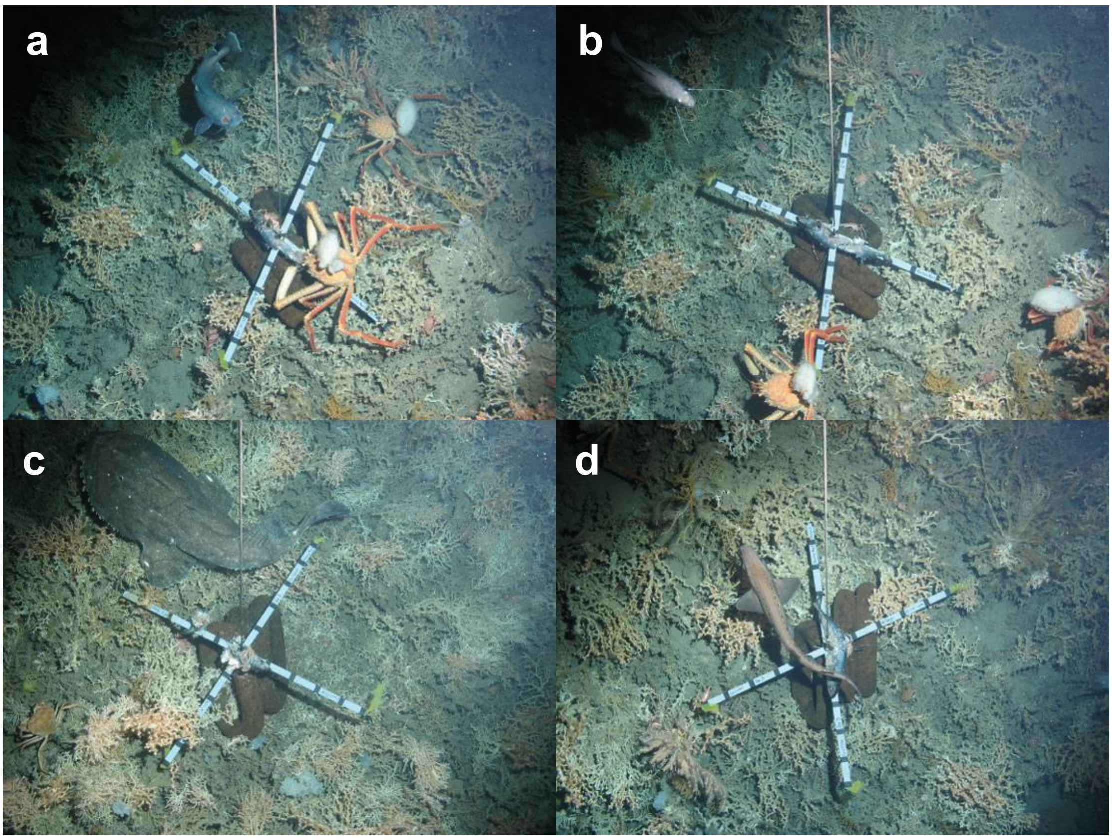
Station	Area	Latitude	Longitude	Depth	# images	interval	coral
3	Galway Mnd	51.45157	-11.75252	885	1342	00:30	+
13	Off Galway Mnd	51.45143	-11.76748	970	1680	00:30	-
29	Therese Mnd	51.42780	-11.77248	877	1193	05:00	+
39	Off Therese Mnd	51.42853	-11.78365	1025	1175	05:00	-
58	Poseidon Mnd	51.45603	-11.69445	685	921	10:00	-

Currents at the seabed were seen to affect the lander at peak times. In some cases the lander was pushed until the reference cross was not totally visible. Observing the cross at an angle will increase the effects of perspective and may reduce the accuracy of length estimates. In some instances the lander was seen to shift from its original position. As this cruise represents this lander's first deployment modifications may need to be made to its buoyancy and ballast to reduce this effect if it is observed again in the future. All animal identification within this report was performed during the cruise with the materials available. Following more thorough data processing some observations may be reclassified.

In all stations bait visitation was dominated by the Common Mora (*Mora moro*) (Fig. 15a), this species was also most commonly the first arrival at the bait. The Greater Forkbeard (*Phycis blennoides*) (Fig. 15b) also showed high levels of visitation. Kaup's Arrowtooth Eel (*Synaphobranchus kaupii*) (Fig. 15e) was present at most stations but appeared in larger groups on the open, off coral stations. Notable occasional visitors on the coral sites were the Monkfish (*Lophius piscatorius*) (Fig 15c), Spiny scorpionfish (*Trachyscorpia cristulata echinata*) (Fig 15h), and the Blackmouth catshark (*Galeus melastomus*) (Fig. 15d). On the off coral areas Mora, Greater Forkbeards and Kaup's Arrowtooth still dominated however there was a single visitation a Leafscale gulper shark (*Centrophorus squamosus*) (Fig. 15f) and by what appears to be a halosaur (*Halosauropsis* sp.).
The 5th deployment on the Poseidon Mound differed from the previous 4 sites. Fish abundance was far lower, the Greater Forkbeard was seen only once and the Mora not at all.

The Spiny scorpionfish and Blackmouth catshark were seen again but also species that had not been seen at previous deployments, such as Ling (*Molva molva*) (Fig.15g) and Conger Eel (*Conger conger*) (Fig. 15h).
Large six gill sharks (*Hexanchus griseus*) were one of the most striking visitors to the bait and were seen at all stations (Fig. 16). Some individuals may approach 4m but accurate measurement has proven difficult since these animals exceed the camera's field of view. The orientation of the camera makes sexing the animals unreliable however no claspers were seen on the individuals photographed. It is possible that the majority or all of these large individuals were female.
The vast majority of the bait was consumed by invertebrates. Of the fish species observed only the Common Mora and Conger Eel were seen to actively feed on the bait. At all stations a cloud of amphipods soon gathered around the bait and stripped the bait internally, gaining access through slashes deliberately put into the mackerels skin to aid scent distribution. Swimming Crabs (*Bathynectes maravignae*) (Fig 15ab) and Carrier Crabs (*Panamola cuvieri*) (Fig 15ab) were seen at all stations, however, coral stations also saw Red Crab (*Chaceon affinis*) (Fig 15a) and squat lobsters (*Munida sp.*). The edible crab (*Cancer pagurus*) was seen only on deployment 5 at the Poseidon Mound.

Forthcoming analysis of the data will consist of: a) image analysis; simple time series counts, length frequency determination, bait visitation by individuals, local abundance estimation calculation for the numerically dominant species, confirmation of species identification, behavioural observations, and b) collation and interpretation of ADCP data in relation to the scavenging fauna observed.



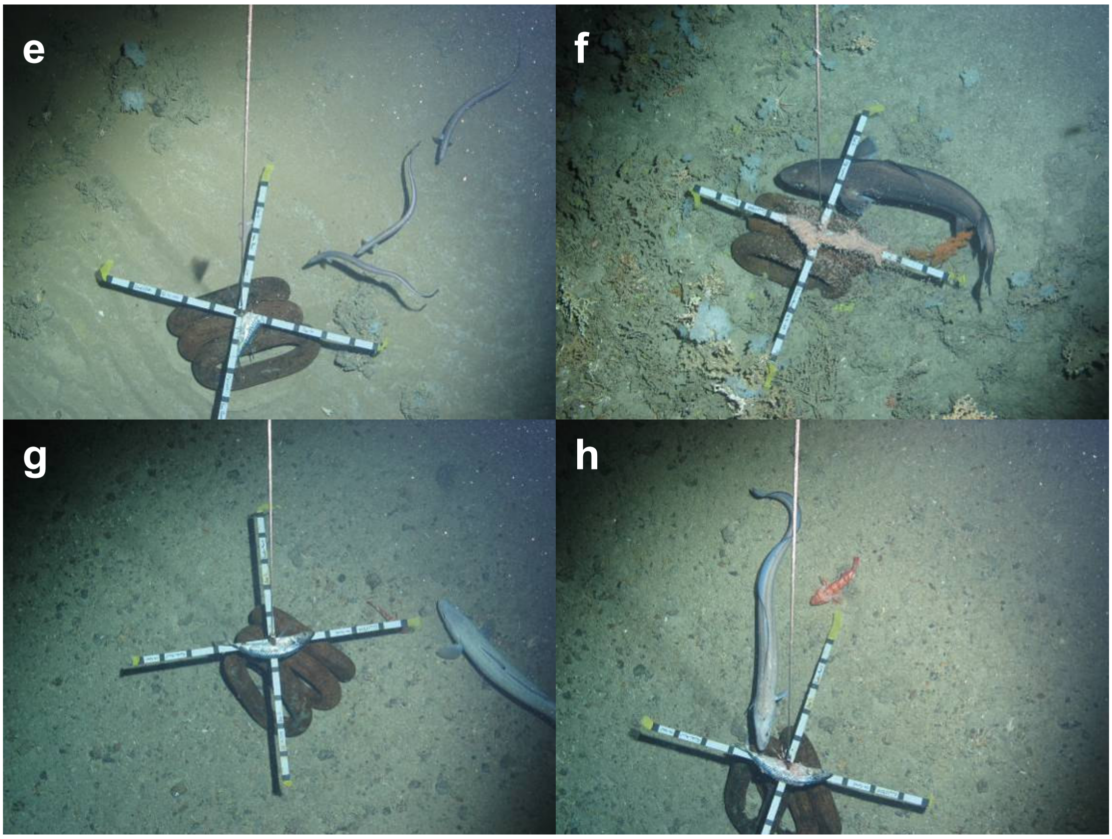


Fig.15. Examples of fish species seen attending the bait at coral sites: a) Common Mora (*Mora moro*), b) Greater Forkbeard (*Phycis blennoides*), c) Monkfish (*Lophius piscatorius*), d) Blackmouth catshark (*Galeus melastomus*). Examples of fish species seen attending the bait at non-coral sites: e) Kaup's Arrowtooth eel (*Synaphobranchus kaupii*), f) Leafscale gulper shark (*Centrophorus squamosus*). Examples of fish species only seen at the Poseidon Mound: g) Ling (*Molva molva*), h) Conger Eel (*Conger conger*) and Spiny Scorpionfish (*Trachyscorpia cristulata echinata*). The Scorpionfish was not unique to this site but appeared far more abundant.

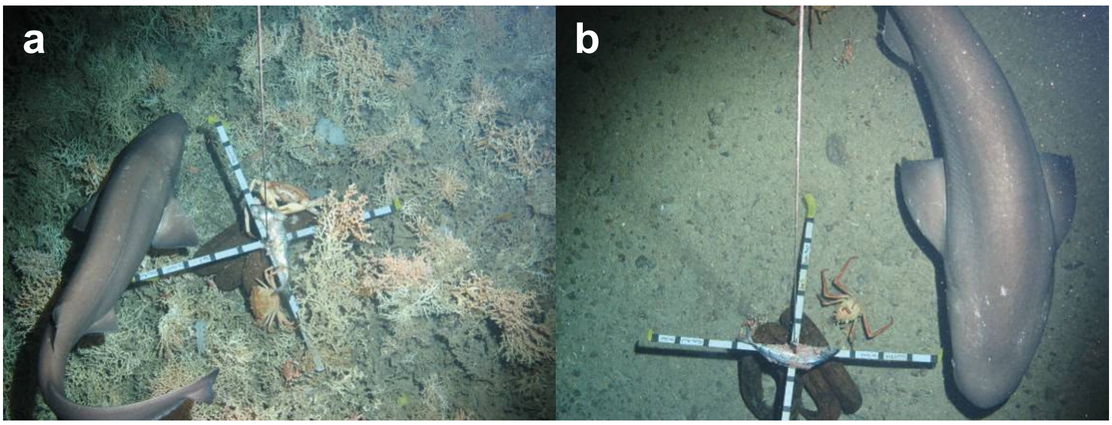


Fig. 16. Examples of Six Gill Sharks (*Hexanchus griseus*) seen attending the bait at both on (a) and off coral areas (b).

NIOZ lander baited experiments (I. van den Beld, M. Bergman)
The NIOZ lander with baited videocamera was deployed at approximately the same positions (Table 7) as the Aberdeen lander (Fig. 14 shows map approximate positions).

Table 7. NIOZ lander deployment positions.

Station	Area	Latitude	Longitude	Depth	Date	coral
3	Galway Mnd	51.45185	-11.76442	965	10/17 16:20	+
14	Off Galway Mnd	51.45187	-11.75312	786	10/18 19:50	-
23	Therese Mnd	51.42772	-11.77197	1183	10/20 19:58	+
33	Off Therese Mnd	51.42792	-11.78328	1024	10/21 20:15	-
41	Poseidon Mnd	51.45668	-11.69985	680	10/23 09:10	-

The video system was mounted so that camera1 pointed at the bait while camera2 pointed at the background. The program of the videosystem was limited by the max recording time of only 90 minutes. Not knowing when the first scavenger arrives, the program consisted of an almost continuous coverage of the first 40 min after bait exposure, followed by 3 sequences with increasingly longer pauses and shorter recording intervals. The timelapse sequences are shown in Table 8. All the video recordings with the digital camera and visible light were successful.

