CORALFISH-HERMIONE CRUISE REPORT

Cruise 64PE324, Texel-Vigo,
10 Sept – 2 Oct 2010

Belgica Mound Province (CoralFISH & HERMIONE),
Whittard Canyon (HERMIONE)

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CONTENTS

Cover page: sticky clay in the deeper layer of a boxcore sample of the Belgica Mound area.

1. INTRODUCTION

The major goal of the cruise 64PE324 is to collect observational data and seabed samples for two FP7 EU-funded programs: CoralFISH and HERMIONE. The HERMIONE project is focused on study of various hotspot ecosystems such as canyons (Whittard Canyon) and cold water coral mounds (Belgica Mounds) whereas CoralFISH aims to study relationships between cold water coral ecosystems and fish. Both projects are so-called integrated projects funded by the European Union and comprise partners belonging to the major European marine institutions. Coordinating institutions are National University Galway (Ireland) and NOC (Southampton, UK), respectively. The shiptime for this cruise is provided by NIOZ.
During the CoralFISH leg of the cruise to the Belgica Mounds, we intend to make estimates of fish abundance on and off coral mounds by means of under water video surveys and baited video landers of NIOZ. A long-term lander with HD-video and bait dispenser, which has been deployed last year in October, will be recovered. Some boxcore samples (additional to those collected in 2009) will be collected on and off the coral mounds for determination of density, trophic status, and respiratory activity of the bottom fauna. These data will be used to construct a carbon flow model of coral and fish communities in cooperation with partners from NIOO (Yerseke, NL). In 2008 NIOZ organized a first CoralFISH cruise (Lavaleye et al. 2008) to the Belgica Mounds and 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. Belgica Mound Province, which lies within the Irish EEZ, is an SAC (Special Area of Conservation). Some of the mounds have a rich cold-water coral community. In this area research is only possible with a special permit. This area was briefly studied during the 2008 cruise with Pelagia (Lavaleye et al, 2008), and more thorough during the 2009 cruise with Pelagia (Duineveld et al, 2009). The 2010 cruise will continue the research started in 2008.
For the HERMIONE (Hotspot Ecosystem Research and Man's Impact on European Seas) project the NIOZ contribution 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. During research in a former EU project HERMES it was discovered that cold water coral habitats are associated with mechanisms that can bring fresh organic matter quickly 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. we will taken multiple CTDs across the slope from 300m to 1100m depth to measure salinity, temperature, turbidity and fluorescence of the different layers of the water column.
During the second leg in the Whittard Canyon we plan to study relationships between seafloor morphology, particle transport near the canyon floor and the benthic fauna, all for the HERMIONE project. For this purpose we will use a hopper camera system and benthic landers. One of the BOBO bottom landers will be deployed in the canyon for a period of 1year to record near bed currents and particle fluxes. During the 2009 Pelagia cruise time to do research in the Whittard Canyon was very limited because of bad weather. Besides we were very unlucky with the BOBO lander deployments. Both landers lost their ballast weights and surfaced prematurely. Only one was redeployed at a depth of about 1500m. The other was salvaged from a beach in Brittany a month after the expedition. The redeployed lander also surfaced prematurely, but about a month before the 2010 expedition, and was rescued at sea with a ship of opportunity, without any damage.

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 64PE324 is shown in Fig. 1 starting with departure from Texel on the 11th September 2010 and arrival in Vigo at the 2th October. Two study areas were visited during the cruise: 1) Belgica Mounds an 2) Whittard Canyon. The sections below contain a map and the work program in each of the areas.

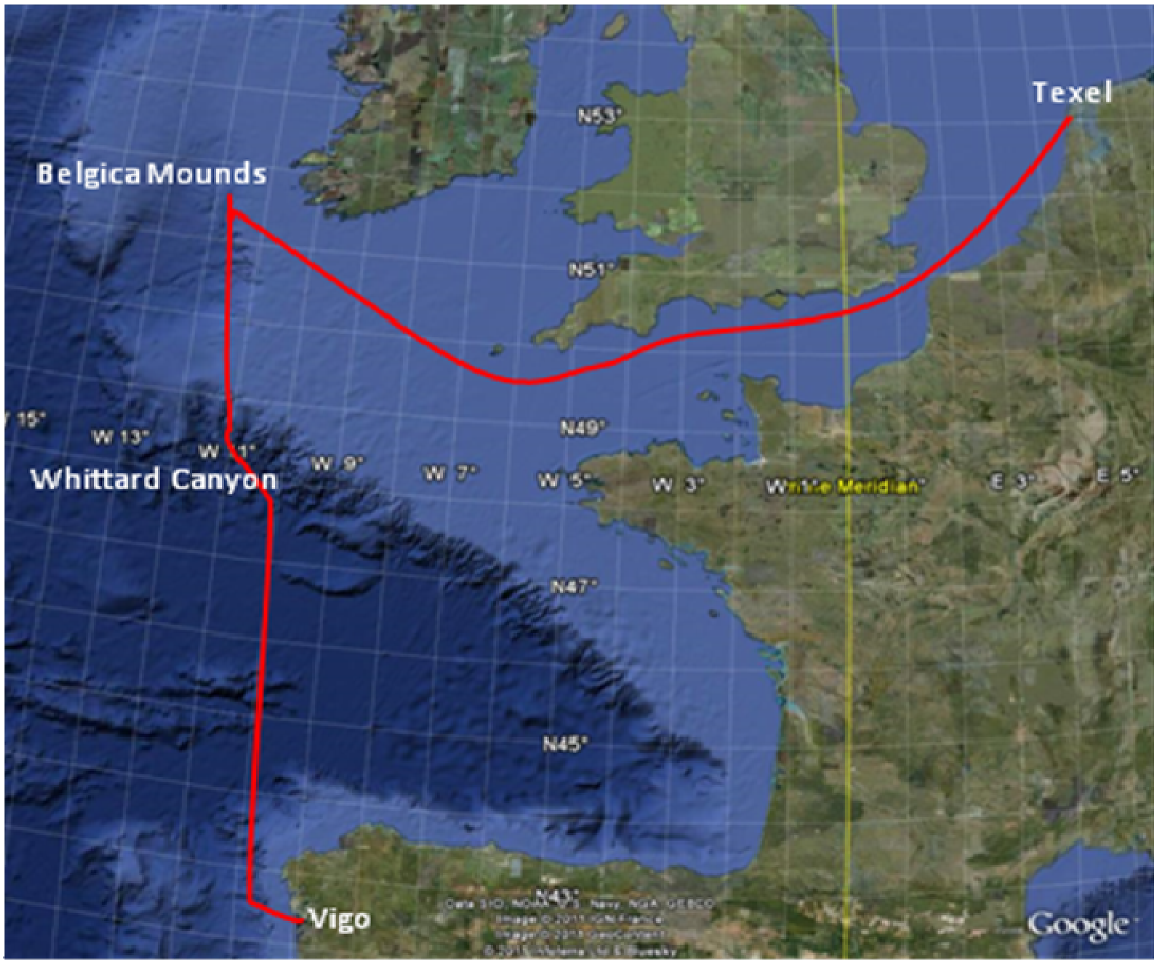

Fig. 1. Track of Cruise 64PE324 (11 Sept-2 Oct 2010).

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). NIOZ visited the area with RV Pelagia already in 2008 and 2009. The area is designated as a SAC (Special Area of Conservation) by the Irish authority for which a research permit is required.

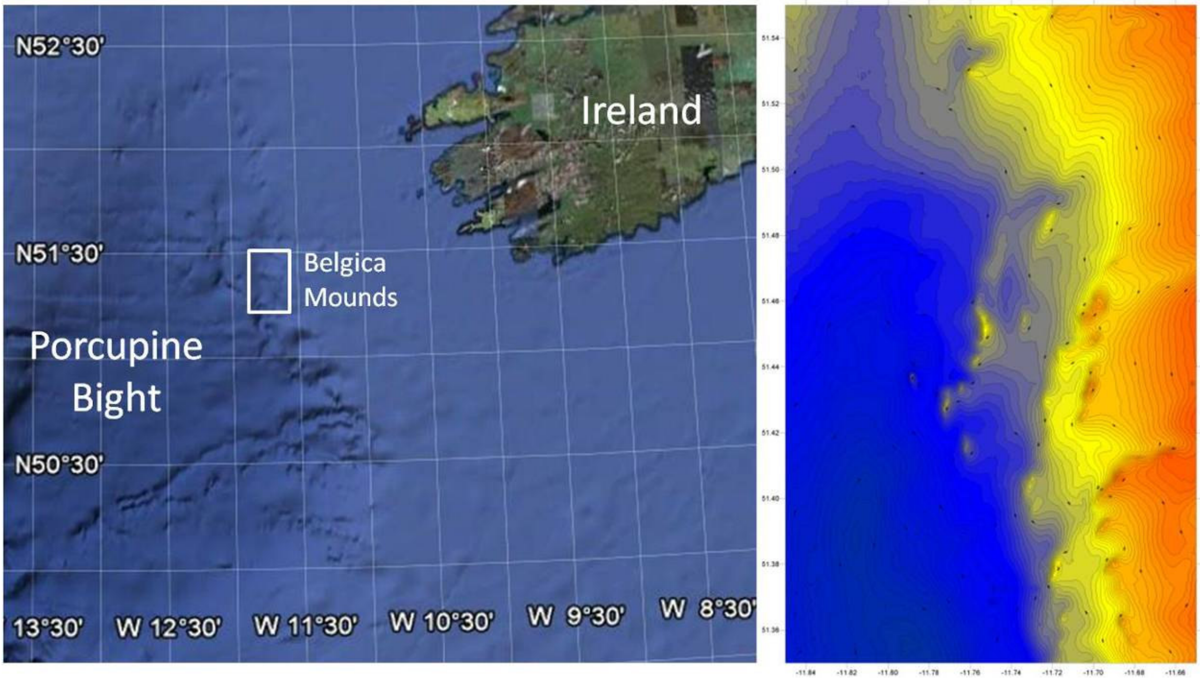

Fig. 2. Left-hand panel: overview of Irish continental margin with the Belgica Mound Province marked by a rectangle. Right-hand panel: bathymetric map of Belgica Mounds.

The combined objectives of cruise 64PE324 for Belgica Mounds were:

- if necessary enlarge the bathymetric map of the Belgica Mound area made during the 2009 cruise by using multibeam
- collect some additional samples on and off coral mounds for the study of biodiversity, biomass and density of macrobenthos
- collect additional 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)
- conduct additional respiration measurements on sediment cores and selected biota collected on and off mound
- collect additional video records from the seafloor on and off mound in order to count fish and relate their distribution to the habitat type
- conduct and compare different baited video experiments on and off mound to estimate fish abundance
- collect long-term records of physical parameters (current, temp, S) and particle fluxes in coral habitat
- collect long-term data on fish abundance in coral habitat by means of repeated baited experiments
- collect CTD data of the watercolumn on a transect across the slope
- try to find evidence for a sponge belt in deeper water (1000-1200m)

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. Up to 2008 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). In 2009 an geobiology cruise with the RRS James Cooke was completely devoted to study the Whittard Canyon (Masson, 2009), and the Dutch deployed long-term landers (Duineveld et al., 2009).