Table 8. Time lapse sequences of the NIOZ videosystem (90 min. max)

Sequence	Camera1	Camera2	Pause	Number	videotime
1	300s	15s	2s	8	42
2	45s	15s	240s	24	24
3	30s	15s	240s	13	10
4	15s	15s	1800s	30	15

Preliminary analysis of the results of the NIOZ lander deployments show principally the same patterns as with the Aberdeen lander, i.e. bait was first explored by invertebrates who also were the first - and usually the only ones - to eat from the bait (Table 9). Among the fish appearing near the bait *Mora moro* was the dominant species on the coral mounds and *Synaphobranchus kaupii* off the mounds.

A striking observation was made during the descent of the NIOZ lander to the top of Therese Mound, was a school of fish (species?) observed swarming over the life coral (Fig. 17). Remarkably, it took 44 minuted befor the fist fish (*Mora moro*) approached the bait after the lander had reached the bottom (Table 9). This observation could be significant for future attempts to assess fish abundance using near-bed video cameras. Possibly fish census around corals should be expanded with tethered cameras or ROV's.

Fig. 17. Left-hand panel: image taken just before landing; bright spots were later discovered to be fisheyes reflecting videolight. Right-hand panel: second image taken 2 s later revealing the source of the bright spots (see marked fish).

Table 9. Arrival times of fish and invertebrates derived from NIOZ lander deployments.

Stn	Date	Area	Fish	after min	Invertebrates	after min
3	18-Oct	off Galway Mnd			shrimp	4
					Amphipoda	7
			Synaphobranchus kaupii	8		
			Mora moro	8		
					Galatheidae indet.	20
					Decapoda indet.	180
					Gastropoda indet.	164
					Chaceon affinis	199
			Mora moro	228		
			Shark indet.	213		
17	19-Oct	Galway Mnd			*Bathynectes maravignae* #1	3
					Bathynectes maravignae #2	29
					Chaceon affinis	14
			Phycis blennoides	43		
			Mora moro	176		
			Shark	181		
					Amphipoda	187
			Lepidion?	220		
			Lophius picatorius	294		
			Helicolenus?	326		
28	21-Oct	Theresa Mnd	Indet.	0		
					Bathynectes maravignae #1	
					Bathynectes maravignae #2	3
					Bathynectes maravignae #3	38
			Mora moro	44		
					Paramola cuvieri #1	55
			Phycis blennoides	71		
			Helicolenus?	72		
			Shark indet.	114		
					Paramola cuvieri #2	119
			Lepideon	177		
					Amphipoda	162
36	22-Oct	off Theresa Mnd			Galatheidae indet.	0
					Cidaris cidaris	5
					Amphipoda	6
			Synaphobranchus kaupii	8		
					Bathynectes maravignae	12
					Paramola cuvieri #1	14
			Mora moro	42		
					Decapoda indet.	193
					Paramola cuvieri #2	171
			Shark indet.	205		
			Shark indet.	690		

Table 9. continued

46	23-Oct	Poseidon Mnd	*Lepideion*	18		
					Shrimp	20
					Bathynectes maravignae	45
			Phycis blennoides	67		
			Shark indet. (spotted)	78		
					Paramola cuvieri #1	113
			Mora moro	90		
					Paramola cuvieri #2	217
					Paramola cuvieri #3	227
			Helicolenus?	295		

During the cruise two new videosystems were tested: 1) a HighDef video (camera Sony HDR-CX6EK) with InfraRed (Led) plus photoflash 2) a Digital videosystem with 10h recording time on a harddisk. In some lander deployments on the Belgica Mounds the standard 90 min Digital Video system was combined with the HighDef video with IR illumination (Table 10). Tests showed that the sensitivity of the HighDef camera for the IR light was lower than anticipated, and the camera plus light source had to be placed nearer to the bait. Test of the flash and photo function of the HighDef camera were successful (see cover page)

Table 10. Deployments of NIOZ lander with baited videocamera plus configuration.

Stn	Area	End date	High Def Camera	Configuration
3	off Galway Mnd	18-Oct	no	
17	Galway Mnd	19-Oct	no	
28	Theresa Mnd	21-Oct	Yes	IR+Visible
36	off Theresa Mnd	22-Oct	Yes	IR+Visible
46	Poseidon Mnd	23-Oct	Yes	2* IR

4.1.7. Longterm records physical parameters and particle flux (G. Duineveld, M. Lavaleye, H. de Stigter)

Long-term data on the hydrographic setting of coral mounds (current, temperature, turbidity, fluorescence) and the particle flux will be collected during the 1 year deployment of the NIOZ Fish observatory at 784 m depth on top of Galway Mound (51^o 27.0972'N, 11^o 45.138'W). The FishObs carries a 12-vial sedimenttrap (Technicap PPS4/3) with HgCl preservation, an acoustic current meter with tilt and pressure sensors (Nortek Aquadopp), and a combined fluoro-turbidity sensor (Wetlabs FLNTU).

During the cruise several short-term near-bed current, temperature and turbidity measurements were made with CTD and Nortek Aquadopp mounted on the lander carrying the baited videosystem. Admittedly being very short records, relations could be seen between for instance turbidity and current speed on top of the mound possibly indicative for resuspension (Fig. 18).

A BOBO lander deployed for 8,5 days at 898 m depth on the plain area E of Galway Mound recorded strong bottom currents displaying a diurnal tidal cycle in speed and direction. Average current speed at 100 cm above bottom was 34 cm s^{-1} during the first four days of the deployment, whereas during spring tide peak speeds of nearly 100 cm s^{-1} were attained. Residual current was 18 cm s^{-1} directed to NNE. Increases in backscatter corresponding with intervals of high current speed indicate periodic resuspension of bottom sediment. During part of the deployment period particle concentrations were below the critical level for ADCP current measurements.

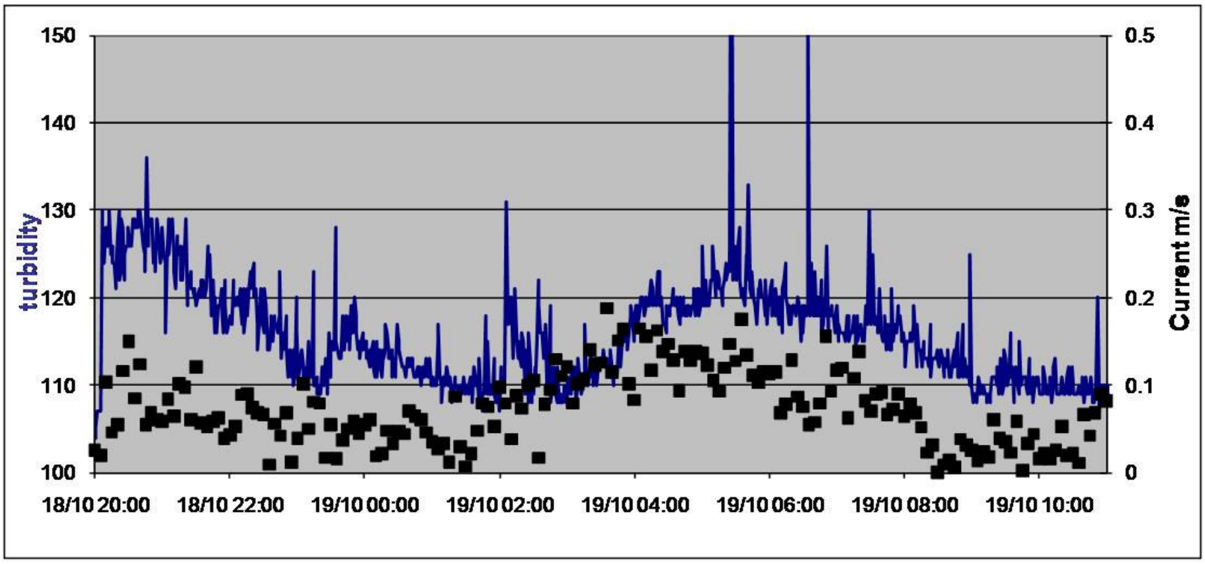


Fig. 18. Current speed (■) and turbidity (—) measured on top of Galway Mound during short deployments baited videosystem.

4.2. Whittard Canyon

4.2.1. Longterm data on current and particle flux at mouth and fan (H. de Stigter)

During the cruise two BOBO landers were prepared for deployment near the head and the mouth of Whittard canyon (Fig. 19). Shortly after the first deployment at 985 m depth near the head of the westernmost canyon branch, the lander became adrift due to loss of its ballast. The lander was retrieved and redeployed at 1479 m. The second lander was deployed at 4186 m depth near the canyon mouth but later appeared to have lost ballast during descent and also became adrift. The lander was salvaged from a beach in Brittany 1 month after the cruise.

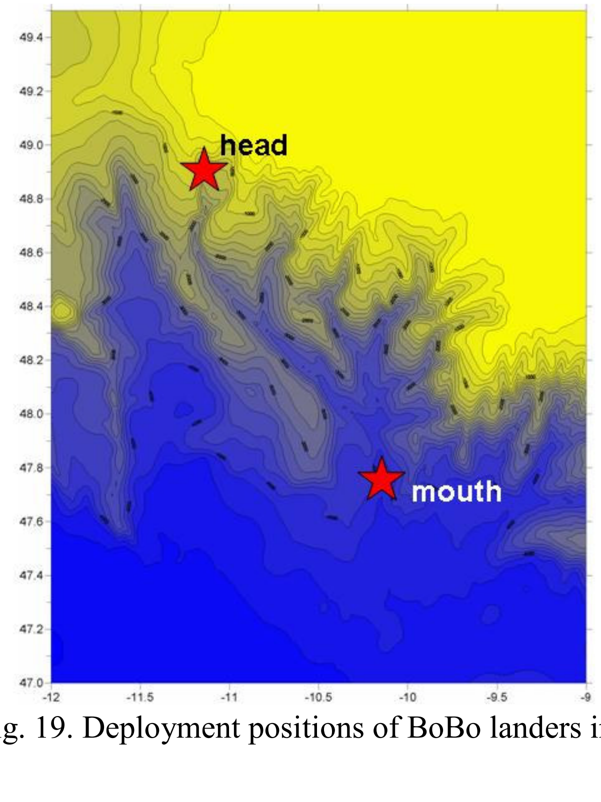


Fig. 19. Deployment positions of BoBo landers in the Whittard Canyon

4.2.2. Video records of Whittard canyon

Due to the bad weather conditions at the time of our visit to the Whittard, no video records could be made with the tethered videosystem.

4.3. Galicia Bank

4.3.1. Mooring pick-up

During the 2008 BIOFUN cruise 64PE296 two moorings were deployed to measure organic matter flux at 1900 and 3000 m respectively. The moorings were equipped with two Technicap PPS4/3 sedimenttraps, a FSI ™ 3dACM current meter, and two custom datalogger with OBS and fluorometer (Seapoint™). The moorings were successfully retrieved although both had lost the top floatation with satellite buoy, possibly through corrosion. Fig. 20 below shows the uncorrected OBS and current meter data retrieved from the moorings, suggesting a significant differences between the two stations in backscatter events and current speed.

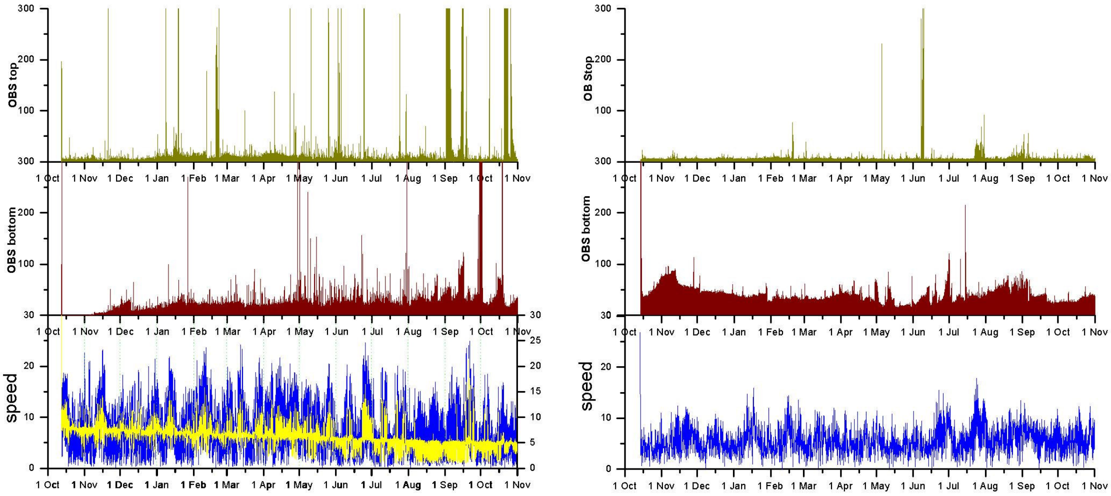


Fig. 20. Left-hand: raw data from mooring at 1900 m waterdepth, from top to bottom optical backscatter at 100mab, at 10 mab and current speed (blue) plus tilt (yellow) at 10 mab. Right-hand: similar from mooring at 3000 m waterdepth.

4.3.2. Video records seafloor

Due to the continued adverse weather conditions over the Whittard Canyon preventing any further work, shiptime and seastate near Galicia Bank permitted us to fill the missing video records of the seafloor at the 1900 and 3000 m stations (Fig. 21), and to deploy the ALBEX and Aberdeen landers for an additional baited experiment.

In the 2008 BIOFUN cruise, a baited lander experiment was performed whereby vegetable food (spinach) was offered instead of mackerel. Surprisingly this elicited a vigorous reaction by macrourid fish who ingested the spinach. Because the experiment contained two artificial conditions i.e. visible light plus the lander frame, we repeated the experiment in this cruise using the Aberdeen photolander which floats above the seafloor. The outcome was similar as in 2008, i.e. macrourids were seen to devour the bait after they had bitten through the nylon netting which contained the spinach (Fig. 22).

A slighty different experiment with vegetable bait was done with the ALBEX lander in cruise 64PE313. Instead of spinach, the videolander carried a carousel with a suspension of unicellular algae. After this suspension was dropped on the seafloor, fish were filmed ingestion the flocs. This strongly suggests that deep-sea fish may feed on the phytodetritus dumps which regularly occur on the abyss in the North East Atlantic (Billet et al. 1983).

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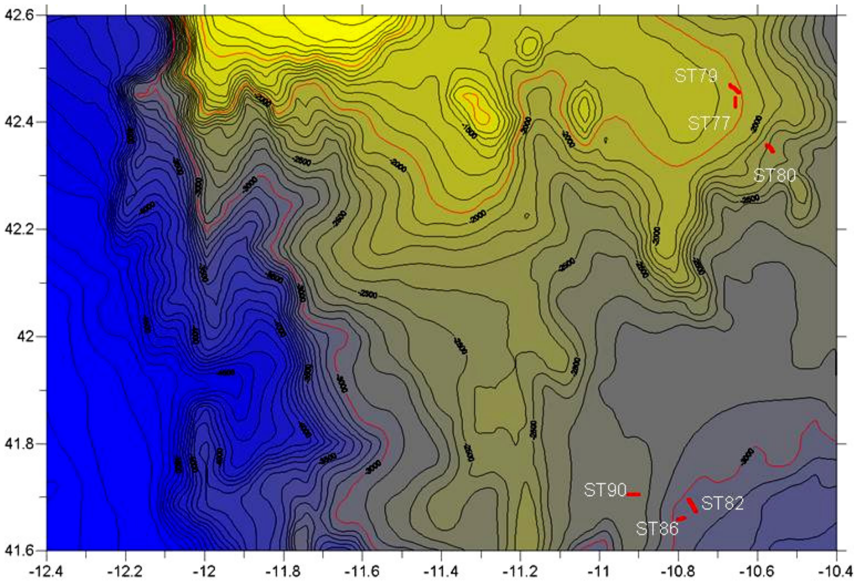

Fig. 21. Positions of videosurveys at 1900 and 3000m waterdepth at Galicia Bank.

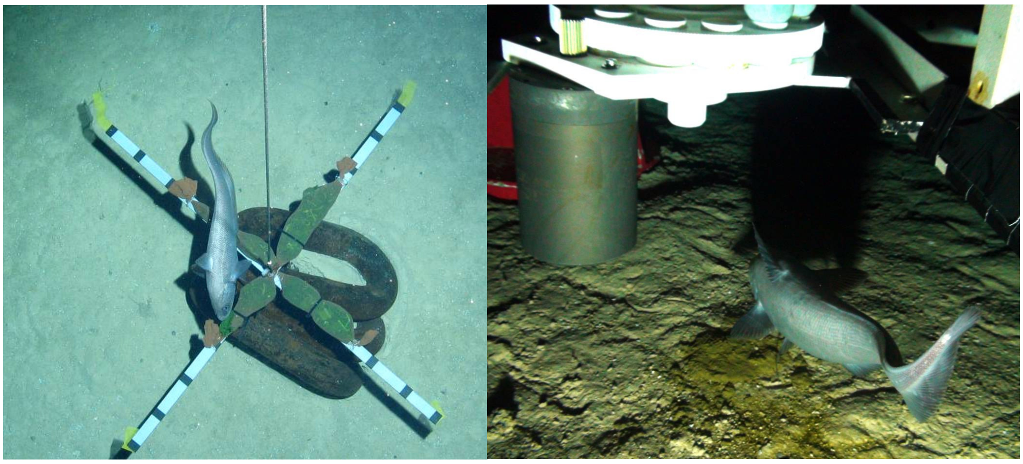

Fig. 22. Left-hand: Macrourid opening the netting which contains the spinach. Right-hand: prior to ingesting a Macrourid inspects the algae suspension that has been released from the lander.

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6. ACKNOWLEDGEMENTS

Shiptime for cruise 64PE313 was provided by the Royal Netherlands Institute for Sea Research. Several participants of the cruise were funded by either the EU-HERMIONE, CoralFISH or BIOFUN programs, viz. M. Lavaleye (CoralFISH contract 213144 Call ENV-2007-O1), H. DeStigter (HERMIONE contract 226354), R. Jeffreys (NWO 855.01.131). We are grateful to Dr. Eamonn Kelly from the Irish Wildlife Services for her help in acquiring permission to work in the Belgica Mound Province. Dr. Veerle Huvenne of the National Oceanography Centre Southampton provided detailed bathymetric maps of Whittard Canyon which served for selecting BOBO lander sites. We thank captain Bert Puiman and crew of the RV Pelagia for their assistance during the cruise. NIOZ marine research facilities (MRT) and associated departments (MTC, MTM, MTE, AA and DMG) provided help during preparations and execution of the cruise.

APPENDIX 1

SCIENTIFIC PARTY AND CREW OF THE CRUISE 64PE313

Scientific Party

No	Name	Institute and profession
1	Gerard Duineveld	Chief scientist, NIOZ biologist
2	Marc Lavaleye	NIOZ -biologist
3	Magda Bergman	NIOZ -biologist
4	Henko de Stigter	NIOZ-geologist
5	Leon Wuis	NIOZ-technician
6	Lorendz Boom	NIOZ-technician
7	Bob Koster	NIOZ-electrotechnician
8	Rachel Jeffreys	NIOZ-biologist
9	Inge van den Beld	Research assistant NIOZ
10	Thalia Whatmough	Research assitant NIOZ
11	Nanne van Hoytema	Student-WUR
12	James Keating	Observer-Irish Marine Institute
13	Thom Linley	Research assitant OceanLab

List of the crew

No	Name	Rank
1	Bert Puyman	Captain
2	Erwin Becks	First officer
3	Mayke van den Brande	Second officer
4	Klaas Kikkert	Chief engineer
5	Marcel de Kleine	Second engineer
6	Cor Stevens	Ships technician
7	Martin de Vries	Able bodied
8	Arie Jan Plug	Ships technician
9	Jose Vitoria	Able bodied
10	Hans van der Linde	Cook
11	Fred Hymstra	Assistant cook

APPENDIX 2

WINKLER METHOD

The Winkler procedure was as follows. Glass sample bottles with a pre-determined volume are filled to overflowing from the incubation cores/chambers to ensure no air bubbles are in the sample. Samples were fixed as soon as they have been collected with 0.5 ml of manganese chloride solution followed by 0.5 ml of alkaline iodide solution (sodium hydroxide and sodium iodide). Each sample bottle was shaken vigorously to increase the efficiency of the oxidation of $Mn(OH)_2$. When all of the samples were collected and fixed, they were stored submersed in cold water in dim light prior to analysis with a spectrophotometer.The samples were analysed after ~ 1 hour, to allow enough time for the oxidation of $Mn(OH)_2$. 0.5 ml of sulphuric acid is added to the sample and a stirrer bar is placed into the bottle. The bottle is then placed on a magnetic stirrer and stirred until all the flocculents from the precipitation of $Mn(OH)_2$ have disappeared (at the moment the amount of O2 is the same as the amount of iodine which is detected by the spectrophotometer at 456nm). Prior to sample analysis the spectrophotometer is calibrated (set to zero) with Millipore water. Each sample is measured twice. After the addition of H_2SO_4 and subsequent stirring the sample is placed on the spectrophotometer magnetic stirrer and the red tube is placed in the sample: this draws the sample into a cell (via a pump) where its wavelength is measured, a reading appears on the spectrophotometer. The system is now cleaned with Millipore water before the second reading is taken from the sample. After a second reading is obtained a few drops of saturated sulphide solution are added to the sample until the bottle turns clear, this solution is now run through the spectrophotometer and a reading is obtained. In this instance the iodine has precipitated to the bottom of the bottle and the turbidity of the water is measured. The concentration of oxygen in the sample is calculated by the following equation:

$$[O_2] = \frac{(Esamp - Eturb))}{k * \frac{(Vb + Vs)}{(Vb - Vr)}} - 1.05 - cb$$

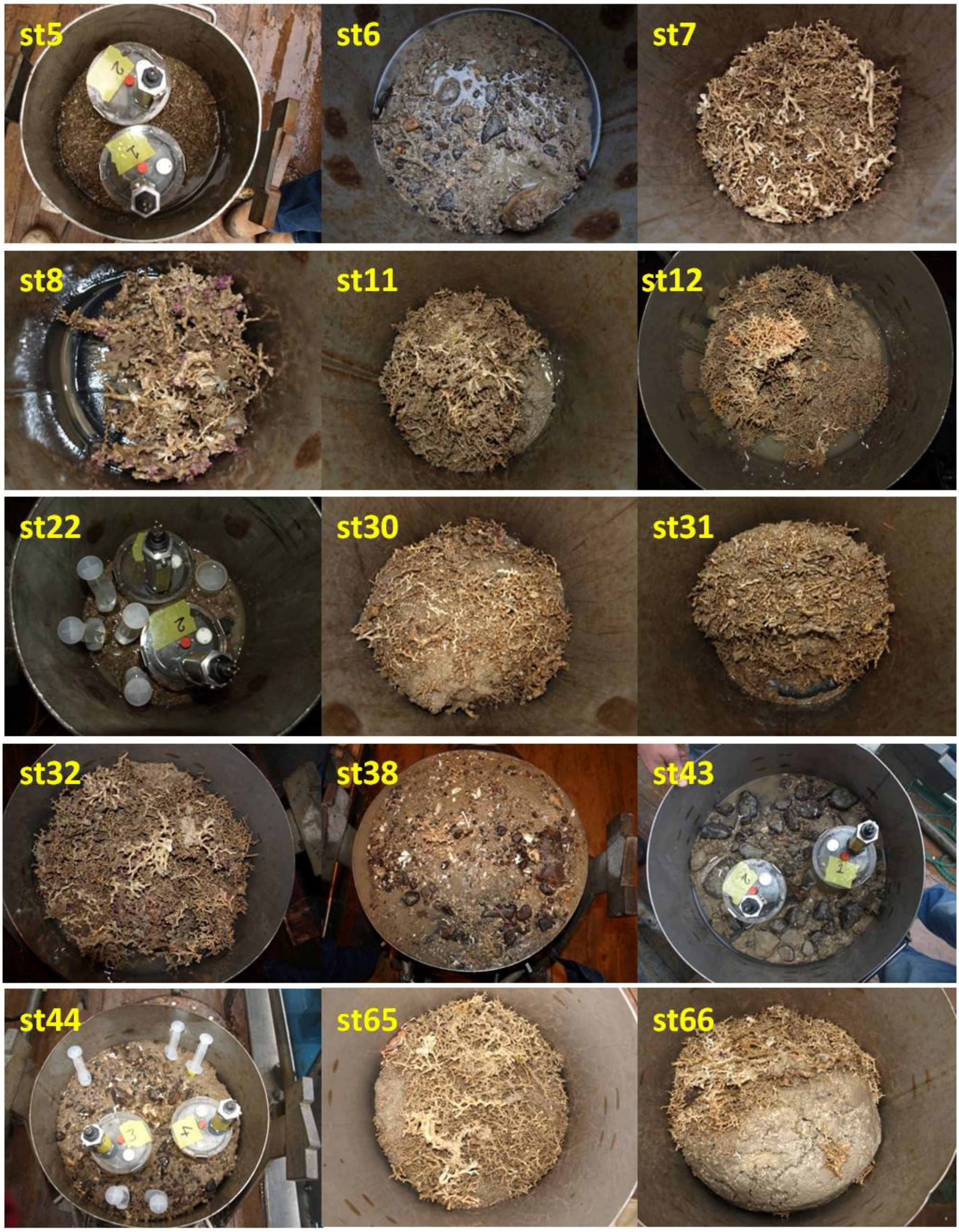
Where, *k* is a constant, *Vb* is the volume of the bottle, *Vs* is the volume of the acid added, *Vr* is the volume of MnCl2 and NaOH/NaI solution. *Esamp* is the reading for the sample obtained from the spectrophotometer and *Eturb* is the reading obtained from the spectrophotometer after the addition of the saturated sulphide solution to the sample and *cb* is the chemical blank obtained from the Millipore water which is 0. Oxygen uptake rates were calculated from the following equation:

$$O_2 = DO_2 x V/T*(1/SA)$$

where: O_2 is oxygen uptake rate µmol m^{-2} h^{-1}; DO_2 is the difference in oxygen at the start and end of the incubation µmol L^{-1}; V is the volume of overlying surface water; T is the duration of the experiment in hours; SA is the surface area of the core in m^{-2}.