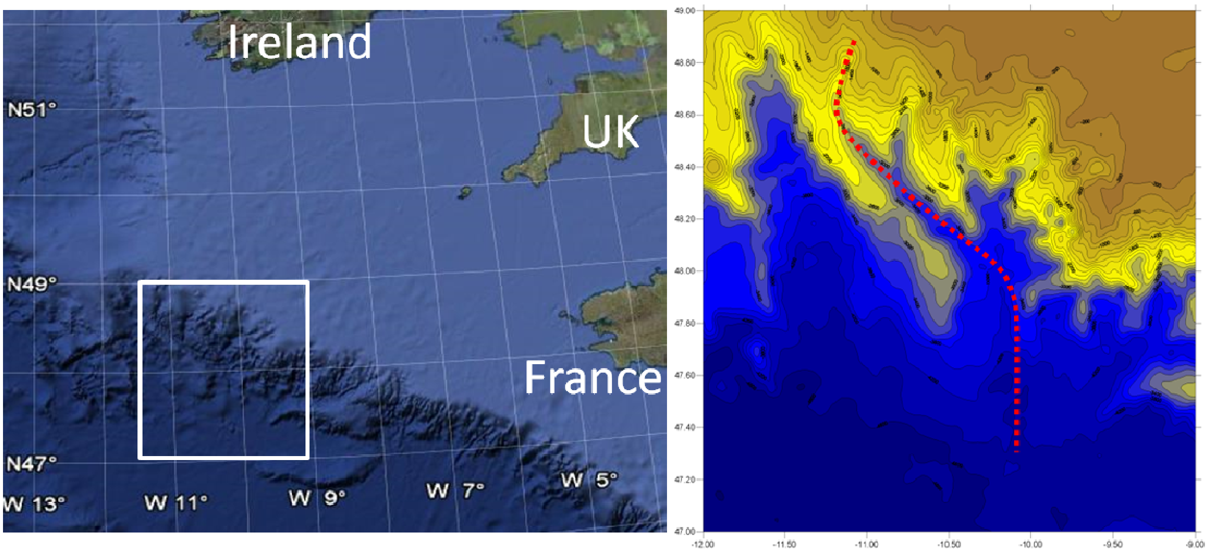

Fig. 3. Left-hand panel: overview of Irish continental margin with white lined rectangle marking the Whittard Canyon area enlarged in the right-hand picture. Right-hand panel: detail of Whittard Canyon. Dotted line marks the westernmost branch.

The objectives of cruise 64PE324 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).
- collect video records from the canyon floor for the analysis of benthic biodiversity
- collect piston core samples from the bed of the deeper part of the canyon

3. METHODS

3.1. Multibeam

During the cruise a multibeam was minly used for more precise location of some seafloor features For this we used 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. Agassiz trawl, Trangular dredge

Because of a malfunction of the deep-sea winch the 3.5m wide Agassiz trawl with camera and odometers could not be used as planned in the Whittard Canyon. So this apparatus was not used at all during this cruise. In the non-coral area of Belgica Mounds we used a triangular dredge to get some larger animals mainly for verifying the identification of the animals seen on the video surveys and for collecting animals for foodweb studies (stable isotope analyses). The dredge was only used in a dipping matter, meaning that as soon as the necessary length of wire was paid out the wire was winched in again. This was to make sure we did as little damage as possible to the bottom, although we of course always avoided the mounds themselves as well as other coral areas. In total we took 4 dredge samples, of which one was unsuccessful as it did not touched the seafloor at all. Selected animals from each 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. 4), 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 26 boxcore samples were collected, 14 from the Belgica Mound area and 12 (of which 3 small cores) from the Whittard Canyon area.The surfaces of the boxcore samples were photographed (see Appendix 3).

Fig. 4: Boxcore sample with inserted incubation cores.

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. 5). 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

Fig. 5. Incubation cores with animals. Left: white softcoral. Middle: *Lophelia*. Right: Gerard Duineveld incubating *Madrepora*. Core with Presence optode, temperature sensor and strirring motor in core holder visible. All measurements done at bottom temperature.

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 the total volume of the overlying water was measured.

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 bait which is usually attached to a camera set-up (photo/video) deployed onto the seafloor (see Priede & Merret 1998). In this cruise we used the NIOZ lander (ALBEX) equipped with cameras to do some additional (to our earlier cruises) baited experiments. The NIOZ lander (Fig. 6), 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 handycams (Sony), and a 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.

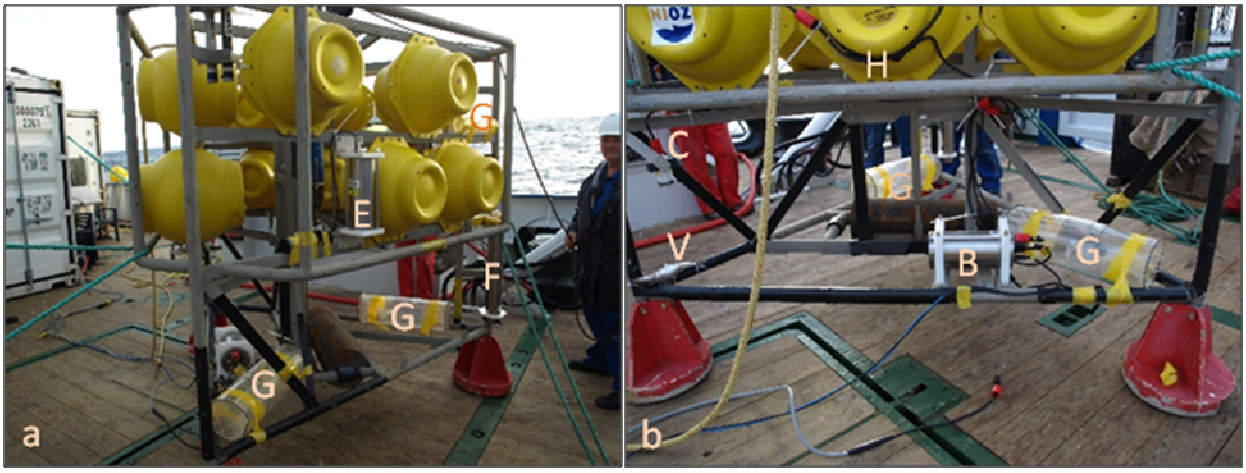

Fig. 6a. ALBEX1 lander used for baited experiment with whole mackerel and with several amphipod traps. 6b. Detail of HD-video camera set up, directed to the mackerel. Explanation of letters. B. HD-video camera. C. Infraredlamp. E. Datalogger with OBS and Fluorometer. F. Aquadop currentmeter. G. Amphipod traps. H. Battery sphere for HD camera. V. Frrozen mackerel as bait.

3.7. FishObs - longterm fish observations

During the cruise the NIOZ fish observatory that was developed in 2008-2009 was recovered after a 1 year period and was deployed again for another year on the top of Galway Mound amidst the coral community. The fish-observatory lander (Fig. 7) consists of a tripod similar as the one in Fig. 6 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 Technicap carousel (24 pots) and sedimenttrap motor was used as a time lapse bait dispenser. 12 sedmenttrap vials filled with sardines in oil were attached. Between each 2 vials a visl position was left open in order to allow for a bait exposure followed by a period without bait. This set-up is meant to do repetitive bait studies over 1 year in order to follow seasonal patterns in scavenger abundances.

The NIOZ Fish observatory was deployed in October 2009 for a period of ~ 1 year at 784 m depth on top of Galway Mound (51° 27.0972'N 11° 45.138'W) equipped with one HighDef camera and 3 Infrared lights (Fig. 7). We recovered it successfully during this 2010 cruise. Unfortunately the battery sphere had leaked, which drained the energy for the camera system, so that no recordings took place. As the leaking was caused by a faulty seal of one of the electrical penetrating plugs, we replaced the battery sphere with better penetrators. As the camera system itselve had no damage, we were able to deploy the fish observatory again for another 1 year period. As this was our last possibility to get a good result in the CORALFISH project period, we took a huge risk of attaching on another completely indepent HD camera system directed at the same food dispenser, in the hope to increase the chance of getting a positive result, but also to get more frequent observations of the bait over time (if both camera systems do their job).

Fig. 7a. The long-term fish-observatory lander (ALBEX4) ready for deployment.
7b. Overview of the equipment of fish observatory. 7c. Zooming in on the second HD camera with one infraredlamp. 7d. Baited carousel with the vials visible. Explanation of letters: A. carousel with 12 vials baited with sardines on oil. B. HD video camera 1 and 2. C. Infrared lamps 1, 2 and 3. D. Sedimenttrap with 12 vials. E. Datalogger with OBS and Fluorometer. F. Aquadop currentmeter.

3.8. BOBO lander

For study of processes in the Benthic Boundary Layer of the Whittard canyon, a BOBO lander was used. BOBO is a tripod of ca. 4 m height with on top a floatation body (Benthos™ glass spheres) and double acoustic releasers (Fig. 8). 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. The BOBO lander was deployed at about 1200m depth near the Belgica Mounds for a week deployment, successily for another week at 3600m in the Whittard Canyon and finally for a long deployment (1 year) in the mouth of the canyon at about 4200m.

Fig. 8. BOBO lander after being deployed for 7 days in the Belgica Mound area.

4. PRELIMINARY RESULTS

4.1. Belgica Mounds

4.1.1. Multibeam maps

We used the maps made out of the XYZ data extracted from the multibeam data from the 2009 expedition to this area. During the 2009 cruise we already mapped the total research area for this cruise so there was need to extend or improve our maps. We only used the multibeam for precise navigation at some points.

4.1.2. CTD- transect

In order to map the watercolumn, to detect nepheloid layers and to sample water for the analyses of the quantity and quality of the suspended food particles, a transect across the continental slope in the south of the Belgica Mound area was sampled at more or less regular distances with the CTD-rosette sampler. See Fig.10 for the position of the transect and the individual CTD casts. A preliminary plot of the beam attenuation data (turbidity) shows indeed some nepheloid layers, especially above 450m depth, but also 700 and 800m depth (Fig. 9).

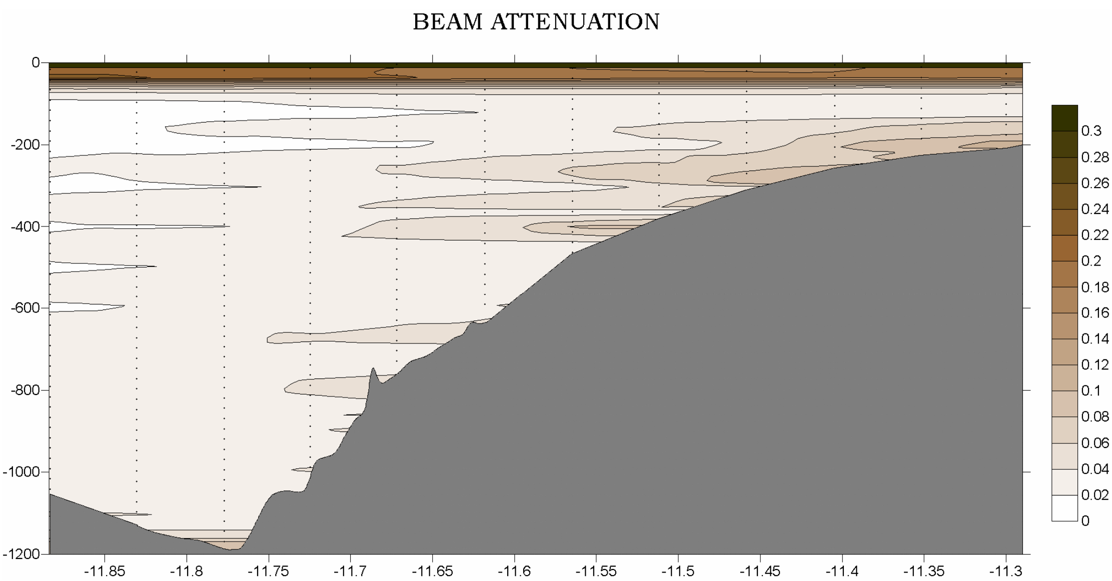

Fig. 9. Plot of the turbidity (beam attenuation) data of the CTD transect across the slope. See for the position of the transect Fig. 10

4.1.3. Biodiversity, density and biomass of macrofauna

A total number of 14 boxcore samples (all 50 cm diameter) were collected in the Belgica moud area. The top 10 centimeters of several boxcores were used for analysis of macrobenthic density, biomass and biodiversity (Table 1). Most boxcores were taken at the end of of a video transect, as the video camera was mounted on the boxcore frame. The samples supplement earlier boxcore samples from the area taken during cruise 64PE291 in 2008 and cruise 64PE313 in 2009. Below is a map showing the positions of the 2010 boxcore samples (Fig. 10). The core samples were sieved and stored (5% formaldehyde) for later analysis in the laboratory. Photographs of the boxcore surfaces are shown in Appendix-3A.