APPENDIX 3

PHOTOGRAPHS OF BOXCORE SAMPLES



APPENDIX 4

LIST OF SPECIES COLLECTED FOR STABLE ISOTOPES ANALYSIS

Station	Depth (m)	Latitude	Longitude	Species	# ind.	Gear
10	932	51.45602	-11.74373	Salps	4	Abdn lander
11	851	51.45493	-11.75287	Orange gorgonian	1	Box core
				Eunice	3	
				Gastropod	2	
				Munida	1	
				Anemone (burrowing)	1	
				Gorgonians	Few	
7	797	51.45438	-11.7532	Shrimp (big claws)	1	Box core
				Hesionidae	1	
				Fish	1	
				Lophelia	Pieces	
				Anemone	2	
				Hiatella	1	
				Gorgonians	lots	
				Eunice	1	
				Dorynchus thomsoni	1	
				Polynoidae	2	
8	826	51.45418	-11.75317	Aphrocallistes	1	Box core
				Pale gorgonian	lots	
				glass sponge	2	
				Purple gorgonian	lots	
				Soft sponge	2	
				Lophelia	2	
				Hiatella	2	
				Desmophyllum	1	
				Ophiuroid	3	
				Gastropod	2	
				orange gorgonian	1	
				Hesionidae	9	
				Amphipoda	1	
20	929	51.45565	-11.74162	Salp	1	CTD
32	836	51.4544	-11.75335	Calliostoma	1	Box core
				Bathynectus	1	
				Glass sponge	1	
				Bivalves	2	
62& 63	100 & 200	51.42828	-11.77173	Plankton		Plankton tows
65	786	51.45157	-11.75252	Glass sponge	1	
				Bathynectus	1	
				Polynoidae	1	
				Dorynchus thomsoni	1	
16	868	51.4306	-11.77225	Madrepora	Pieces	Beam Trawl
				Lophelia	Pieces	
				Glass sponge	1	
				Hydroid	2	
				Desmophyllum	Lots	
				Munida	2	
				Munidopsis	6	
				Hiatella	lots	
				Bryozoans	lots	
				Pandalus	2	
				Ophiuroid	lots	
				Eunice	5	
				Soft sponge	3	

Station	Depth (m)	Latitude	Longitude	Species	# ind.	Gear
16	868	51.4306	-11.77225	Bathynectus	3	Beam Trawl
				Echinus	3	
				Fish	1	
				Hesionidae	5	
				Cidaris	1	
				Psolus	1	
				Amphipoda	1	
				Gorgonians	Lots	
				Black coral	Lots	
				Anthomastus	3	
				yellow sponge	4	
				Orange anemone	3	
				Spiral black coral	3	
				Spongosorites	2	
				Polynoidae	3	
				Aphrocallistes	few	
67	933	51.4568	-11.7420	Madrepora	3	Beam Trawl
				Lophelia	3	
				Asteroidea	9	
				Octopus	2	
				Oreo	1	
				Grenadire	3	
				Lepidion	4	
				Mora	1	
				Brosme	5	
				Gaidropsaurus	2	
				Actinauge	1	
				Gorgonians	Lots	
				Black coral	Lots	
				Spiral black coral	Lots	
				Hydroids	Lots	
				Cidaris	Lots	
				Sponges	Lots	
				Bathynectus	Lots	
				Desmophyllum	3	
				Munidopsis	1	
				Munida	Lots	
				Eunice	Lots	
				Gastropoda	Few	
				Pandalus	4	
				Anthomastus	2	
				Scalpellum	few	

APPENDIX 5

CRUISE BLOG

16-17 October 2009 - Today marked our first day of work on the HERMIONE/CoralFISH cruise; these overlapping projects focus on areas of biological wealth. Either high numbers of species or rare species associated with a distinct area. These areas have been referred to as ecosystem hotspots and are sites of interest from both biological and conservational standpoints. The roll that they play must first be understood before they can be effectively preserved.

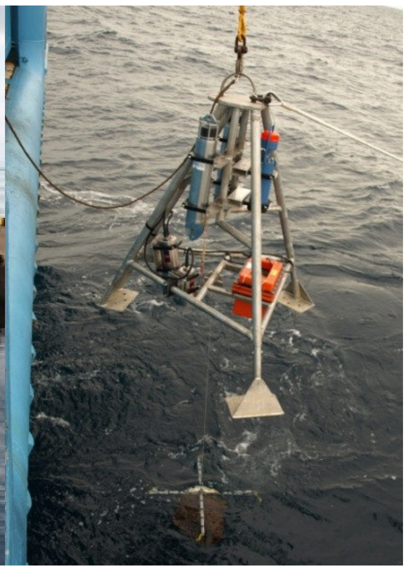
We sailed from Galway at 2pm yesterday and arrived at the Belgica Mounds in the early hours of this morning. This area was studied last year and found to be an area rich in cold water corals. The footage that was captured proved popular with the local media and public interest was captured in Ireland's previously unknown coral reef. Once on site we conducted a quick multi-beam survey of the area, this is essentially bouncing sound off the seabed and using the echo to form a three dimensional map of the area. The undersea mountains (mounds) of this area are small and distinct. To effectively place our equipment we first needed an accurate map of the area to work from. Once that was completed we lowered the CTD, this stands for conductivity (from which salinity can be calculated), temperature and depth. These factors are some of the most basic environmental conditions but also some of the most significant when it comes to what organisms are found in an area. The CTD is also equipped with a rosary of bottles. This is a ring of 24 sampling bottles that can be triggered at desired depths to bring water back from that layer. This water can then be subjected to more detailed tests such as nutrient content and amount of particles suspended within the water.

Once the CTD was complete I had my first opportunity to launch the lander that I have been working on over the last few months. This will be used to compare the megafauna (large animals like fish and crabs) both on and off the coral mounds in the hope of identifying how these communities differ. The lander is basically a time-laps camera looking down at some bate. A CTD and current metre is also attached. The current metre lets us to estimate how far the smell of the bait has spread and, coupled with how many fish are seen in the image, allows us to make estimates of the number of fish in the area. Once the lander has collected this data, taking something between 12 and 24 hours, it is remotely commanded to release its ballast and surface.

Deploying a piece of equipment in this way for the first time can be a very stressful experience. You have to trust that you remembered to do everything right and then release it to fall to the seabed. Did I calculate the ballast and buoyancy correctly? Did I start everything recording? Did I close all of the watertight housing properly? Will the ballast hold? All of this is going to go through my mind tonight and it won't ease until I have everything back on board and checked over, only to do it all again some hours later.

My worried were eased by a very smooth deployment. The *Pelagia* crew are very experienced with this sort of deployment and I was happy to relax and trust the equipment to people far more experienced than me. Later in the afternoon saw the deployment of the BoBo lander and the Albex Video lander. Deploying gear like this as soon as possible is not only time effective but also clears deck space for the processing of samples brought up from the bottom. The hope for tomorrow is to recover two of these landers and quickly re-deploy them. There is some bad weather coming our way and they are actually safer on the seabed collecting data than up here feeling sick with us! (Thom Linley, OceanLab Aberdeen).

Leaving Galway harbour through its narrow entrance.



The Aberdeen baited lander.

Monday 19th October - 51.25.96N, 11.46.40W Belgica Mounds. We have had the luck of the draw with the weather for the first few days; but on this, day 4 of the CORALFISH/HERMIONE survey, the Atlantic swell has won. With the Albex and Aberdeen 'landers' already in the water from last night and the video boxcore being repaired; first order of the day was to deploy our benthic trawl. The relatively small beam was expertly guided to the bottom by the crew in 1000m. The plan was to collect samples off the coral mounds. With the gear still on its long journey to the bottom, we were again visited by a pod of pilot whales ('griend' in Dutch), with their entourage of associated gannets and petrels. The best estimate was 5-10 individuals, with calves present. These small black 'torpedo-like' whales can grow to 6m in length and are easily identified by the well rounded, broad-based dorsal fin. This was the 4th visit in the past few days and with good photos, we may be able to do some photo ID to establish if it is the same group. With one final 'spy-hop', the whales went on their way, and it was time to recover the trawl. Scientists and crew alike gathered on deck to get a glimpse of the diverse life in the cod end. The trawl was good, and contained Lophelia spp, Madrepora spp, various solitary corals and some interesting black-corals. All hands helped separate the live material for the biologists. Squat lobsters, deep sea crabs, polychaetes, sponges and anemones will all provide valuable stable isotope information. The trawl had travelled over sharp coral, and without rollers, tears to the net occurred; a minor repair for the experienced crew! The swell increased to at least force 5 and it was decided to recover the ALBEX 'lander'. This was completed with the minimum of fuss, albeit without its mackerel bait. With the swell constantly increasing, Thom decided his Aberdeen lander would be safer on the mound and will recover it when the weather improves. 'Down-time' due to the weather gave everyone opportunity to sort through their data. Thom has put together an excellent time lapse video from his first deployment and he was very excited to capture an image of a large Monkfish, possibly over 1m in width. Rachel and her team have been busy setting up and monitoring their coral incubations as well as sorting through the remaining samples from the trawl. The weather forecast is not good, and we may see a southerly F8-9 overnight. Everything on deck is secured, and the safest place to be is inside. All we can do now is keep our head to the wind, moving at only a few knots and ride out the storm. As we say in Ireland, today is "a day for the high stool" (James Keating, Observer Irish Marine Institute).

A living black coral (Antipatharia).

Lander with HD camera to be deployed.

20 October 2009- For most people, the day started at 6:30 when the ship was lifted by a very big wave. Things were flying through the cabins. Not only cabins turned into a mess, also the galley, where the cook has started preparing breakfast. Some expensive measuring apparatus, like a current meter, fell down from the table, even if they were secured. A big tank full of water and live animal samples from the bottom was flipped over; all – but two – samples were gone. This was not a very good start of the day. Because the swelling of the waves was very high, we could not pick-up Thom's lander, which is still standing on the bottom. We started doing a CTD-

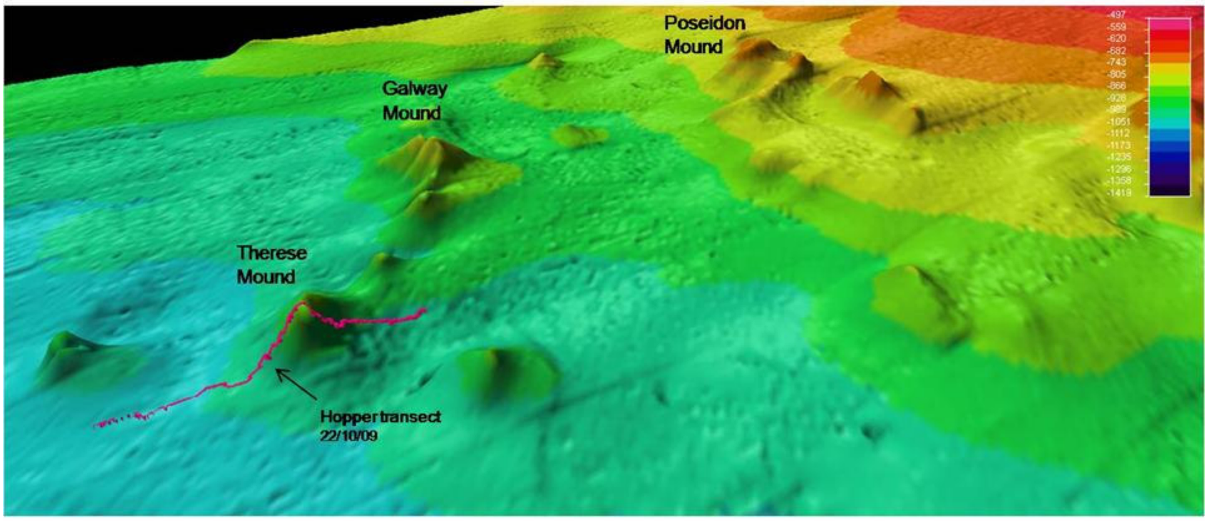
transect. Five positions were taken in a line over Galway mound. During each CTD, which measures density, salinity and temperature (among other), bottles of the Rosette samples were filled with water of two to four different depth – at the bottom and at the surface and sometimes at 600 and 800 meter depth. The samples waters are filtrated and used to determine lipids, the amount of carbon and nitrogen, algae pigments and nutrients, such as silicate. After the CTD, which ended somewhere in the afternoon, a small boxcore was taken. There was not much in this boxcore, mostly sand, some pebbles and some broken shells. Rachel took some cores for measuring oxygen.
After dinner, the ALBEX lander was deployed, that was prepared during the CTDs. A current meter, a datalogger (fluorescence and OBS) and a baited camera (with mackerel) was attached to the lander. The brand new HD-camera was also attached to the lander to test if the camera and the lights – both visible (white) and infrared light – are working as they should. At the end, when we leave the Belgica mounds area, this camera will be attached to an ALBEX lander for a year-round deployment.
The weather was not that bad. The wind was mostly around wind force 5 and started to increase during the afternoon and evening. Sometimes it rained, which gave beautiful rainbows through the sky. The day finished with a nice drink in the messroom (Inge van den Beld, NIOZ**)**

21 October 2009-Today is Rachel's birthday and we were welcomed this morning at breakfast by balloons and lines of flags. Apparently the crew had needed some very feminine decorations in the past and these came to good use today. After breakfast, the "Aberdeen lander" was finally recovered, now that the waves had shrunk to an acceptable level. After examination, it turned out that everything had worked as it should have and only the battery of the sensors had died due to the long bottom-time. After a quick glance through the pictures, Thom said that there were loads of fishes on them "it is really busy down there". The morning coffee break was enlivened by some very nice gifts for Rachel and two beautiful pies for all after a more that decently sung birthday song. Today was mostly about boxcores. These stamp a core out of the sea floor which is then sealed and hauled up to the ship, or at least, this is the plan. The first two boxcores came up without having triggered and a third came up closed, but it turned out to contain only water. Things were not looking good for the activities planned later today as the boxcoring was taking up more and more time. The next two boxcores came up with a flipped sample and these were sieved to collect all animals. At this point it was decided to move up to the big boxcore to see whether this would have a better result. At six o'clock in the afternoon, the big boxcore came back up and we went for dinner. When we came back, it was opened and it turned out to be a great sample, loads of live material to replace the samples lost when their tank turned over, and a good sample for respiration measurements of the top layer of the soil. These respiration measurements are also performed with good samples of live corals and segments of the rubble below the coral with all the little animals included. In these incubations, the oxygen depletion of the water is measured to get an estimate of the animals' metabolism over time.

A black coral in an incubation chamber.

We were visited today by some common dolphins which came to play with the boat's waves, but they left in a hurry when we arrived on station. The ALBEX lander was also picked up today and the two cameras showed some really nice footage. Fishes, big crabs, sharks and even something looking a whole lot like an octopus (which turned out to be a monkfish, but it still looked good) were massing around the lander and were trying to get some of the mackerel attached to it. The HD camera, attached to the lander, turned out to have some focus problems and the lander was deployed again after dinner to try and get the camera to work properly before the year-long deployment soon, the "Aberdeen lander was also deployed again to get more footage from the deep (Nanne van Hoytema, Wageningen University)

22 October 2009-I am in the CTD lab. Looking out the porthole ahead of me there is little reference of our location or direction other than the angle of the rolling waves, and the haze of sun peeking through the clouds. On my laptop screen however, I have quite a different sense of orientation. Fledermaus is running with a colourful 3D picture of the seafloor, which stretches out 900m beneath us. A second laptop beside me is hooked up to a GPS and is mapping our position and the track of the ship as we cross over a prominent feature rising up from the seabed: Theresa mound. It is about 100m tall and below in the dry lab, Marc and Bob and a few other by-standers are checking her out! They are watching video images that are currently being collected by the hopper camera, 800m beneath the waves.
Over the past few days, a lot of hard work was put into trying to get the online video working with the usual deep-sea cable. After a few failed attempts due to suspected broken wires in the cable, today Bob managed to get the system working on the CTD cable. The images from the hopper can be used in a variety of ways. It can be used for habitat-mapping purposes to determine the primary facies of the survey track, we can see how much live coral and coral rubble is where, describe the macrofauna assemblage of the area, or, importantly for Coralfish, estimate fish abundance.
The video diary also started today. We will try and take a few nice clips to edit into a little film about this research cruise. I visited Rachel in the container earlier, and filmed the Lophelia in the incubation chambers which were collected from last night's boxcore from Galway mound. They were doing well; the polyps were out, although some oxygen-deprived black corals from the same boxcore apparently didn't make it through the night. The hopper is up now, and on deck preparations are being made to take a boxcore before dinner. The Albex and Aberdeen landers that were collected today will be deployed again after dinner if all goes according to plan. 19:00. The boxcore from the plane to the East of Galway mound yielded a mammoth overflowing pile of mud with a sprinkling of coral rubble on top. The top layer was sieved but the emptying of the sticky clay-filled barrel led to an impromptu artistic pottery session. Nanne, Inge, Tom, James and Henko lined up the skulls, faces and trophies they had created along the ship's starboard barrier, with a backdrop of the dark sea.



Three dimensional map of the research area with the video transect made on 22 Octobre.

23 October 2009- Rainbow day. We have the typical Irish weather. Short and long showers beat the ship. When they are gone there are always dark clouds of rain in the distance. Mixed with a bit of sun, these produce lots of rainbows during the day. The ALBEX lander has been prepared for another deployment. With the small crane on the hind deck it is easily put over the railing into the water, and than unleashed. In a free fall it sinks to 900m depth where it lands softly on the seafloor. A time lapse video will record which animals are attracted by the mackerel bait. When the lander is on the loose, the ship is free to do other things. We use the time to survey the seafloor with two camera systems which are attached to the so called "hopper frame". The frame is lowered to the seafloor on a steel cable. The normal digital camera is connected online with the ship through the copper wire inside the steel cable. The video footage of the camera is stored on its own harddisk, but every second a low resolution picture is also send through the cable to the ship. I am sitting behind the monitor peering at the incoming seafloor pictures, making rough notes about the presence of corals and fish. Next to me José Vitoria is sitting with a box with joy sticks. He controls the winch and tries to keep the camera at a distance of 2-3 m from the seafloor. As the ship is slowly drifting over Galway Mound and drags the camera along, it is not an easy task for José to keep the hopper at the right distance, because the pictures come with some delay and it is difficult to predict if the bottom is going down or up. He has some help, however, from the two lasers that are also attached to the hopper. The two laser beams are 30 cm apart and parallel to each other, and show as 2 green dots on the pictures. If the hopper is coming closer to the bottom the distance between the 2 laser points becomes optically larger. So José eyes are fixed at these two moving green dots. A hopper of two hours can therefore be very tiring for the eyes! But the result is rewarding. We see lots of blue-white fingerlike sponges, lots of orange corals, carrier crabs holding a piece of coral above their carapace for protection, and some monkfishes. The funniest moment is when a shark suddenly moves in and attacks one of the laser dots. After lunch we do two boxcores, which means taken undisturbed bottom samples. Both are successful, and come from the area between the coralmounds and the continental slope. The surface of one of the cores is literally covered with so called dropstones. This is not because they have a black colour (in Dutch "drop" is a very popular black salt-sweet liquorice), but because they were carried away by icebergs long ago from northern countries to be "dropped" here when the iceberg melted away. We end the day by recovering two landers and doing a hopper transect over the Poseidon Mound.

Boxcore with surface covered with dropstones.

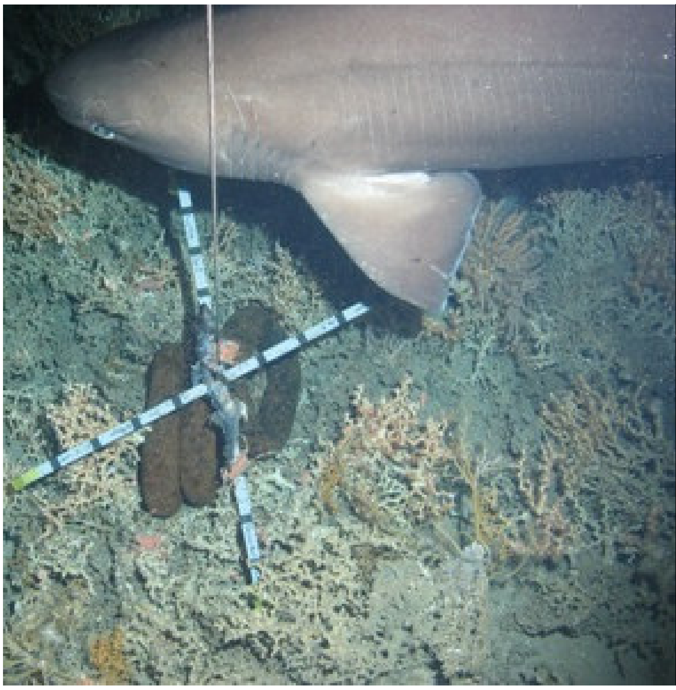
Oreo (*Neocyttus helgae*), a rare fish caught in our trawl.

26 October 2009-Today is the last working day of the CORALFISH portion of this cruise and a very busy day it turned out to be too. We had to recover all of the landers that were currently in the water, this included both Henko's and Thom's landers. A hopper-camera and box core was also on the program for today. But for me there were two main tasks to complete.

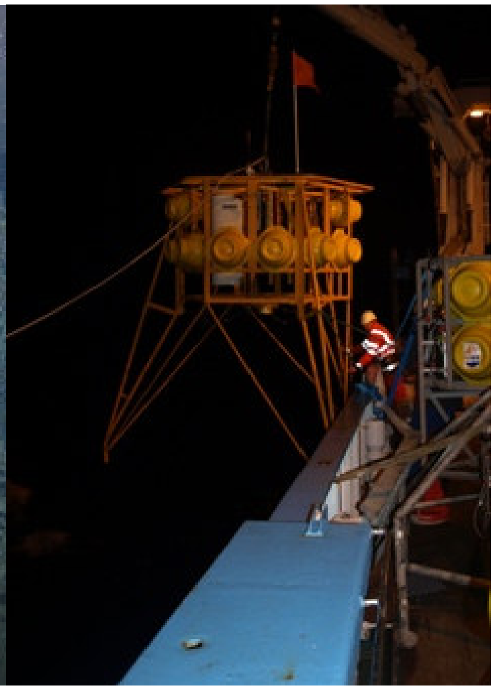
The first task was to complete our collection of animals and samples for food web analysis. Nanne has spent the last few months at NIOZ trying to piece together the food webs of various different coldwater coral ecosystems. Working out the food webs of these systems is important if we are to understand them and manage/protect them appropriately. In order to do this Nanne will measure the stable isotope ratios of the food sources e.g. sediments, plankton and organic material in the water column and the ratios of the tissues of the consumers (animals) we collect from the coral framework. We will measure the isotope ratios of carbon and nitrogen and these increase by about 1 and 3 units, respectively, in a food chain from food source to consumer. In simple terms we can see through these measurements, that 'you are what you eat'!

So in order to finish our collection we needed to take a plankton tow using a vertical net, we did one tow at 100 m and another at 200 m below the surface of the water. In these tows we found small crustaceans called copepods and a few jellyfish. But one of the most exciting parts of the day had to be the beam trawl which we used to collect the animals living near the live coral. We carried out the trawl between two coral mounds in order to preserve the living coral on top of the mounds. When the net came back up to the surface we could see that it was bulging with a huge catch. Most of the catch included 'coral rubble', large pieces of dead coral but we could see on the top of this some very large fish. After spending some time searching through the rubble we found some very nice animals, these included: springy spiral black coral, a few rather fat sea stars (we think some of these eat the corals), lots of squat lobsters, anemones, Bathynectus, a crab that we have been observing in the videos, a carrier crab…these have also been seen in the videos carry sponges or corals with their hind

legs, lots of Eunice these are polychaete worms that build tubes through the coral framework, Cidaris a pencil urchin (its spines look like pencils) and a couple of octopi. The fish that we caught included: rat tails, a Mora, Lepidion, Brosme, Gaidropsaurus and a very unusual diamond shaped fish called an Oreo (see the photograph) which has only been reported twice before. Once we sorted through the catch we bagged up the samples and put them in the freezer ready for Nanne to analyse back in the Netherlands.
The final task of the day was to send away the new NIOZ lander 'Fish observatory'. For most of the day we had been busy preparing this lander, which was deployed in amongst the coral. The main task of this lander is to observe the fish living near the corals over the course of one year. In order to do this a time-lapse bait system was attached to the lander which will release a bait (sardines) every 20 days in order to attract fish so that they may be recorded on the video cameras. Also attached to the lander are a current meter, a fluorometer and a sediment trap, which, will collect the particles sinking through the water for each month of the year; this will enable us to estimate how much food is available to the corals. So, we will wait with baited breath for the cruise next year to retrieve the lander and to see the first long-term observations of fish living in cold water coral systems (Rachel Jeffreys, NIOZ).