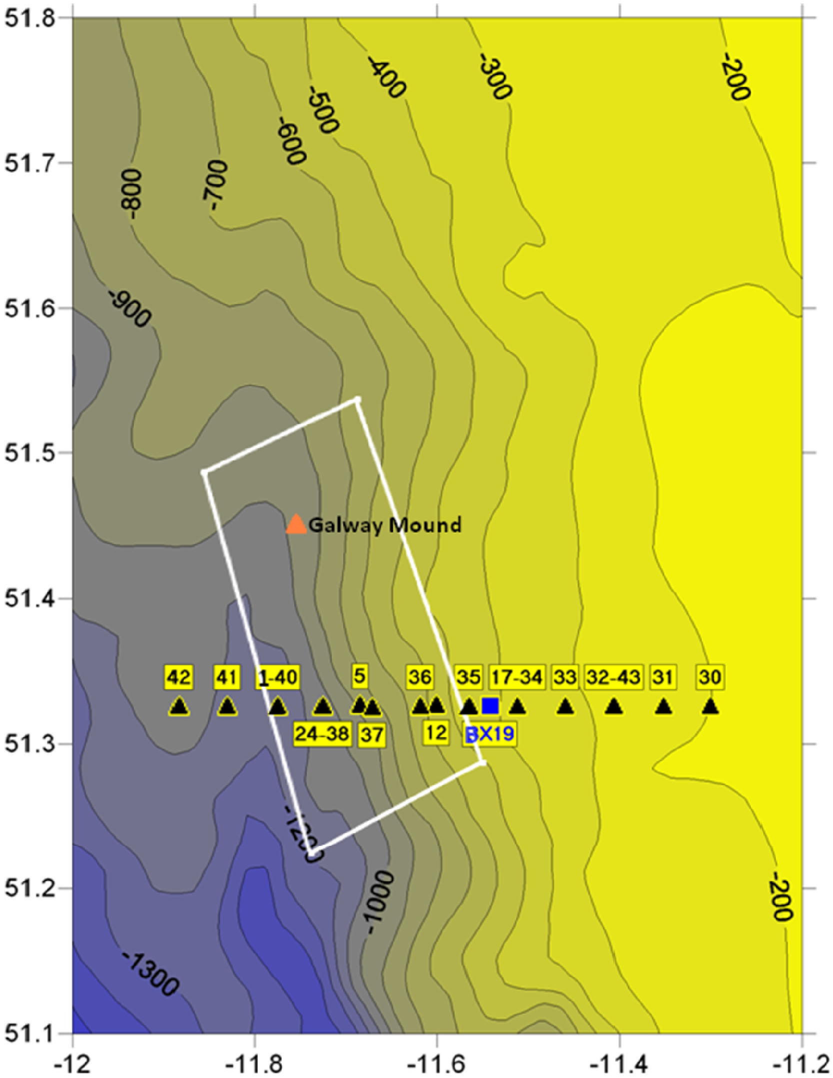

Fig.10. Map of the Belgica Mound province and surroundings. The SAC (Special Area of Conservation) is indicated with a white quadrangle, Galway Mound by an orange triangle, CTD casts on our southern transect by black triangles, and one boxcore (outside fig. 11) with a blue square.

Table 1. Quality, rough contents, and indication if used for biodiversity and or deck incubations of the boxcores taken in the Belgica Mound area.

Station	Quality	Sediment	Visible Animals	Biodiversity	Incubation
2	Good	Fine sand; clay below 10cm	Polychaetes (2x)	0-10cm	no
4	Good	Fine sand; clay below 10cm	Polychaetes (2x)	0-10cm	no
8	Full, but good	Sand with gravel, clay underneath		0-10cm	no
11	Good	Sand with gravel		0-10cm	1 core
14	Good	Sand with gravel		0-10cm	1 core
16	Good	Fine sand; clay below 10cm	none	0-10cm	1 core
19	Good	Soft sediment	none	0-10cm	1 core
22	Good	Fine sand; clay below 10cm	Echinus,Ophiuroidea,Munida	0-10cm	no
26	Too full	Soft sediment	Sipuncula 2x, Anthozoa 2x	no	no
48	Good	Sandy with few stones		0-10cm	no
50	Leaked, oblique	Soft sediment and corals	Soft corals	no	no
51	Almost empty	No sediment	Lophelia	no	corals
52	Good	Soft sediment and coral	Madrepora	0-10cm	2 cores
53	Disturbed	Soft sediment and coral	Lophelia, Madrepora	no	corals

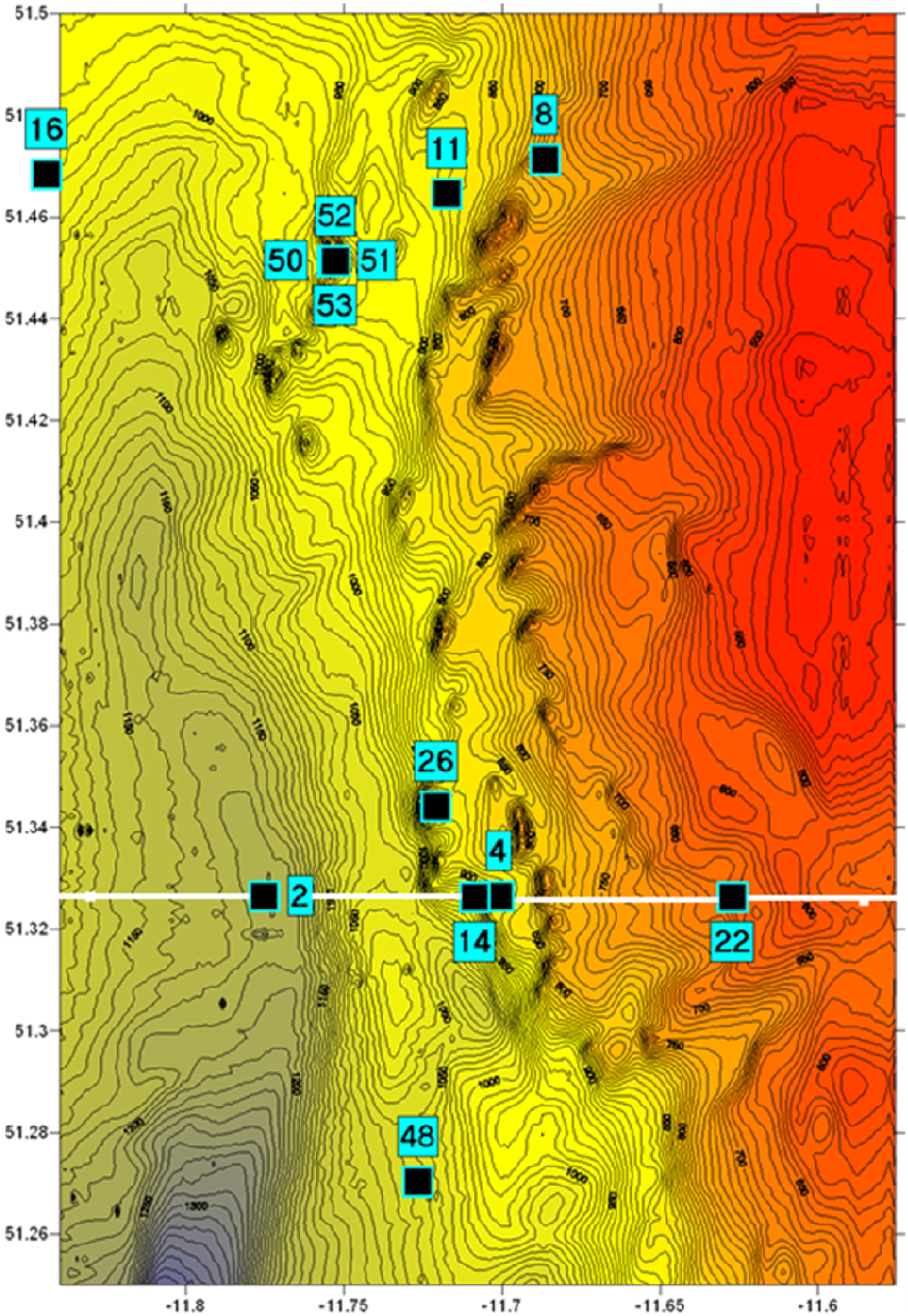

Fig. 11. Position of large boxcores taken in the Belgica Mound area. Boxcore 19 is plotted in fig. 10. The white line is our southern transect. Box 50-53 were taken on Galway Mound.

4.1.4. Food Web Studies

Study of the Belgica Mounds foodweb involved sampling of organisms (Fig. 11) 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. Sediment samples for organic chemistry analysis (stable isotopes/lipids/ pigments) were obtained from a boxcores using cut off syringes. Three syringes were taken per boxcore and immediately frozen at -80˚C for processing and analysis at NIOZ. A list of all collected animals and sediments is presented in Appendix-4.

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 water samples from the CTD were filtered for analyses of suspended matter. Positions are plotted for Belgica Mounds in Fig. 10. Apendix 2 shows more detailed information for the filters for biological and geological analyses

Station	Area	Depth in m	Analyses
1	Belgica Mounds	1183	Biology + Geology
5	Belgica Mounds	718	Biology + Geology
12	Belgica Mounds	612	Biology + Geology
17	Belgica Mounds	386	Biology + Geology
24	Belgica Mounds	1033	Biology + Geology
30	Belgica Mounds	208	Biology + Geology
31	Belgica Mounds	226	Geology
32	Belgica Mounds	257	Biology + Geology
33	Belgica Mounds	310	Geology
34	Belgica Mounds	381	Geology
35	Belgica Mounds	487	Geology
36	Belgica Mounds	633	Geology
37	Belgica Mounds	760	Geology
38	Belgica Mounds	1006	Geology
40	Belgica Mounds	1181	Geology
41	Belgica Mounds	1125	Geology
42	Belgica Mounds	1054	Geology
43	Belgica Mounds	258	Biology + Geology
74	Whittard Canyon	1489	Geology

4.1.5. Respiration experiments organisms and sediment (G.Duineveld)

Subcores were obtained from boxcores for incubation experiments of sediments (Fig. 5). These measurements form additions to the incubations done during the 2009 cruise. The aim is to ascertain if there are differences in sediment oxygen uptake rates between coral mounds and areas without coral mounds. In addition to the sediment cores also live corals and dead corals with epifauna e.g. soft corals were incubated in a large chamber (Fig. 6). The number of incubation experiments including blanco's is shown in Table 3.

Table 3. On board incubations with sediments, fauna and water (blanco's).

Station+sample	**Area**	**On/Off Coral Mound**	**Depth (m)**	**Material**
1	South Transect	Off	1183	Surface water
11	Off Galway Mound	Off	878	Sediment core
14	South Transect	Off	934	Sediment core
16	Deep water	Off	988	Sediment core
19	South Transect	Off	434	Sediment core
22	South Transect	Off	634	Sediment core
28	Off coral area	Off	865	Gorgonaria
28	Off coral area	Off	865	Blanco
46	Off coral area	Off	821	Black coral
46	Off coral area	Off	821	Blanco
50	Galway Mound	On	783	Madrepora
51a	Galway Mound	On	782	Anthothelia grandiflora
51a	Galway Mound	On	782	Blanco
51b	Galway Mound	On	782	White softcoral
51b	Galway Mound	On	782	Blanco
51c	Galway Mound	On	782	Lophelia
51c	Galway Mound	On	782	Blanco
52	Galway Mound	On	782	Madrepora
52	Galway Mound	On	782	Blanco

4.1.6 Videosurveys of the seafloor

A total of 11 videosurveys were made with the tethered videosystem in the Belgica Mound area (Table 4, Fig. 12). The tracks were made to cover our southern transect, to investigate some smaller mounds in the south, to do two extra over Poseidon Mound (additional to our earlier cruises), and to search for the sponge belt in deeper water. The video of survey 4 was not well recorded by a malfunction of the recorder, and therefore done again in survey 14 (Fig. 12). The very short video guided boxcore footage of sta. 50-53 is not plotted, as this is equal to the boxcore position (Fig. 11).

Table 4. Videosurveys made with the tethered videosystem.

Station	From Depth in m	To Depth in m	Remark
2	1040	1180	South Transect, Sponge Belt search
4	751	889	South Transect
8	820	738	Poseidon Mound
11	710	877	Poseidon Mound
14	748	935	South Transect
16	1062	988	Sponge Belt search
19	362	435	South Transect
22	608	633	South Transect
26	806	807	Small South Mounds
29	927	907	Small South Mounds
48	1168	1053	Sponge Belt search

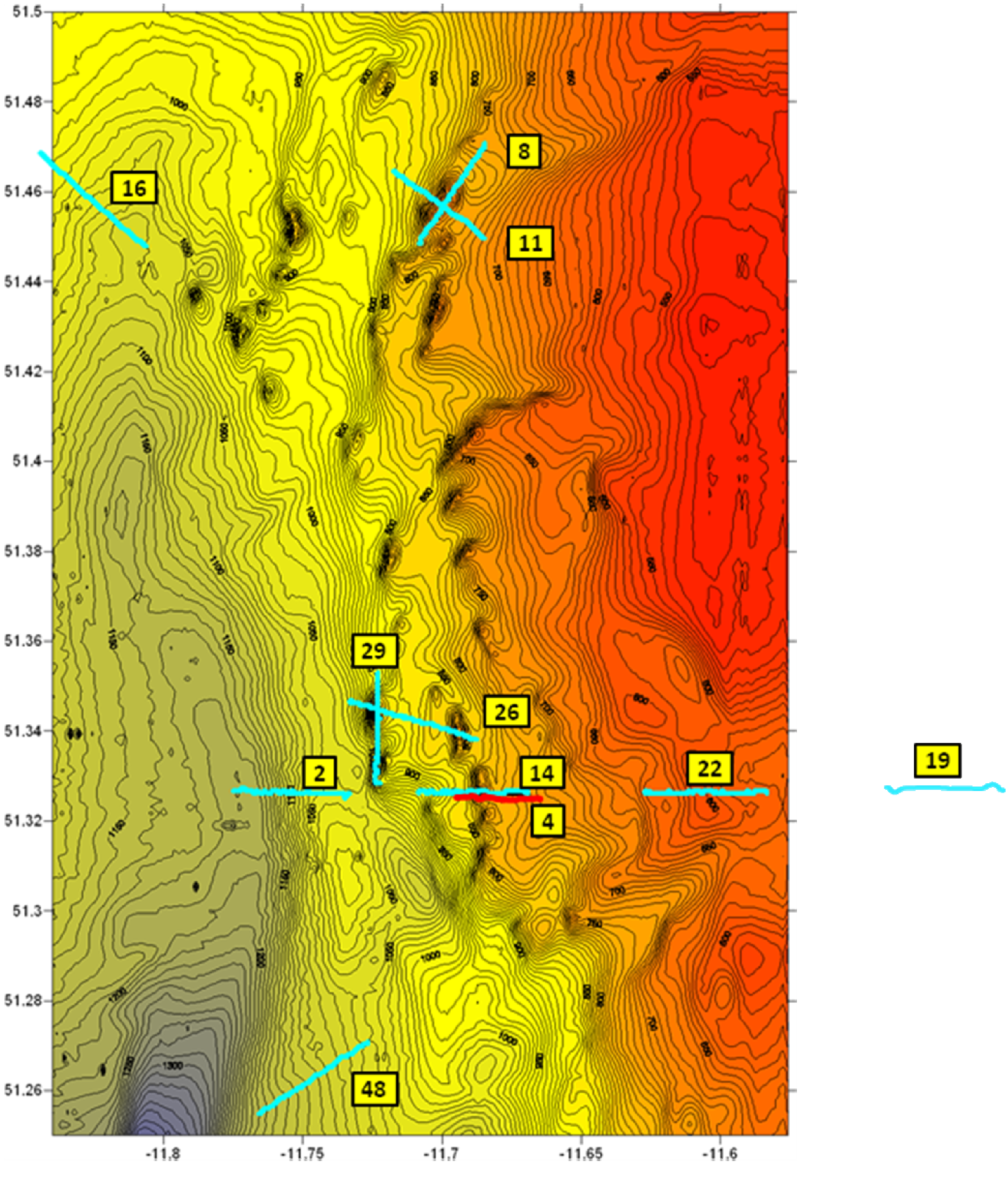

Fig. 12. Tracks of surveys made with tethered videosystem. Survey 19 is correctly plotted against other surveys, but falls outside the underlying map.

4.1.7 NIOZ-landers

The ALBEX-1 lander was deployed 4 times successfully for short periods. The ALBEX-4 lander was recovered, and redeployed for 1 year at the top of the Galway Mound. The BOBO-lander was deployed for 7 days in deeper water but still in the protected area. A list of the lander deployments is shown in Table 5.

Table 5. NIOZ lander deployment positions.

Station	Lander	Area	Duration	Depth	Remark	coral
3	BOBO	Possible sponge area	7 days	1186		-
6	ALBEX1	at CTD transect	25 hours	720		-
7	ALBEX4	Galway Mound	after 1 year	820	Recovery	+
15	ALBEX1	at CTD transect	19 hours	614		-
20	ALBEX1	at CTD transect	19 hours	732		-
27	ALBEX1	at CTD transect	25 hours	841		-
47	ALBEX4	Galway Mound	for 1 year	793	Deployment	+

4.2. Whittard Canyon

4.2.1. BOBO-lander

The BOBO-lander was deployed twice here (Fig. 13). Once for a short-time (4days 10 hours) at 3566m depth, and at the end of the expedition for 1 year at 4166m depth.
Analysis of a 10-month record of near-bottom currents, temperature, salinity and turbidity, recorded by a BOBO lander at 1500 m depth in Whittard Canyon (recovered just before the cruise, while it surfaced unexpectedly to early), revealed the existence of strong currents in the upper canyon reaches. On several occasions the current speed at 1 m above bottom exceeded 70 cm s-1. Two high current speed events, recorded on 15 November 2009 and 14 January 2010, bore characteristics of a sediment gravity flow: an abrupt increase in current speed and change to down-canyon direction, accompanied by a sharp rise in turbidity. During the most intense event in January 2010, the instantaneous near-bottom sediment flux during the peak of the event was estimated to be in excess of 1 kg m-2 s-1 in down-canyon direction. For comparison, the typical average rate of sediment accumulation at that depth as determined from 210Pb in sediment cores is on the order of 10 kg m-2 y-1. During the last recorded high current speed event on 19 July 2010 the BOBO lander was dislodged from its anchors and surfaced prematurely. During the short deployment at 3566 m depth from 23-28 September 2010, only relatively weak currents were recorded, not exceeding 15 cm s-1.

4.2.2. Video surveys

In total 7 video-surveys with a length of more than 1 hour were performed (Fig. 13). A preliminary check of the footage revealed that the sediment had a fluffy layer on top that was easily blow away by the movement of the video frame 2-3m above the bottom. Further few animals were visible among which were Umbellula, Cerianthus, sea-cucumbers and fish.

4.2.3. Sediment sampling

At the end of every video survey a sediment sample with the boxcore was tried. At the very shallow part (170m) at the beginning of the canyon only one of three trials was successful. In three instances we used the smaller boxcore instead of the standard large boxcore (50cm diameter) with video system because of time constraints. For more undisturbed samples 4 almost perfect Multicore samples were taken. Two trials wit a pistocorer were made (Fig. 13). The first only retrieve 35 cm, but the second retrieved a sample of about 2 meters.
The objectives of this work were to establish whether any recent down-canyon sediment transport can be detected in the lower canyon. Thin layers of fine silty sand alternating with soft watery hemipelagic ooze were found in boxcores from the canyon thalweg at depths between 4000 and 4400 m depth, suggesting relatively recent sediment gravity transport through the canyon. Dating with 210Pb will be used to establish the date of gravity transport events. A boxcore retrieved from 4392 m depth in Whittard Channel contained a coarse sandy turbidite layer and debris flow deposit, in which fragments of scleractinian corals were

common. These corals must have been transported from the upper reaches of the canyon and upper slope around 1000 m depth, where living corals were observed during ROV explorations by HERMIONE partners NOCS and UGhent.

4.2.4. CTD and calibration of OBS

Only one CTD was taken and this was done mainly to calibrate four OBS with the CTD instruments. Water was filtered to measure the dryweight of the suspended particles. This will be used to quantify the OBS signal.