A six gilled shark visiting the bait of the Aberdeen lander.



The BOBO lander deployed in the night**.**

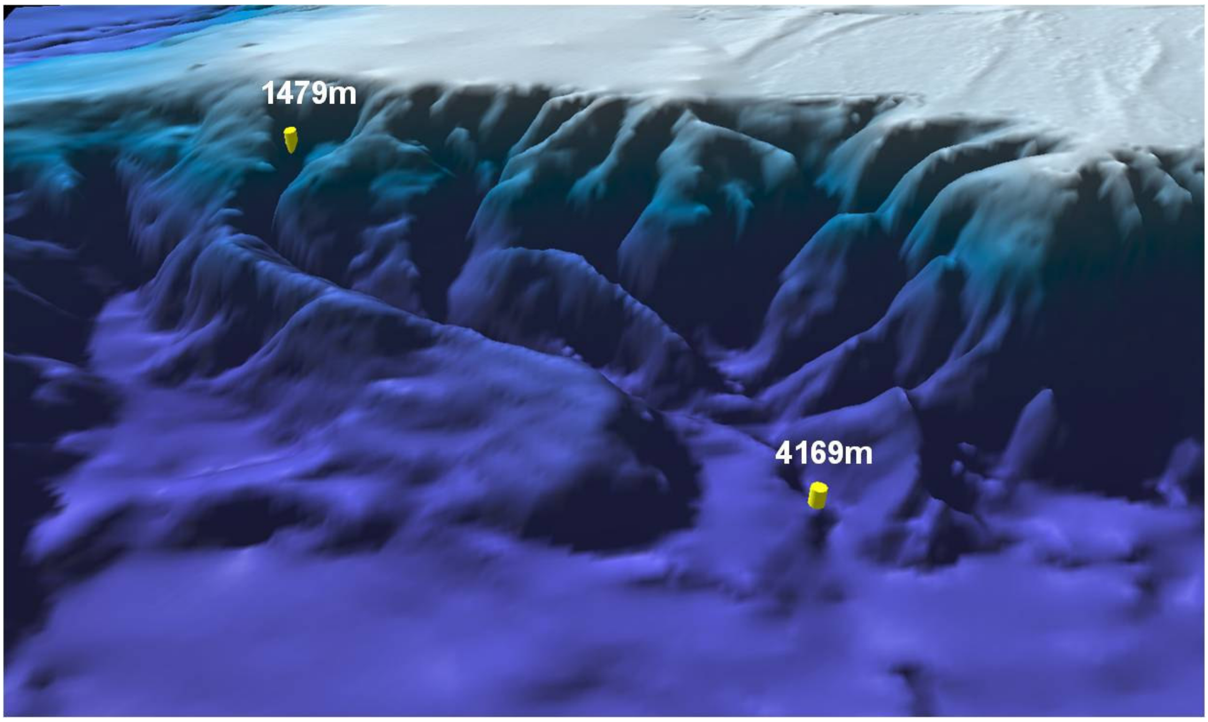
27 October 2009 - Hello all, let's set the scene…..I am writing this in a shipment container that has been modified into a small lab. It is currently on the lowest deck within the hold of the research vessel Pelagia. Around me are the usual signs of any workspace I inhabit, a mix of tools, deep sea equipment and notes on scraps of paper. This is where I have been spending much of my waking time aboard the vessel trying to keep track of the huge amount of data that has been created by the lander I am here to operate. As the description of my desk may hint at, I am not a particularly organised person, so this has required a fair amount of focus.
Yesterday represented the end of the CoralFISH portion of this cruise and therefore the part I was directly involved with. These first 10days were particularly significant as it was first field work on this project for both me and the lander that I have been building for the past few months (unfortunately it still doesn't have a name, that's the one part I have struggled with). The lander worked very well and I managed to deploy it 5 times, gathering over 6,300 images of the seabed and of the animals that were attracted to the bait. Processing all of these images is going to take me some time but I have managed to make a start on it while being out here; more to get me familiar with the procedure and the species I have encountered.
Some of the images recovered have been truly beautiful. One of the first significant discoveries was a large Monkfish (*Lophius piscatorius*), exceeding 1m in length. These animals are rarely seen on baited landers and it may have been attracted to the commotion around the bait rather than the bait it's self. Other methods of video assessment used on this cruise have shown us that these fearsome predatory fish are abundant in the coral areas. Our most regular visitors were the Common Mora (*Mora moro*) and the Greater Forkbeard (*Phycis blennoides*). The Mora's possess very large eyes that glow red under the light of the camera's flash. Somehow this doesn't make them look evil, it is a soft, warm red and with their habit of looking quizzically into the camera; these are among the cuter deep fish species. But maybe I am bias, I have a tendency to find the unusual cute. Unlike the

Mora with its large eyes the Forkbeard locates the bait with its long, branched and wip-like pelvic fins acting as whiskers; giving the animal its name. These are just a few of the species seen. We have seen eels of several species, dogfish, rat-tails and even a small black fish that I was unable to identify who would regularly come out from his cave within the coral, grab a piece of bait and then hurry back to safety.
But with all these amazing species to show you I have to make a decision. Due to the limited internet connection, I have to select one image to accompany this blog. Luckily, this is easy. By far the most impressive visitors we have seen are the sixgill sharks (possibly Hexanchus griseus). As the bait attracts more and more attention, more fish arrive but every now and then the area seems to clear and soon after something of a completely different scale is captured in an image. These animals have been seen at almost all sites. Some may well exceed 3m and often are too large to fit into the view my camera offers. I hope you agree with my choice, that if I could only show you one image, this would be it. The reference cross in the foreground is a metre long and the markings on it 10cm. Today we continue our transit south to the Wittard Canyon area where the second half of this cruise will take place. Here we will look at the ecology of marine canyons as part of the HERMIONE project in a similar way as we have looked at coral habitats in this first section. Both represent distinctly different habitats likely to contain features unique to them and provide little that is familiar. (Thom Linley, OceanLab Aberdeen).

28 October 2009- In the early morning we arrived at the Whittard Canyon about 400 km south of England. The Canyon consists of a couple of deep “gullies” along the slope between the shallow (500 m) continental shelf and the deep sea (4000 m). They form the connection between the productive shelf sea and the relatively poor abyssal plane. It is assumed that they are not only a major transport route for sand and clay, but also for organic matter that is the food for the bottom fauna in the deep sea. Their length is about 120 km. The dimesions of these canyons are similar to or even greater than our largest canyon on land, the Grand Canyon. At the continental margin the deepest part of the canyon is quite narrow, only 200 m. Here Henko planned to deploy a BOBO-lander for a year. The instruments fitted on the lander provide measurements of current speed, turbidity, salinity and temperature. The sediment trap collects the particles depositing from the water column to the bottom. These data hopefully contribute to the knowledge on the transport through the canyons, a process focused at in the HERMIONE-project. After the last preparations, the lander was successfully deployed at 09:00. Finally its position at the seabed was estimated by a triangular acoustical ranging.
In the mean time the normal activities on board have been started. Gerard and Thalia tried to create maps of the Canyon area and of the survey area of the next BIOFUN-cruise in the Mediteranean. Marc and Magda sorted through the rest of catch of the last 3 m beamtrawl. Inge compiled a videoclip of the predators on the mackerel-baited pole on the ALBEX-lander that had been deployed five times in the Belgica Mounds in the CORALFISH-project during the last week. Rachel prepared her paper on the consumption of vegetables by rattail fish. Nanne continued his incubations in the cool-container at the aft deck. The technicians prepared the next BOBO-lander for the deployment in the deepest part of the Canyon planned for tomorrow. The ship headed south to the deepest part of the Canyon.
Then Henko decided to go back to the deployed lander since its position seemed to be wrong: the depth appeared to be only 500 m in stead of 1000. It had landed by accident at the slope of the canyon. Within the last few kilometers off its estimated position Bob started a new acoustical ranging. The results were unexpected and we became suspicious. It was off position and thus had possibly gone adrift! We tried to verify its position and finally after a wild chase we were able to approach the lander and to release the last weight. This position was about 6.5 km west of the original deployment site. In the dark and foggy evening ten pair of eyes tried to spot the now nick-named GOGO-lander and James saw the feeble flashlight at first. Soon the lander was retrieved and safely tightened on the aft deck. The temperature data learned that the lander shortly after its arrival at the seabed had taken off and had floated in the upper water layers. Luckily we came back after just a few hours in stead of a year! (Magda Bergman, NIOZ).

29 October 2009- Following yesterday’s adventure with the runaway BOBO lander, a multibeam survey was carried out during the night in the upper canyon area to see if we could find a more suitable landing site for re-deploying the lander. Free-falling landers like BOBO and ALBEX usually do not land exactly below the place where they are released from the ship, but under influence of currents they will drift off a few tens of metres away from the projected landing spot. How far and in what direction is hard to predict if we don’t know these currents beforehand. When a reasonably flat piece of canyon bed had been selected, wide and long enough for a safe landing, the lander was lowered into the water and released shortly after 8 o’clock in the morning. Triangular ranging later confirmed that BOBO had safely landed on the canyon floor 1500 m below us.
Next on the program was deployment of a second BOBO lander at 4000 m water depth in the lower end of the canyon, more than 80 miles to the southeast. Steaming against the wind and current, we would need most of the day to get there. A lot of time, spent in preparing the BOBO lander for deployment and a variety of other activities. Mostly indoors, because the grey autumnal weather with rain and gushes of salt spray splashing over

the decks was not really inviting to stay outdoors very long. What can you do on a ship during a long rainy day? Why not, a helicopter drill! Very useful to know what you have to do in the eventual case when someone has to be evacuated from the ship by helicopter. Inge was appointed as volunteer to be strapped on a stretcher. When no helicopter appeared to take her away, she was eventually released. To our luck, because in the evening Inge showed us a very nice compilation of the best coral & fish video and photo stills.
At 8 o'clock in the evening, after a short multibeam inspection of the landing site, the second BOBO lander was launched in the lower canyon. Its descent to the sea bottom would take approximately 1.5 hour, and only late in the evening ranging of its position could start. Unfortunately the wind had picked up in force, and waves were splashing against the hull of the ship. No matter how intensely we listened, no response was heard from our lander deep down, only a nervous whispering of water…Unable to communicate with the lander through the noisy water, we could only hope that it arrived safely and is now collecting data for us. We departed from the Whittard Canyon shortly before midnight, heading south to our next destination (Henko de Stigter , NIOZ).



The Whittard canyon in 3D.

30 October 2009 - We are sailing to the south to the Galicia Bank area. The Galicia Bank is a seamount that rises from 5000m to about 600m below sealevel. On the top are also corals, but we are going there for the deep-sea soft bottom fauna. Last year, also in October, we have done research there with the Pelagia at depth between 1200 and 3000m. The research was done in the frame work of the BIOFUN project, a project funded by the European Science Foundation. With several European countries we study the biodiversity of the deep-sea bottom fauna from Bacteria to megafauna (large animals like fish and how the ecosystem functions. For that last item we measure the circumstances in the deep-sea, like temperature, current speed, the number and quality (in the sense of food) of particles in the bottom water, and how much of this material is deposited at the seafloor (and thus available for the animals living there). Of course we like to know how these circumstances vary during the year. For that purpose we have deployed two moorings with autonomous measuring devices (currentmeter, sedimenttrap, turbidity and fluorescence meter) at 1900 and 3000m. We hope they are still there, and we soon will found as we are now on our way to recover them. The weather is reasonable and the Pelagia can keep a good speed, and the expected time of arrival will be tommorow in the afternoon (Marc Lavaleye, NIOZ).

31 October 2009 - As expected we arrive at the 1900m mooring station south of the Galicia bank at 16:00. We send a sound signal through the water to the acoustic releaser of the mooring that stands1900m below us. To our joy it immediately answer that it is still alive. However, there is so much fog that we do not dare to command it to drop its weight and there upon rise to the surface. In this fog we probably cannot find it. So we agree to wait till tomorrow, and hope for a clear day. Instead we do a hopper station, which means a video survey of 2 hours of the seafloor. We see small red bushes of a coral with a flexible skeleton, some pancake sea-urchins, white sausage-like sea-cucumbers, a lot of burrows that seem to laugh at you as they have the form of a clowns mouth, and some fish (rattails and cut-throat eels). There are some problems with the transfer of video through the cable, and after 40 minutes of good video we have to break it off. It is Haloween, and the youngsters have decorated the bar with ghosts, spiders and and enlarged pictures of scary deep-sea fish (Marc Lavaleye, NIOZ).