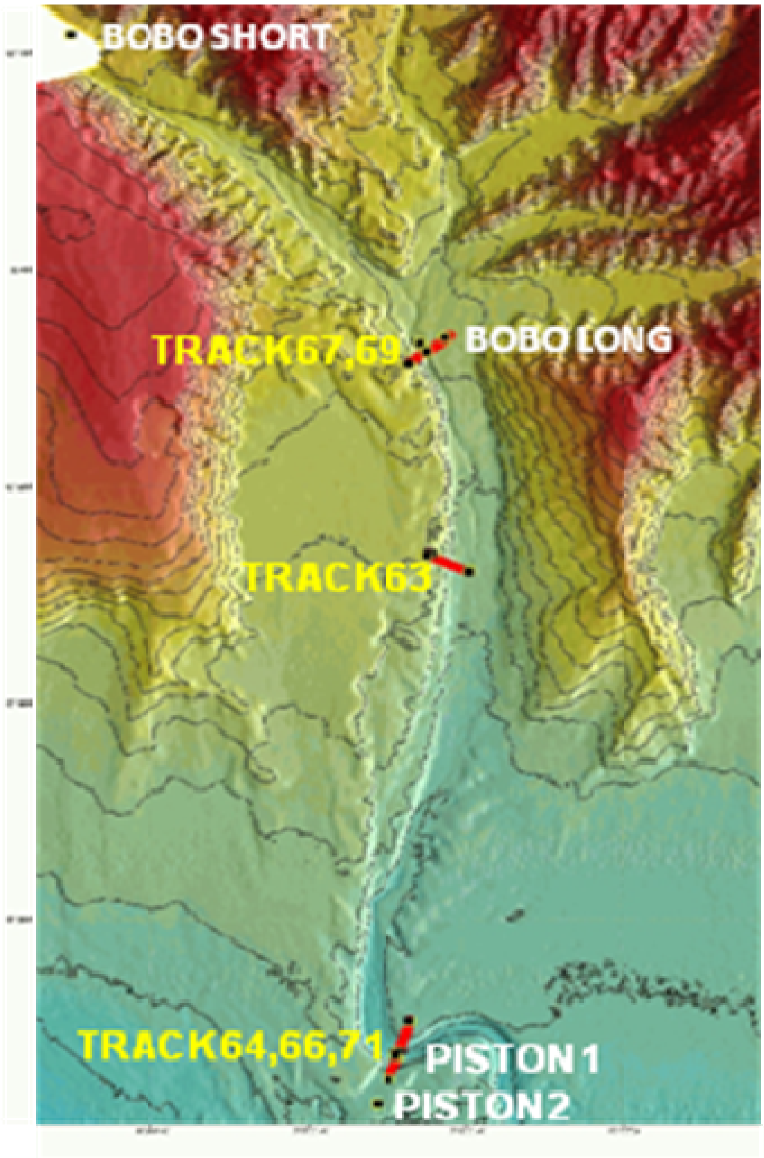

Fig. 13. The Whittard Canyon with indication of the 2 BOBO lander positions (dot) and the videotracks (red lines). The other black dots indicate multicore and boxcore positions. Underlying map: courtesy of V.Huvenne, National Oceanography Centre, Southhampton, UK.

5. REFERENCES

Duineveld GCA, Lavaleye MSS, Berghuis EM, DeWilde PAWJ (2001) Activity and composition of the benthic fauna in the Whittard Canyon and the adjacent continental slope (NE Atlantic). Oceanologica Acta 24: 69-83

Foubert, A., Beck T, Wheeler AJ, Opderbecke J, Grehan A, Klages M, Thiede J, Henriet H - P. & Polarstern ARK-XIX/3a shipboard party (2005) New view of the Belgica Mounds, Porcupine Seabight, NE Atlantic: preliminary results from the Polarstern ARK-XIX/3a ROV cruise. pp. 403-415. In: Freiwald, A. & J. Murray Roberts (eds), 2005. Cold-water corals and ecosystems. pp. i-xxxii, 1-1243. Springer: Berlin.

Lavaleye MSS, shipboard scientific crew, 2008. HERMES and CoralFISH program. Biodiversity, ecosystem functioning and food web complexity of cold water coral reefs in the NE Atlantic (Belgica Mound Province, Hatton Bank), the relation between fish and coldwater corals, and testing the MOVE. R/V Pelagia Cruise 64PE291-292, 10 June-16 July 2008. 90pp

Otto S & Balzer W, 1998. Release of dissolved organic carbon (DOC) from sediments of the NW European Continental Margin (Goban Spur) and its significance for benthic carbon cycling. Prog. Oceanogr. 42: 127–144.

Priede IG & Merrett NR (1998) The relationship between numbers of fish attracted to baited cameras and population density: Studies on demersal grenadiers Coryphaenoides (Nematonurus) armatus in the abyssal NE Atlantic Ocean. Fisheries Res. 36(2-3): 133-137.

Reid GS, Hamilton D., 1990. A reconnaissance survey of the Whittard Sea Fan, southwestern approaches, British Isles. Marine Geology 92, 69–86.

Tyler P et al., 2009. Europe's grand canyon: Nazaré submarine canyon. Oceanography 22(1): 46-57.

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APPENDIX 1

SCIENTIFIC PARTY AND CREW OF THE CRUISE 64PE324

Scientific Party

No	Name	Institute and profession
1	Marc Lavaleye	Chief scientist, NIOZ biologist
2	Gerard Duineveld	NIOZ -biologist
3	Magda Bergman	NIOZ -biologist
4	Henko de Stigter	NIOZ-geologist
5	Marcel Bakker	NIOZ-technician
6	Jan Dirk de Visser	NIOZ-technician
7	John Cluderay	NIOZ-electrotechnician
8	Evaline van Weerlee	NIOZ-analist
9	Libby Kochen	Master student RUG
10	Nina Langwald	Master student RUG
11	Paul O' Connor	Marine Institute Ireland

List of the crew

No	Name	Rank
1	Corky Burkhard	Captain
2	Bert Puijman	First officer
3	C.J. de Wannemaeker	Second officer
4	Klaas Kikkert	Chief engineer
5	M. Frankfort	Second engineer
6	Roel van der Heide,	Able bodied
7	Martin de Vries	Able bodied
8	Ger Vermeulen	Able bodied
9	Jose Vitoria	Able bodied
10	John Dresken	Cook
11	Fred Hymstra	Assistant cook

APPENDIX 2

GFF FILTERS FOR BIOLOGICAL ANALYSES

Station	CTDbottle	depth m	parameter	filter	volume in L	remarks
1	2	1160	pigments	1926	8	
	4	1160	C	1650	8	
	5	1160	N	1654	8	
	6	1160	lipids	1913	8	milliQ rinsed
	8	32	C	1655	4.5	
	9	32	N	1651	4.5	
	10	32	pigments	1912	4.5	
	11	32	lipids	1927	4.5	milliQ rinsed
5	2	700	C	1649	9 or 10	
	3	700	N	1652	10	
	4	700	pigments	1911	9 or 10	
	5	700	lipids	1915	10	
	10	33	C	1646	4	
	10	33	N	1648	4.5	
	11	33	pigments	1916	4.5	
	11	33	lipids	1917	4.5	
12	2	592	C	1615	10	
	3	592	N	1610	10 or 9	
	4	592	pigments	1918	10	
	5	592	lipids	1922	9.78	
	10	32	C	1647	4.5	
	10	32	N	1191	4.5	
	11	32	pigments	1914	4.5	
	11	32	lipids	1919	4.5	contaminated
17	2	363	C	1609	9.83	
	3	363	N	1608	10	
	4	363	pigments	1925	9.71	
	5	363	lipids	1924	9.69	
	8	37	C	1612	5	
	9	37	N	1607	4	
	10	37	pigments	1921	5	
	10	37	lipids	1920	5	
24	3	1008	C	1601	9.915	
	2	1008	N	1606	9.98	
	4	1008	pigments	1720	<10	
	5	1008	lipids	1923	9.94	
	12	23	C	1604	5	
	12	23	N	1605	5	
	13	23	pigments	1721	5	
	13	23	lipids	1722	5	

Station	CTDbottle	depth m	parameter	filter	volume in L	remarks
30	5	187	C	1643	9.95	
	2	187	N	1645	10	
	3	187	pigments	1714	10	
	4	187	lipids	1719	7.98	
	6	187?	C	1602	4.23	
	6	187?	N	1603	4.14	
	7	187?	pigments	1717	5?	
	7	187?	lipids	1718	4.09	
32	4	50	C	1640	5	
	4	50	N	1644	5	
	5	50	pigments	1716	4.5	
	5	50	lipids	1715	4.5	
43	2	250?	C	1638	10	
	6	250?	N	1637	10	
	5	250?	pigments	1712	9.62	
	8	250?	lipids	1711	10	
	12	30?	C	1641	5	
	12	30?	N	1642	5	
	13	30?	pigments	1708	5	
	13	30?	lipids	1713	5	

APPENDIX 3A

PHOTOGRAPHS OF BOXCORE SAMPLES FROM BELGICA MOUND AREA
Station 4 missing, station 52 with 3 pictures (with live coral, live coral removed, and coral rubble removed for incubation chambers). All cores with diameter of 50cm.

APPENDIX 3B

PHOTOGRAPHS OF BOXCORE SAMPLES FROM WHITTARD CANYON AREA
Station 62, 65 and 68 are small boxcores (30cm diameter), all others large cores (Ø50cm)

APPENDIX 4

LIST OF SPECIES & SEDIMENTS COLLECTED FOR STABLE ISOTOPES/LIPID ANALYSES

Station	Depth (m)	Species/Material	Group	Gear
6	720	Bathynectes (3x)	Crustacea	Trap on lander
		Amphipoda (100x)	Crustacea	Trap on lander
7	820	Porania (starfish) (1x)	Echinodermata	Boxcore
		Calliostoma (1x)	Gastropoda	Boxcore
		Hydrozoa	Cnidaria	
9	100	Plankton		Vertical net
10	200	Plankton		
15	614	Amphipoda	Crustacea	Trap on lander
19	434	Sediment (2 syringes)		Boxcorer
20	732	Ampipoda	Crustacea	Trap on lander
23	480	Actiniaria (flat, 4x)	Cnidaria	Dredge
		Actiniaria (on hermits, 2x)	Cnidaria	
		Actinauge (1x)	Cnidaria	
		Epizoanthus (21x)	Cnidaria	
		Polychaeta (1x)	Polychaeta	
		Polychaetes (shelled tubes,5x)	Polychaeta	
		Liocarcinus (crab, 2x)	Crustacea	
		Paramola (crab, 1x)	Crustacea	
		Ebalia (crab, 5x)	Crustacea	
		Shrimps (2x)	Crustacea	
		Hermit crabs (4 species, 50x)	Crustacea	
		Buccinum (2x)	Mollusca	
		Neptunea (1x)	Mollusca	
		Colus (4x)	Mollusca	
		Euspira (3x)	Mollusca	
		Astarte (1x)	Mollusca	
		Limopsis (3x)	Mollusca	
		Ophiuroidea (brittle star)	Echinodermata	
		Echinus (17x)	Echinodermata	
		Crinoidea (3x)	Echinodermata	
		Trisopterus (1x)	Pisces	
27	841	Ampipoda	Crustacea	Trap on lander
28	865	Sponges (divers)	Porifera	Dredge
		Aphrocallista	Porifera	
		Spongoserites (3x)	Porifera	
		Sponge ball (4x)	Porifera	
		Lophelia (100x)	Cnidaria	
		Madrepora (100x)	Cnidaria	
		Seawhip	Cnidaria	
		Hydrozoa	Cnidaria	
		Actiniaria	Cnidaria	
		Gorgonaria (30x)	Cnidaria	
		Small Gorgonaria	Cnidaria	
		Desmophyllum (10x)	Cnidaria	
		Leiopathes (100x)	Cnidaria	
		Black coral	Cnidaria	
		Slimy black coral (5x)	Cnidaria	
		Spiral black coral (10x)	Cnidaria	
		Hesionidae, Leocrates (100x)	Polychaeta	
		Eunice norvegica (100x)	Polychaeta	
		Bathylasma (barnacle) 4x	Crustacea	
		Scalpellum 1x	Crustacea	

Station	Depth (m)	Species/Material	Group	Gear
28 (suite)	865	Verruca (barnacle) 2x	Crustacea	Dredge
		Rochinia (2x, crab)	Crustacea	
		Bathynectes (2x, crab)	Crustacea	
		Xantho pilipes (3x, crab)	Crustacea	
		Munida (5x)	Crustacea	
		Chlamys (50x)	Mollusca	
		Delectopecten (10x)	Mollusca	
		Calliostoma (2x)	Mollusca	
		“Gibbula” (20x)	Mollusca	
		Turridae (3x)	Mollusca	
		Volutomitra (1x)	Mollusca	
		Asperarca (100x)	Mollusca	
		Cuspidaria (2x)	Mollusca	
		Crinoidea	Echinodermata	
		Cidaris (40x, seaurchin)	Echinodermata	
		Orange brittle star (100x)	Echinodermata	
		Large brittle star (4x)	Echinodermata	
		Henricia (1x, starfish)	Echinodermata	
		Echinus (5x)	Echinodermata	
		Porania (1x, strafish)	Echinodermata	
		Goosefeet starfish (4x)	Echinodermata	
		Ascidiacea (10x)	Tunicata	
45	100	Plankton		Vertical net
	200	Plankton		
46	821	Small Gorgonaria (3x)	Cnidaria	Dredge
		Leiopathes (4x)	Cnidaria	
		Cidaris (1x)	Echinodermata	
		Synaphobranchus (1x)	Pisces	
48	1055	Lophelia	Cnidaria	Boxcorer
50	783	Lophelia	Cnidaria	Boxcorer
		animals		
51	782	Lophelia	Cnidaria	Boxcorer
		Soft coral	Cnidaria	
		Soft corals on dead coral	Cnidaria	
		crab	Crustacea	
52	782	Madrepora	Cnidaria	Boxcorer
		animals		
53	789	Hydrozoa	Cnidaria	Boxcorer
54	1185	Sea urchin	Echinodermata	BOBO lander
58	174	animals		Boxcorer
75	4000	Sediment(surface+syringe, 3x)		Multicorer
76	3717	Sediment (syringe,3x + syrface, 3x)		Multicorer
77	4166	Sediment (syringe,3x + syrface, 3x)		Multicorer
79	3887	Sediment (syringe,3x + syrface, 3x)		Multicorer

APPENDIX 5

CRUISE BLOG

10 Sept 2010 Friday

The RV Pelagia has recovered from the party that was held yesterday for people of NIOZ. During a barbecue on deck they had the chance to see for themselves how much the overhaul at the wharf in Spain renewed the ship. Today it is very busy as the ship has to be loaded with containers and equipment in one day, because we planned to leave the harbour of NIOZ on Texel at 22:00 this evening. This plan has to be abandoned soon as one of the deep-sea winches malfunctions, and we need it to be able to trawl at great depths (4000m) in the canyon. A specialist from the continent is found to come on such short notice and agrees to work through the night to try to fix the problem. As we have no internet on the Pelagia for some unknown reason, he and Klaas had to wake up the harbour master Ewout, to access the necessary data on internet to be able to repair the winch. This longer stay in the harbour is used by the engineers of the ship to repair one of the smaller cranes, while other specialists do the finishing touch on the repair of the big crane. The participants of the cruise all arrive, though some make the choice of spending a last night at home.


In the middle of the night people are still working on the crane and winches

11 Sept 2010 Saturday

In the morning the specialists are gone after successfully repairing the winch and crane. The last things are loaded on the ship, and Hans Malschaert had an unexpected early start in his free weekend for trying to repair the internet connection. Jan Dirk and Marcel are busy of winching the extra 2000m of steel cable on the repaired deep-sea winch. To their surprise the reel had two separate unconnected cables on top of each other, so they have to connect the two to each other before they can proceed. Jack arrives to help them out. After continuing with the winch it breaks down again to our despair. The specialist is already gone and anyway does not have time today to help us out. So we decide it has no use to wait any longer in the harbour as it is unknown if and when the winch can be repaired. So we have our hopes on the ships engineers, who will try to find the cause of the malfunction during our cruise. At 13:00 we finally leave the harbour and the ship heads for The Channel to steam to our research area in the Porcupine Bight, south of Ireland. The weather is not so suited to the new comers on board, so seasickness takes its toll. We know that this will vanish in a few days, which they can not imagine at this moment. Luckily the unpacking of our two containers with material was already done during the delay in the harbour, and further it will take at least 3 days of steaming to reach our destination. So we are not in a hurry to build up everything right now.

No internet connection,so what do you do during the transit?

12 Sept 2010 Sunday

Today we sail through The Channel between Dover and Calais. The white cliffs of Dover are clearly visible. This is a busy traffic lane for large ships, so the bridge has to be very alert. Evaline is building up the filtration unit in the cool container. Gerard is improving the maps of the research area and setting up our own GPS system. Henko is servicing his BOBO lander that he picked up form the Atlantic a week ago with an Irish fisherman. Unexpected this lander which was deployed last year released itself and popped up on the surface. Because it had a satellite beacon we were warned that NIOZ equipment was drifting on the ocean. The rescue operation was successful, and here it is after a very quick refit at NIOZ, to be deployed again during this cruise. Yesterday Magda and I started up the new datalogging program on the computer, called Casino. But for some reason it stopped this afternoon, and we were unable to start it again. By creating a new cruise we circumnavigated the problem, and got it running again. This program is crucial to the expedition as it stores every 30 seconds all the basic data, like position, depth, actions, surface temperature and much more. During the obligate safety drill outside on the front deck, everybody was present with life-jacket and survival suite. In the evening Henko and I give an introduction for the crew members and the participants of the intended program.

Henko, the only geologist on board, tries to escape form biologist in his BOBO-lander.

13 Sept 2010 Monday

It is sunny weather. We pass the south of England and are at 18:00 near the Scilly Island. This will be the last land we will sea for more than 2 weeks. The landers are being built up. Henko attaches his ADCP, a special current meter, to the long-legged BOBO lander. The ALBEX lander which has short red feet is furnished with flash, radiobeacon, datalogger, currentmeter and HD-video camera. Gerard is busy setting up the incubation chambers in the other cool container. This is for getting an idea of the activity of animals and sediment by measuring their oxygen consumption.

Gerard, Evaline and Magda testing the incubation set-up in the cool-container.

14 Sept 2010 Tuesday

There is quite a swell, and people have slept badly because of the rolling of the ship and the very irritating squeaking noises of the beds. Other participants must have suffered too of these noises, as there are multiple traces of attempts to stop these noises. Gerard found a few dozen toilet paper rolls in his cabin, wedged between the bed supports and the walls. But even this did not work enough, and he finally switched to another cabin. The internet connection did not establish itself as Hans had hoped, and besides our e-mail connection was lost yesterday too. It means our only connection with the mainland is the satellite telephone on the bridge. This of course is major loss for all people onboard. By phoning frequently with the computer technicians at NIOZ we try to find the problem. John, our electrotechnician on board, is quite busy with it, but all the suggestions from land do not prove to be the solution so far. The only thing we find out is that the mail works only partly. We can send emails, but cannot receive anything. Our two students, Libby and Nina, are still a bit seasick, and we get worried a bit, and suggest them to take a seasickness pill. For Nina this works like a miracle, and she is up and running again, trying to catch up by talking a lot.

Jan Dirk found another use for our now workless deep-sea trawl.

15 Sept 2010 Wednesday

Finally we have arrived in the research area. We are at the NE corner of the Porcupine Bight, a deep very large bay in the continental shelf of Ireland. At this particular site deep-sea corals abound on a few sea-mounds at about 800m depth, called the Belgica Mounds. Of course no trace of it can be seen at the surface of the ocean, and indeed most people don’t know that reef forming corals also grow in the deep-sea, not just in tropical seas. Because of recent research, in which NIOZ also played a role, the uniqueness of these coral communities was recognized. As they are very easily destroyed by bottom trawling and negatively affected by bottom exploration, it was felt necessary to protect at least part of these coral areas. The Belgica Mounds are now indeed protected by the Irish, and we got a special permit from Ireland to do more coral research in this area. We start with a CTD-Rosette sampler to see if there are any layers in the water column with a higher concentration of particles. For this purpose the water collected at different depth is poured over a very fine filter. The filter with retained particles is stored in the freezer and will be analysed at home. It is all to solve the question where these rich coral communities get their food from. Libby and Nina are up, a bit frail, but sitting in the wetlab, watching the CTD going in the water. After paying out 300m of cable the CTD-winch stops with a loud bang. The apparatus for spooling up the cable got stuck against the support of our big winch with 10km of synthetic cable. Finally the problem is solved by lifting the heavy 10km winch a few centimetres with hydraulics. But then the counters for cable length and speed do not react anymore. This makes it difficult for the winch man to control this. Paul, our Irish observer on board, turned out to be a biology student, and is actively helping us. He now controls the CTD-room where the data of depth, temperature, salinity, turbidity and fluorescence are available online. He guides the winch man by telling every 50m where we are. The CTD with full bottles arrives safely on deck again, and Evaline, Nina and Libby tap the bottles, and will be busy for the whole day to filter this water. At the end of the day it turns out that the pump of the filtration unit has not worked properly during the day, which is why it took so long to filter. We could not help to have a good laugh over the poor girls suffering so long in the cool container (10 degrees) unnecessary. The pump was replaced which helped a lot. Our first hopper survey with a digital camera is on the deeper part of a transect south of the main coral mounds. Instead of corals it show lots of so called dropstones, that where brought here by icebergs in the past. When icebergs melted the stones had no floatation anymore and fell to the seafloor. At the end of the survey there is a sandy patch, where we drop the BOBO lander to get some data about the near-bottom currents. The lifting of the long-legged lander over the containers into the water went well. It is unhooked from the cable, and then it sinks on its own to the bottom of the sea. We now have some more space on the hind deck, although there are still 2 landers standing. Another video survey is carried out and some live horny corals (gorgonians) and patches of coral rubble (dead) show up on the images. During both surveys a bottomsample was taken at the end of the survey line, and this is sieved for macrofauna by Nina. When the camera is back on board, John discovers that the recording of the video didn't go too well down there, and we have lost more than half of it. Changing the recording unit with a spare one hopefully will give better results tomorrow.

Paul, Nina, Libby, Gerard and John waiting for the first water samples.

16 Sept 2010 Thursday

We start with a CTD, so filtering the water can begin early. In the meantime all equipment in the ALBEX-lander is programmed. A mackerel as bait is attached to the frame in view of the HD-video camera. This lander is deployed on a small mound with gorgonians near our southern transect. Then comes the exciting moment to recover our long-term lander, which has been here for almost one year on the bottom. It has a novel fooddispenser together with our new generation of HD-video camera. As it was a prototype that was ready at the last moment, it would be a small miracle if it worked well this first time. Contact with the lander is immediately established, so it is still there. After releasing the ballast, the bright orange flag pops up on the surface after about 17 minutes. The lander is hooked on and safely hoisted on deck. Lots of featherlike hydroids (colonies of very small animals looking like sea-anemones) have fouled the frame during the one year deployment. We also collect a dozen of live snails that were probably grazing the hydroids, and one cushion starfish from the frame. On a closer look it proves that we were very lucky, as the bed in which the ballast weight of 260kg was lying is badly corroded, and would not have lasted much longer. This would have meant that the lander would have lost its weight, causing it to surface to early. As we discover that the satellite beacon is flooded, we would never have got any alarm. The lander could then have drifted anywhere, and would be lost for us, unless it would wash ashore onetime somewhere. We check the lander further, and to our big surprise the novel food dispenser, that was programmed to offer every 20 days a full pot of sardines to attract scavengers, has worked very well. Most of the sardines in the pots are almost completely gone (eaten away). When reading out the camera we get a heavy blow. It still works perfectly, but did not record anything! Checking the sphere with lithium batteries that powers the camera, we notice that it was flooded too. We never had problems like this in our previous long deployments, so we guess we were very lucky then. Another blow is that the sediment trap did not complete its program. Only 5 of the 12 pots were turned in front of the funnel to catch sinking particles, but then the motor was flooded through the spindle. These motors are expensive and normally very reliable. What rest of the long-term deployment are the records of current speed and direction, temperature, turbidity and fluorescence. And this is a very nice set of data, not previously measured in this area, but of course we had hoped for more. The program on board is continued with 2 camera surveys over Poseidon Mound, which has a cover of some live coral and gorgonians. This time the 4 hour of video is recorded perfectly. A plankton haul in between the 2 surveys completes the program for today.