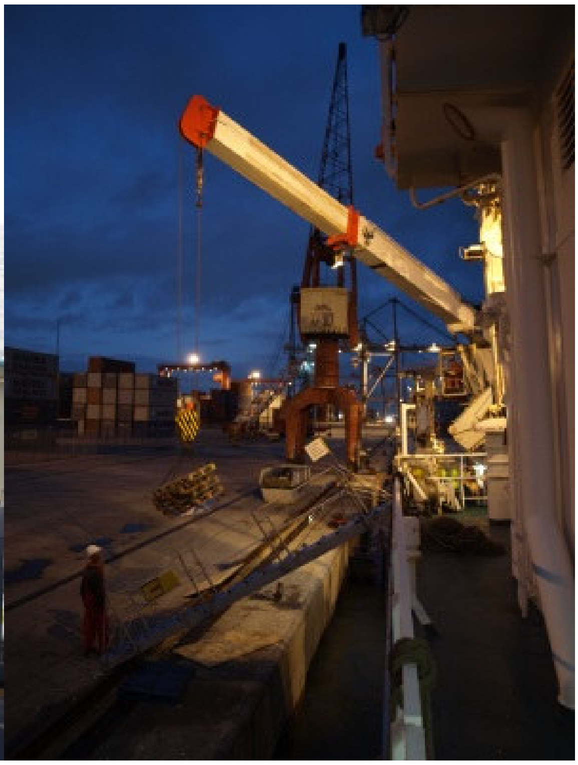
01 November 2009 - It is a nice bright day, and after breakfast we command the releaser of the mooring by means of sound signal of a special frequency to drop its heavy weight of 260kg. It obeys and by telemetry we notice that the mooring is coming to the surface. It will take about 32 minutes before the mooring has travelled from the 1900m deep bottom to the surface. We are anxiously waiting on the bridge, armed with binoculairs. Probably with some luck I detect the two yellow floats at a distance of 1 km first, although I did not put a price on it. At first I am quite happy to see it, but than I notice that I cannot see a flag. When the ship comes nearer it is quitre obvious that the upper part of the mooring is missing. It consisted of 2 floats tighthened together with a flag and a satelite beacon. The pickup line (a floating line of 25m with an extra float) is also gone. It is therefore quite difficult to pick it up. Bert has to steer the ship very close to the row of floats (diameter less than 50cm) that are bobbing on the surface. Sometimes 2 to 3 are visible, but the other moment it disappears altogether for some moments below the water surface. Arie and Lorendz try to catch it by angling for it with a small dredge on a rope. After 20min trying it in vain Arie has the luck to hook. Lorendz follows, and both pull it in as far as they can, than the crane can take over and slowly the mooring is hauled in. First the 6 remaining floats, than the first sedimentrap and datalogger are recovered. The 12 plastic vials of the trap all show a few millimeters of deposited material and the fluorometer attached to the datalogger flashes a blue light, which means that they both worked well!. After another 100meters of cable the lower trap, datalogger, currentmeter and both acoustic releasers come into view. All the important equipment is now safely recovered. A big sigh. We have been very lucky. If one more float would have been lost, we would never have found it back. Now we have a contineous record of current speed and direction, temperature, fluoresence, turbidity and the flux of material to the bottom for each month. We feel very happy. The rest of the day is filled with video surveying the seafloor with the hoppercamera. In the evening we steam to the location of the 3000m deep mooring. Rachel, our BIOFUN postdoc cannot sleep because of excitement of what the next day will bring (Marc Lavaleye, NIOZ).

Angling for the remains of the long-term mooring.

Rachel preparing algae smurry for the in-situ experiment.

02 November 2009 - Early in the morning we beep the mooring. It immediately answers that it is 3058 away from the ship, which means that it is almost straight down below us. We will try to pick it up in the afternoon. First we want to redo our spinach experiments from last year at this station. We had the crazy idea to offer the scavenging fish of the deep-sea some fresh spinach. Spinach was attached to our lander and a time-lapse camera recorded any uninvited guests. This resulted in the surprising and asthonishing find that especially the rattail fish were very fond of it. They ripped the nylon stockings in which the Iglo frozen blocks of spinach were packed to pieces to eat the contents. Now we had the Aberdeen lander on board, which is specially designed to record scavenging fish. And as Thom was willing to deploy his lander with spinach instead of the usual mackerel, we hope to duplicate and strengthen our findings of last year. In preparing his lander Thom noticed at least one advantage as spinach is easier and less messy to handle as a thawing mackerel and it doesn't smell as bad. In beautiful sunny weather the Aberdeen lander was easily deployed. In the mean time the ALBEX lander was also prepared for another baited experiment. Instead of spinach we want to offer the fish material that is more natural. We learned from former projects that the algae springbloom in the surface waters can sink quite quickly to the deep-sea bottom to form a green matt that sometimes can be more than 1 cm thick. So we try to mimick this by dumping green unicellular algae on the seafloor ourselves. We designed a device that can do this and have attached this to our lander. Again a camera will record what will happen. Deploying the lander in this nice weather is a matter of a few minutes. In the afternoon the BIOFUN mooring is released and it indeed confirms that it is on its way to the surface. The whole ascent of the mooring will take about 50 minutes. At the right time a bunch of people is standing on the bridge to try to spot it. Again I am the first to spot it, and again I don't see the flag! Arie and Lorendz have experience, and together with Erwin who is steering the ship, they manage to catch the mooring after only a few trials. Again all equipment is recovered safely and again all equipment worked very well. But the top part of the mooring is gone and is drifting somewhere in the ocean. We haven't found the cause, but the eroded iron chains at the top of the mooring show that seawater can be very agressive for metals (Marc Lavaleye, NIOZ).

Nanne with a halosaurid deepsea fish.



Our "cosy" place in the harbour of Lisbon.

03 November 2009- We are still at the 3000m station south of Galicia Bank. To collect extra material for our foodweb studies we need tissue from larger bottom animals. So Gerard, our expedition leader, has put a trawl on the program for this day. So we are going to fish with our little 3m beamtrawl. The chances are quite small as the winch we use proves to have only 3900m of steelcable. I instruct Bert to steam a slow as possible, as to much speed will drag the trawl form the bottom as a kite. After fishing for more than an hour the net is hauled in. The catch can be pulled in by man power, and the catch at first seems feeble. But to our surprise we caught a real deepsea fish, 10 snails, 120 bivalve shells, 12 large tusk shells, sea-anemones, shrimps, and a few goose barnacles. More than we dreamed of. We pick the animals out of the small heap of dropstones and man made litter. A close look at the stones shows that almost all have one or more brown pimpels of half a centimetre. These are strange Brachiopods with a chitineous shell. They belong to a group of animals that did very well in the far far past, but now this group is represented by only a few hundred of species. In the afternoon we pick up both landers. Both worked very well. The pictures of Thom show again, a now even more undisputable, that rattail fish at 3000m depth attack and swallow the spinach bait eagerly. We will add the new evidence to the manuscript of which Rachel is the lead author and which we hope will be published soon. The algae experiment is also a success and probably will be our next subject for a publication. In the evening the scientific program has come to an end and the ship heads for Lisbon (Marc Lavaleye, NIOZ).

04/5 November 2009- The end of our expedition is inevitably drawing near. Although it still takes the entire Wednesday and early hours of Thursday to cover the more than 200 miles to Lisbon, we notice more ships around us as we are getting closer to our destination. One last stop is made for testing the multicorer. On Wednesday evening an orange glow above the horizon announces that we are approaching the inhabited world, and in the course of the night millions of tiny orange sparks appear in the dark in front of the ship. In the first light of Thursday morning the distant outlines of Lisbon can be distinguished, set against the dark contours of the Sintra and Arrabida hills. RV Pelagia slowly moves ahead to the entrance of the Tagus river, waiting for permission from the naval authorities to travel the last few miles upstream to port.

Behind us are three weeks of intense work at sea, where we worked hard to lift some of the veil of mystery shrouding the deep-sea world. Every day expecting that the grey autumnal ocean would turn a grimmer face upon us, and impede us to work any further. But we have been extremely lucky, with only two working days lost due to storm, and weather turning really bad only when we left the area. We were very successful in multiple deployments of our landers and in collecting many good bottom samples, providing us valuable and often surprising new information about the inhabitants of the deep water coral ecosystems. Who would have thought that deep-sea rattail fish are so fond of spinach? Or that our mackerel bait would be bitten to shreds by swarms of tiny crustaceans, rather than by big mouthed sharks? The fish and coral specimens collected for isotope and fatty acid analysis will hopefully tell us more about the peculiar feeding tastes of deep-sea fauna. In the meantime, three landers will stay out there until next year monitoring the physical environment of Galway Mound and deep Whittard Canyon.

Although our expedition will soon end officially as we moor off in Lisbon, there will be a lot of work ahead of us. First packing our samples and saving our data and cleaning the labs. Loading and unloading equipment and taking in stores for the ship, preparing the ship for its departure next day. And of course, writing the cruise report, accounting of our different activities and preliminary results. For such an eventful and non-routine expedition, this will require a bit more than copying last year's report and changing station numbers and dates. As we approach the historical city of Lisbon from where many adventurous sailors departed in the past centuries to discover new continents and new seas, we feel privileged of taking a humble part in the continuing discovery of the still vast unknown parts of our planet. We hope that through this cruise diary we have succeeded to share some of our excitement with you (Henko de Stigter, NIOZ).

CRUISE 64PE313 LOGBOOK

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
1-1	Multibeam	Start	10/17/2009 06:25	51.45103	-11.7250	235	
1-1	Multibeam	End	10/17/2009 06:44	51.45187	-11.7767	235	
1-2	Multibeam	Start	10/17/2009 07:17	51.47878	-11.7490	235	
1-2	Multibeam	End	10/17/2009 07:26	51.47868	-11.7252	847	
1-3	Multibeam	Start	10/17/2009 07:55	51.42552	-11.7244	841	
1-3	Multibeam	End	10/17/2009 10:38	51.50592	-11.7768	917	
2-1	CTD-rosette	Start	10/17/2009 11:15	51.45157	-11.7766	990	
2-1	CTD-rosette	Bottom	10/17/2009 11:34	51.45167	-11.7767	996	
2-1	CTD-rosette	End	10/17/2009 13:32	51.4518	-11.7764	996	
2-2	CTD-rosette	Start	10/17/2009 14:17	51.45155	-11.7766	996	
2-2	CTD-rosette	Bottom	10/17/2009 14:40	51.4518	-11.7769	996	
2-2	CTD-rosette	End	10/17/2009 15:08	51.4518	-11.7759	990	
3-1	Lander-ABDEEN	Deployment	10/17/2009 15:48	51.45157	-11.7525	825	
3-2	Lander-ALBEX	Deployment	10/17/2009 16:20	51.45185	-11.7644	965	
3-3	Lander-BOBO	Deployment	10/17/2009 19:17	51.4531	-11.7235	898	
4	Multibeam	Start	10/17/2009 21:28	51.37367	-11.6641	669	
4	Multibeam	End	10/18/2009 07:27	51.51403	-11.7930	921	
5	Boxcore small	Bottom	10/18/2009 08:39	51.45433	-11.7764	986	2 incubations, 1 geocore, 3 syringes.
6	Boxcore small	Bottom	10/18/2009 09:47	51.45445	-11.7766	986	Biodiversity, 3 syringes.
7	Boxcore small	Bottom	10/18/2009 11:07	51.45438	-11.7532	797	Rubble in incubation.
8	Boxcore small	Bottom	10/18/2009 11:54	51.45418	-11.7532	826	No sediment, rubble in incubation.
9	Lander-ALBEX	Recovery	10/18/2009 14:06	51.45658	-11.758	878	
10	Lander-ABDEEN	Recovery	10/18/2009 14:57	51.45602	-11.7437	932	
11	Boxcore small	Bottom	10/18/2009 16:17	51.45493	-11.7529	851	most easterly one
12	Boxcore large	Bottom	10/18/2009 17:42	51.45547	-11.7523	816	large video boxcore
13	Lander-ABDEEN	Deployment	10/18/2009 19:09	51.45143	-11.7675	978	
14	Lander-ALBEX	Deployment	10/18/2009 19:50	51.45187	-11.7531	786	on moundtop
15	Multibeam	Start	10/18/2009 20:46	51.50605	-11.7946	932	
15	Multibeam	End	10/19/2009 07:25	51.37632	-11.7749	1075	
16	3m Beamtrawl	Start paying out	10/19/2009 08:40	51.44118	-11.7699	989	off Therese Mound
16	3m Beamtrawl	Stop paying out	10/19/2009 09:18	51.4306	-11.7723	868	
16	3m Beamtrawl	Start hauling	10/19/2009 09:18	51.4306	-11.7722	868	
17	Lander-ALBEX	Recovery	10/19/2009 11:40	51.45	-11.7067		
18	CTD-rosette	Start	10/20/2009 08:54	51.45435	-11.7767	991	
18	CTD-rosette	Bottom	10/20/2009 09:18	51.45437	-11.7766	997	
18	CTD-rosette	End	10/20/2009 09:41	51.45387	-11.7761	989	
19	CTD-rosette	Start	10/20/2009 10:33	51.45495	-11.7242	900	
19	CTD-rosette	Bottom	10/20/2009 10:51	51.4553	-11.7235	902	
19	CTD-rosette	End	10/20/2009 11:13	51.45438	-11.7229	900	
20	CTD-rosette	Start	10/20/2009 11:42	51.45547	-11.742	929	
20	CTD-rosette	Bottom	10/20/2009 12:00	51.45565	-11.7416	929	
20	CTD-rosette	End	10/20/2009 12:22	51.45563	-11.7452	924	
21	CTD-rosette	Start	10/20/2009 13:47	51.45553	-11.7543	813	
21	CTD-rosette	Bottom	10/20/2009 14:07	51.46132	-11.7611	970	
21	CTD-rosette	End	10/20/2009 14:37	51.46748	-11.7605	972	
22	CTD-rosette	Start	10/20/2009 15:53	51.45513	-11.7645	967	
22	CTD-rosette	Bottom	10/20/2009 16:32	51.45438	-11.7653	967	
22-1	CTD-rosette	End	10/20/2009 16:41	51.45585	-11.7678	975	
22-2	Boxcore small	Bottom	10/20/2009 17:29	51.45382	-11.7656	970	2 incubations, 1 geocore, 4 syringes.

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
23	Lander-ALBEX	Deployment	10/20/2009 19:58	51.42772	-11.772	1183	with HD camera
24	Lander-ABDEEN	Recovery	10/21/2009 08:43	51.45147	-11.7654	972	
25	Boxcore small	Bottom	10/21/2009 10:33	51.45435	-11.7648	964	Failed, not tripped
26	Boxcore small	Bottom	10/21/2009 11:05	51.45438	-11.7651	964	Failed, not tripped
27	Boxcore small	Bottom	10/21/2009 11:47	51.4542	-11.7651	967	Failed, only water
28	Lander-ALBEX	Recovery	10/21/2009 13:56	51.429	-11.7712	916	
29	Lander-ABDEEN	Deployment	10/21/2009 14:54	51.4278	-11.7725	901	
30	Boxcore small	Bottom	10/21/2009 16:41	51.4543	-11.7532	800	oblique surface
31	Boxcore small	Bottom	10/21/2009 16:49	51.45442	-11.7521	830	oblique surface
32	Boxcore large	Bottom	10/21/2009 17:48	51.4544	-11.7534	836	good, with coral
33	Lander-ALBEX	Deployment	10/21/2009 20:15	51.42792	-11.7833	1024	Off Therese Mound
34	Multibeam	Start	10/21/2009 20:46	51.38485	-11.8213	1156	
34	Multibeam	End	10/22/2009 06:33	51.57652	-11.6421	557	
35	Lander-ABDEEN	Recovery	10/22/2009 11:33	51.42662	-11.7706	942	
36	Lander-ALBEX	Recovery	10/22/2009 13:48	51.42552	-11.7816	1015	
37	Videohopper	Start	10/22/2009 15:06	51.42745	-11.7634	955	Digi+HD camera +flash
37	Videohopper	End	10/22/2009 16:36	51.4286	-11.7878	1031	
38	Boxcore large	Bottom	10/22/2009 17:49	51.45885	-11.7417	932	Biodiversity, full
39	Lander	Deployment	10/22/2009 19:45	51.42853	-11.7837	1025	off Therese Mound
40	Multibeam	Start	10/22/2009 21:30	51.57697	-11.6198	498	
40	Multibeam	End	10/23/2009 07:47	51.501	-11.7281	857	
41	Lander-ALBEX	Deployment	10/23/2009 09:10	51.45668	-11.6999	680	
42	Videohopper	Start	10/23/2009 10:40	51.46178	-11.76	948	Digi+HD camera+ extra lamp.
42	Videohopper	End	10/23/2009 12:11	51.43368	-11.7447	936	
43	Boxcore large	Bottom	10/23/2009 13:52	51.45422	-11.7415	924	Dropstones, 2 incubation vials, 5 syringes.
44	Boxcore large	Bottom	10/23/2009 15:06	51.45658	-11.7234	900	Dropstones, 2 incubation vials, 5 syringes, geocore.
45	Lander-ABDEEN	Recovery	10/23/2009 16:25	51.42808	-11.7818	1018	
46	Lander-ALBEX	Recovery	10/23/2009 17:41	51.45718	-11.695	695	
47	Videohopper	Start	10/23/2009 19:13	51.45970	-11.6944	702	Poseidon Mound
47	Videohopper	End	10/23/2009 20:36	51.44705	-11.7169	846	
48	Multibeam	Start	10/23/2009 21:38	51.50005	-11.7559	912	
48	Multibeam	End	10/24/2009 03:14	51.33063	-11.8194	1136	
49	CTD-rosette	Start	10/25/2009 08:38	51.45428	-11.6796	707	
49	CTD-rosette	Bottom	10/25/2009 08:52	51.45417	-11.6797	707	
49	CTD-rosette	End	10/25/2009 09:09	51.45437	-11.6797	712	
50	CTD-rosette	Start	10/25/2009 09:32	51.45430	-11.6915	742	
50	CTD-rosette	Bottom	10/25/2009 09:47	51.45427	-11.6916	742	
50	CTD-rosette	End	10/25/2009 10:02	51.45430	-11.6914	742	
51	CTD-rosette	Start	10/25/2009 10:18	51.45415	-11.7019	686	-
51	CTD-rosette	Bottom	10/25/2009 10:33	51.45442	-11.7012	681	
51	CTD-rosette	End	10/25/2009 10:49	51.45440	-11.7013	686	
52	CTD-rosette	Start	10/25/2009 11:16	51.45438	-11.7115	844	
52	CTD-rosette	Bottom	10/25/2009 11:31	51.45433	-11.7114	839	
52	CTD-rosette	End	10/25/2009 11:47	51.45402	-11.7114	844	
53	CTD-rosette	Start	10/25/2009 12:05	51.45445	-11.7227	901	
53	CTD-rosette	Bottom	10/25/2009 12:21	51.45463	-11.7226	901	
53	CTD-rosette	End	10/25/2009 12:37	51.45405	-11.7234	901	
54	CTD-rosette	Start	10/25/2009 13:17	51.45385	-11.7334	875	

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
54	CTD-rosette	Bottom	10/25/2009 13:35	51.45477	-11.7332	865	
54	CTD-rosette	End	10/25/2009 13:55	51.45472	-11.7331	860	
55	CTD-rosette	Start	10/25/2009 14:16	51.45422	-11.7417	926	
55	CTD-rosette	Bottom	10/25/2009 14:34	51.45395	-11.7415	926	
55	CTD-rosette	End	10/25/2009 15:02	51.45438	-11.7515	844	
56	CTD-rosette	Start	10/25/2009 15:07	51.45427	-11.7531	829	
56	CTD-rosette	Bottom	10/25/2009 15:23	51.45415	-11.7534	829	
56	CTD-rosette	End	10/25/2009 15:40	51.45420	-11.7530	829	
57	CTD-rosette	Start	10/25/2009 16:01	51.45397	-11.7652	967	
57	CTD-rosette	Bottom	10/25/2009 16:24	51.45410	-11.7640	962	
57	CTD-rosette	End	10/25/2009 16:42	51.45405	-11.7657	967	
58	Lander-ABDEEN	Deployment	10/25/2009 17:22	51.45662	-11.7002	681	Poseidon Mound
59	Videohopper	Start	10/25/2009 19:19	51.45423	-11.7480	870	Galway Mound
59	Videohopper	End	10/25/2009 20:28	51.45432	-11.7781	992	
60	Lander-BOBO	Recovery	10/26/2009 08:32	51.45437	-11.7171	882	
61	Lander-ABDEEN	Recovery	10/26/2009 09:21	51.45603	-11.6945	717	
62	Vert Plankton net	Close	10/26/2009 10:33	51.42828	-11.7717	863	to 200m depth
63	Vert Plankton net	Close	10/26/2009 11:14	51.42843	-11.7720	939	to 100m depth
64	Videohopper	Start	10/26/2009 12:31	51.43663	-11.7601	954	Therese Mound
64	Videohopper	End	10/26/2009 13:53	51.42140	-11.7805	1021	
65	Boxcore large	Bottom	10/26/2009 15:05	51.45157	-11.7525	786	Biodiversity, oblique
66	Boxcore large	Bottom	10/26/2009 16:50	51.46679	-11.7503	906	disturbed sample
67	3m Beamtrawl	Stop paying out	10/26/2009 17:24	51.45688	-11.7420	933	
67	3m Beamtrawl	Start hauling	10/26/2009 17:24	51.45688	-11.7420	933	
68	Lander-FISHOBS	Deployment	10/26/2009 20:32	51.45162	-11.7523	784	1 year deployment
69	Multibeam	Start	10/26/2009 20:54	51.45547	-11.8025	1050	Multibeam
69	Multibeam	End	10/26/2009 21:09	51.45532	-11.8417	1013	
WHITTARD CANYON-HERMIONE							
70	CTD-rosette	Start	10/28/2009 07:05	48.99167	-11.1905	985	
70	CTD-rosette	Bottom	10/28/2009 07:22	48.99133	-11.1909	989	
70	CTD-rosette	End	10/28/2009 07:43	48.99125	-11.1894	952	
71	Lander-BOBO	Deployment	10/28/2009 09:23	48.99150	-11.1906	985	1 year deployment
72	CTD-rosette	Start	10/28/2009 12:33	48.73350	-11.1651	2301	
72	CTD-rosette	Bottom	10/28/2009 13:15	48.73335	-11.1651	2301	
72	CTD-rosette	End	10/28/2009 14:01	48.73375	-11.1657	2295	
73	Multibeam	Start	10/28/2009 20:54	49.05513	-11.1356	456	
73	Multibeam	End	10/29/2009 07:46	48.98045	-11.2314	575	
74	Lander-BOBO	Deployment	10/29/2009 08:44	48.91518	-11.1500	1479	Re-deployment
75	Mulitbeam	Start	10/29/2009 19:25	47.73555	-10.1553	4181	
75	Mulitbeam	End	10/29/2009 19:47	47.76810	-10.1495	4151	
76	Lander-BOBO	Deployment	10/29/2009 20:09	47.75003	-10.1499	4169	1 yr deployment
GALICIA BANK-BIOFUN							
77	Videohopper	Start	10/31/2009 17:27	42.44755	-10.6551	1891	
77	Videohopper	End	10/31/2009 18:44	42.42945	-10.6573	1885	
78	Mooring	Recovery	11/01/2009 08:59	42.45942	-10.6541	1902	1 year deployment
79	Videohopper	Start	11/01/2009 11:24	42.45517	-10.6461	1907	
79	Videohopper	End	11/01/2009 13:40	42.47575	-10.6774	1896	
80	Videohopper	Start	11/01/2009 16:41	42.34555	-10.5606	2271	
80	Videohopper	End	11/01/2009 18:32	42.35818	-10.5785	2190	
81	Mooring	Tracing	11/02/2009 08:08	41.66683	-10.7502	3054	1 year deployment
82	Videohopper	Start	11/02/2009 09:32	41.67330	-10.7571	3042	
82	Videohopper	End	11/02/2009 11:17	41.69545	-10.7744	2957	
83	Lander-ALBEX	Deployment	11/02/2009 13:43	41.70672	-10.7833	2908	with algae

APPENDIX-6 CORALFISH-HERMIONE 2009 Cruise 64PE313

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
84	Lander-ABDEEN	Deployment	11/02/2009 14:42	41.70683	-10.7382	3030	
85	Mooring	Recovery	11/02/2009 17:36	41.66137	-10.7605	3054	1 year deployment
86	Videohopper	Start	11/02/2009 18:52	41.66023	-10.7841	3024	
86	Videohopper	End	11/02/2009 19:58	41.65817	-10.8030	2979	
87	3m Beamtrawl	Start paying out	11/03/2009 08:20	41.6646	-10.7454	3060	
87	3m Beamtrawl	Stop paying out	11/03/2009 09:36	41.67202	-10.7675	3030	
87	3m Beamtrawl	Start hauling	11/03/2009 11:02	41.68423	-10.7844	2975	
88	Lander-ABDEEN	Recovery	11/03/2009 13:46	41.70847	-10.7345	3036	
89	Lander-ALBEX	Recovery	11/03/2009 15:23	41.70545	-10.7782	2939	
90	Videohopper	Start	11/03/2009 17:30	41.70478	-10.9019	2768	
90	Videohopper	End	11/03/2009 19:16	41.70575	-10.9294	2713	
91	Multicore	Bottom	11/04/2009 14:54	39.34175	-10.215	1682	for Fatima Abrantes