The 1 year old hydroids on the long-term ALBEX lander.

17 Sept 2010 Friday

After the CTD the ALBEX lander which was deployed yesterday is recovered. The camera directed to the mackerel (now gone) recorded only 15 minutes because of a failure of the battery sphere. We have a spare and replace it immediately. The traps that Magda had attached to the lander caught 3 swimming crabs and about a thousand amphipods. These last animals are small shrimp-like creatures and are the scavengers of the deep-sea. Any bait will be attacked by them and eaten clean within a few days. Here however, larger scavengers got the bait first. We deploy the lander again with another mackerel and now hope to catch these animals on our video images. We also redo the lost video transect of 15 Sept. This time without any problems. The technicians are busy building up the pistoncore for tomorrow. The area where Henko wants his pistoncore is first video-surveyed today. It turns out that the area is not very interesting for a geologist and the core is postponed for the time being. The mud sample taken by the boxcore is undisturbed and Gerard takes a core out of it for incubation. The surface is literally covered with dropstones. On one of the bigger ones sits a harnessed sea-cucumber (see photo). The rest of the block of mud is sieved for macrofauna. In the evening the internet and email connection is finally fixed and running.

A boxcore sample with dropstones, sea-cucumber and incubation chamber.

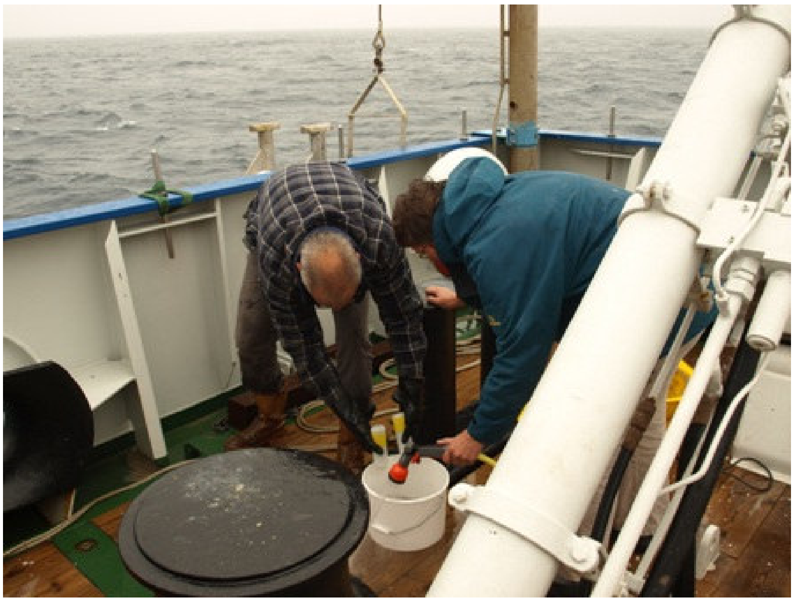
18 Sept 2010 Saturday

After a shallow CTD at 350m the ALBEX lander is picked up for the second time. This time the video worked well, and it shows that Mora fishes of 50cm length arrive quickly and attack the bait vigorously. Within one and a half hour the bait is completely gone. A very large crab, called the carrier crab, shows up too. With its long legs and nippers it looks impressive. Besides, it holds with the hooks of its 2 hind legs a large piece of coral above its head, probably to protect it self from shark attacks. The traps caught some amphipods and a few tiny snails, which had to climb more than a meter to get into the trap. The lander is quickly prepared again for another deployment and dropped in the water after lunch. The videosurvey ends with a boxcore sample. The sample shows a sandy surface with some stones and a sea-urchin. The get some more and bigger animals for foodweb studies a dredge is launched. A sandy area far away from the main coral areas is picked to drop the dredge. The final catch consists of stones (one bucket full), some 50 hermitcrabs (4 species), a few whelks, bivalves, feather stars, anemones, crabs, one fish and a bunch of sea-urchins. We also caught 17 small colonial anemones which are used by hermitcrabs as a home. This is called a symbiosis, because the hermit gets protection from the anemone with its stinging cells, and the anemone gets a free ride and is protected from being slowly buried alive. Everything is sorted, labelled and put into the freezers for later analyses. So far we are lucky with the weather in this area in this time of the year. Weather predictions stay good too.

Hermit crabs from 450m depth.

19 Sept 2010 Sunday

First another CTD on our transect from shallow to deep water over the coral area. At the end of the expedition we hope to have a set of data to construct a crosscutting of the whole water column, in order to find indications if there are particles that can feed the coral community and where these come from. The ALBEX lander is recovered, and the video images show that the 2 mackerels (bait) vanish in 25 minutes by four Mora fishes. We can see how they tear with force big parts of the mackerels. In the mean time we are busy to prepare the long-term lander. Gerard and Evaline are cleaning the fooddispenser with the 12 pots of sardines on oil. These sardines (or what is left of them) have been at the seafloor for almost one year, and have developed a certain smell that is not particularly pleasant. It seems certain people are avoiding during the rest of the day for some reason. We perform 2 surveys with the hoppercamera over one of the southern mounds, once from East to West, and once from North to South. Particularly the west side of the mound has live corals and some orange sea-fans (gorgonians). During the first hopper our datalogging system Casino has stopped. Before we notice and before Magda and I get it running again more than half an hour of data has been lost. Luckily we have our own independent GPS systems, that still can tell us exactly what track the camera has travelled over the sea bottom. The core of sediment at the end of the first track is too full, which means it is disturbed and cannot be used for quantitative research (abundance, biomass and biodiversity of the fauna). We sieve it anyway as it may contain some interesting unknown species. These things can happen if the bottom is much softer than thought. We catch a good number of animals in the dredge we perform. We call it a dipping dredge as we do not allow it to fish over some distance. After it is laid on the bottom it is immediately hauled in again. We get a fair bit of coralrubble with some live black corals and a nice piece of sea-fan. The black corals look orange because of their polyps, but when dead only show their black skeleton. These are used for incubations. Gerard is very surprised of the high activity of these 'corals', they consume a lot of oxygen. With almost all hands we screen the catch meticulously, and store all animals in the cool container for later precise sorting. It is already dark when it is finished.


Gerard and Evaline cleaning the smelly sardine pots.

20 Sept 2010 Monday

Of course we start with a CTD again, this time at a very shallow station of 210m depth. But for a change this will not be the only one today. We have planned 12 stations on our southern transect. The stations are lying 2 miles apart, and the deepest will be at 1200m. A whole day work! Especially Henko will have a busy day as he wants to filter water from all stations! Evaline, Libby and Nina only tap the first station, as their filtering is more labour intensive. When we have done CTD number nine we are close to the position of the baited lander, and pick it up first before we continue with the CTD. I have send Libby and Nina to the front deck to try to spot the lander. They both peer over the waves in the distance looking for an orange flag popping up. We on the bridge, armed with binoculars and with help of the alarm that the radiobeacon on the lander sends when it is at the surface, see it immediately. I let the girls search on their own a bit longer, but finally help by pointing in which direction they have to look. Even for me, having seen this many times, it is still exciting to see the lander popping somewhere in this wide ocean. The video shows again the Mora fishes that finish the bait within the hour. A large carrier crab is running a hurdle with his long legs to reach the bait too, but for some reason it is not to his liking and disappears again now on a slower pace. I am busy the whole day in the cool container to split the dredge catch from yesterday into different species, bag and label them, and store them in the freezer. We use them to identify them properly at home (this will greatly improve our identification of the animals seen on the video footage), but the main reason for collecting them is for the research of the foodweb. By analysing the ratio of stable isotopes of nitrogen and carbon we will get a clue if an animal is a filter-feeder or predator. In all I find at least 50 species in the catch.

Black corals (Leiopathes) with orange polyps will be used for incubations and foodweb research. Height is about 10cm.

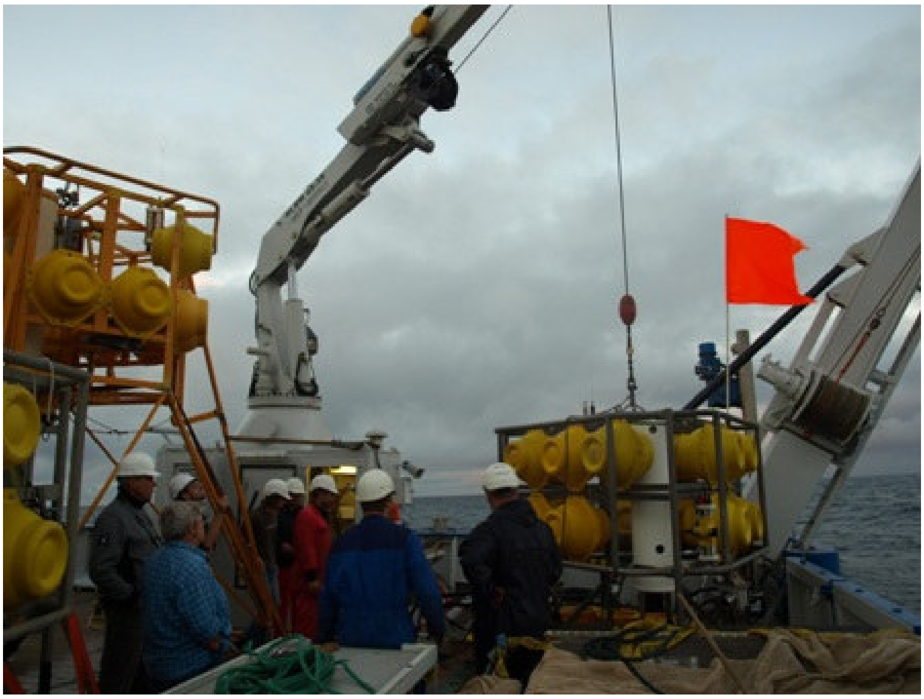
21 Sept 2010 Tuesday

The last CTD in this coral area is coming up in the morning. The technicians Marcel and Jan Dirk are very busy since yesterday to repair the ballast release mechanism of the long-term ALBEX lander. This part was corroded heavily during the one year deployment here. First they try to interchange it with that of the other lander, but it proves to be not exactly the same and besides is quite worn too. We hope they manage to fix it this afternoon, as we have planned a test deployment with the long-term lander. In the meantime we can not use the large winch with 10km synthetic wire, because they cannot do two things at the same time. The weather is not nice, rain and windforce 7. We dredge for more animals; this time in a stony area. As it is a dipping dredge we catch only a few buckets of stones with very few animals. If we wash the mud from the stones about fifty strange sea-cucumbers appear. In stead of burrowing in the mud or slowly crawling over the bottom, this species clings to stones with its naked sole. The rest of the animal is covered with calcareous plates for protection. With feathered gills it can filter food particles from the water. Of course it has retracted these tender gills into his armoured body. As the catch is small we try the dredge another time. When hauled in we notice that the net is torn badly, but despite that the catch is much better than the first. We caught some animals that can be used for our incubation experiment, and these are stored alive in aquaria in the cool container at bottom temperature (100 C). With the small vertical net plankton of the upper 200m of the water column is fished. Apart from thousands of tiny, tiny shrimp-like animals (Copepoda) we also catch a 5 cm large jellyfish, called Pelagia. Our research ship, named after this beautiful oceanic animal, is with its overall length of 66 meters much larger. In the mean time the technicians are happy with their repairs, and after all equipment is programmed the long-term lander is deployed for a test. As there is still time we are trying to find the sponge belt. It is known that especially in the Porcupine Bight concentrations of large glass sponges can occur at depth between 1000 and 1200m. We have a crude distribution map based on data from about 100 years ago that indicates that they once lived in the area we are now. But alas we have no luck, and only discover lots of thick spined sea-urchins, called Cidaris. My colleague Gerard has named his sailing boat after this animal, as he likes the animal as well as the name, and also because pronounced it sounds like the Dutch sentence ‘Zie daar eens’ [Look there]. After the heavy rain all day, the thick clouds suddenly break open, the sun appears and the wind is gone. A perfect scenery for the youngsters to start a mud fight with the left-over’s of the boxcore sample.


Mud fight between John and Nina over the left-over of the boxcore sample.

22 Sept 2010 Wednesday

In the morning we recover the longterm ALBEX lander. It worked very well. On the video images we have caught the opening of the pot with sardines, clearly visible by the escaping air and fish oil. To our amazement fish arrive in 3 minutes and immediately put their nose into the fish pot. In one image sometimes 4 fishes are visible. They behave naturally, and are not aware that they are filmed. To achieve this we use infra-red light which can not detected by most fish. We now work hard to get the lander ready for its one year deployment. We gamble high by attaching another video camera which will operate completely independent of the other camera. Chances of getting video images of scavengers attracted by our fooddispenser become higher, and if both cameras work well we will have video shots every half hour. We have good hopes that the two new battery spheres will not be flooded this time as improvements have been made. Of course these long-term deployments are always very risky business, and few institutes carry out this kind of research. During the preparation we take a few boxcore samples from Galway Mound, an area covered with a very rich coral community. With our video guided sampler we manage to grab some living pieces of the two reef-forming stony corals, Madrepora and Lophelia for our experiments. Because of the second camera and extra battery sphere an extra float seems necessary. With some improvising we manage to attach it to the now quite crowded lander. As we want the lander to stand quite firm on the seafloor we inform the technicians that we like to use the heavy ballast weight of 320kg instead of the normal weight of 260. Normally this is no problem, but now with the new made bed for the weight, it doesn’t fit even after some quick adaptations. As we still have to pick up the BOBO lander, preferable during daylight, it is decided to do that first. That buys us more time for the long-term lander. Picking up the BOBO is quick and without problems. Steaming back to Galway mound cost one hour, but than everything is ready and the lander is deployed successfully from the back side of the ship. This is our last action at the coral area, and the ship now heads for the Whittard Canyon more than half a day away from here.



The last action at Belgica Mounds: the deployment of the lander for one year.

23 Sept 2010 Thursday

The ship arrives at 12:00 at the first station of our canyon mission. The Whittard Canyon is a very large canyon running from about 200m to 5000m depth. Through it material can be transport from shallow water to the deep-sea, a bit comparable with a river system. We try to find out if this transport occurs, how often and if this influences the fauna in the canyon and in the deep-sea adjacent to the canyon. The research is part of the HERMIONE project. As the special deep-sea trawl can not be used, because of malfunctioning of the winch, the biology research is severely trimmed. So the geology part will be enlarged. We start at he beginning of the canyon at about 200m depth and take a few boxcores to study the nature of the original material to be transported through the canyon. To our surprise the sampling is problematic. For some reason the fine sand poses a problem for the boxcore. The core is torn from the apparatus, has turned 90 degrees in the vertical, and than got stuck between the frame and the knife, and is now oval instead of round. A strange sight, and of course no sample. After one good sample this happens again, and it is decided to go to the next station which is 6 hours away. I rightly guessed that the sample contains solitary corals and calcareous tube worms (Ditrupa). The tubes look like tusk shells, but contain a bristle worm instead of a mollusc. The technicians take the frame of the boxcore apart and attach it the other way around. They hope this might help. During the transit we spot a large whale about 30m from the ship. After 21:00 we arrive at the station to deploy the BOBO at a depth of 3500m in the canyon.

The BOBO lander deployed in the night with moonlight.

24 Sept 2010 Friday

We start with a video survey in the Canyon at about 4000m depth. The camera is programmed to switch on at a moment when the frame is near the bottom. The camera is indeed switched on but the image stays black. This means that there is something wrong with the lasers and the lamp. As both are not working the most logical explanations is that the safety protection for the lamps and lasers was switched on through some software bug. This safety was build-in to protect the lamp when it surfaces, as otherwise it destroys itself by getting to hot when it no longer has the cooling of the water. So we take a bottom sample and haul the camera in again. The boxcore worked a bit too well, as the core is completely filled with mud, meaning the surface is a bit disturbed. Anyway Henko takes a subcore out of it, and Libby and Nina sieve the upper 10 cm for macrofauna. While John is fixing the problem with the camera, we continue by taking a small boxcore sample at the same spot. Although the surface is cracked, it is good enough for subcoring and sieving. Bruno on the bridge thinks we are now ready at this station and follows the program by starting to steam to the next station. I run up the stairs and explain to him that we are not ready yet at this station as the first video did not work. John has erased the safety from the camera program, and hopes this will solve the problem we had. And indeed it works. The first images show a flat soft sediment bottom with some weak current ripples and with patches of fluff everywhere. This fluff is very easily disturbed and resuspended by the bow effect of the hopperframe. Libby and Nina in turn watch the 3.5 hours of video surveying and make notes of all the animals and other peculiar things they see. This includes a few fishes, 2 very large blue sea-cucumbers formed like a rugby ball (Benthodytes), seapens of 30 cm long (Umbellula), tube-living anemones (Cerianthus), and some hydroids. The boxcore at the end of the track has a crack but is the best so far. In sieving the mud we find a strange cylindrical sea-urchin. Deep-sea sampling takes a lot of time, so with these 3 actions we filled the whole day.

An elongated sea-urchin collected with a boxcore (24 Sept)

25 Sept 2010 Saturday

During the night the ship moved to a bit deeper water (4400m) where the canyon shows a very clear meander. First we have a look with our video equipment. The difference with yesterday is that there are no zigzag patterns of small holes, but instead many so-called fairy mounds. The last are small mounds with a maximum height of 50 cm with a ditch circling around it. The ditch is clear visible by the black holes inside it. The boxcore sample at the end of the survey is good. We discover at 5 cm depth an echiuran worm with a length of 4 cm. The many faecal pallets in its gut system are clearly visible through the skin. At the surface of the boxcore sits a large Komokiacea of 3 cm diameter. It is giant unicellular organism which looks like a furry ball. It is very fragile and will be destroyed if we clean it on the sieve. So it is separately preserved. After lunch the small boxcore is used to get a bottom sample from the southern end of the track. Despite the fact that the problem with the top seal of the corer is only provisionally repaired, the sample is perfect. Again a similar echiuran is found together with a tanaid crustacean. In the meantime the video data from hopper survey this morning are saved (a slow process as we only can read it out on a 1 to 1 basis, meaning that 1 hour of video costs 1 hour), so it is ready again for redeployment. The online video images are quite terrible as they are overlaid with a strange zebra pattern, caused by interference. One of the lasers is probably debit on this. It makes it very difficult to detect special features, and we have small hopes that it will not be visible on the high resolution video stored in the recorder down there. This is the first time that we had such poor image quality during this cruise. Hopes that it will fade away in time do not work out. The sediment sample has half of a fairy mound in it, but we do not discover its maker. Sieving reveals another echiuran worm, coloured green this time. It is definitely echiuran country here. These special worms have a long tongue to lick the sediment surface, but can not retract it into their mouth. If the tongue was not covered with small hairs (cilia) to transport the food particles to the mouth, it would be a true Tantalus torture for the animal. Our video indeed proves to be almost worthless because of the zigzag lines. John will try to find out if he can solve the problem.


Liby and Paul watching and annotating the online video pictures from the bottom of the canyon.

26 Sept 2010 Sunday

We do a third video transect across the canyon, this time just south of were it splits in two branches at a depth of about 3900m. Because of wind and currents we run the transect from west to east. The bottom looks much the same as in the other transects, but this time we notice a lot of white “golfballs” lying on the bottom. Actually they are huge unicellular organism, called Xenophyophoracea, in short Xenos. Sometimes 20 are visible in one image of about 4 square meter. We have to shorten the transect because it is Sunday and then the geologist Henko has a to keep up a tradition of a so called “port-call”. It has nothing to do with a harbour, but everything with drinking port wine. So the boxcore has to be on board before 11:30. In this relatively short time we do not manage to reach the bed of the canyon, and so have to take a boxcore sample on the slope of the canyon. The sample is nice and undisturbed. Henko takes 3 subcores and Nina takes the rest of the sediment for sieving for macrofauna. Evaline has been busy for the last few days in trying to make a small movie of the highlight of the coral video surveys and the baited lander images. These last are shot in HD quality and still give some problems to edit. Just before the party starts, it is ready to be shown on the big screen in the mess room. Drinks and snacks are plenty available, and for most people on board this seems to be more important than the scientific research! Only a few of us see it as a waist of time. The lunch also has a Sunday appearance with a shrimp cocktail and a dessert of crêpes suzettes. But then it is time to work again. A small boxcore is taken and is successful. In the mean time John has been working on the lasers of the videohopper, as he thinks these might be the cause for the terrible video images we recorded yesterday. And he is very confident that he has found the problem and a solution to fix it. We immediately try it out and launch another video survey. Now we start in the canyon, and than move from there to the east slope. The video images are perfect without any interference from the lasers. Paul, Libby and Nina take their turns behind the video screen to note down animals or peculiarities they see. The survey ends with a good boxcore sample which is on board at 20:00. So the rest of the evening is filled by sieving the sample and slicing the subcores. Klaas, our chief engineer, is busy checking the drinking water quality on board. He is puzzling with Evaline how much Chlorine he has to add to make it save on the one side, and still drinkable on the other side.

Nina and Libby sieving boxcore samples in the night.

27 Sept 2010 Monday

The bottom of the deep-sea is like an archive of the past. During million of years particles in the water sink to the bottom of the oceans and form there layer upon layer. Especially the heavier tiny calcareous parts of some algae and Foraminifera form an important and recognizable part in this sediment. For palaeontologist this is a mer-a-boire to study the past. Henko is also very much interested in the past, especially of the activity of the Whittard Canyon. For that purpose he wants to take a long core (several meters deep) from the bottom of the canyon. We use a pistoncore to get such a long core. It is an apparatus with a long hollow pipe with a diameter of about 12cm. On the top end sits a very heavy weight to push it into the sediment. Besides it has a clever device that will suck in the sediment as soon as the pipe hits the bottom. The gravity of the weight and the sucking of the piston together cause the core to penetrate as deep as the stiff sediment allows. We hope for a few meters, but then everything has to go right. Very important is that the core hits the sediment surface perpendicular, otherwise it will not penetrate very deep or even will bent or break the long pipe during impact. We are not lucky this time, the pipe only contains a few centimetre of sediment. The opinions over why it failed are divided. Henko thinks the hard clay is probably the cause, while Marcel thinks the weather is too bad for taking a good core. Anyway we do not try it again because of the weather conditions, and the program continues with a videosurvey. The track from yesterday, during which we experienced very bad video because of a faulty laser, will be done again. This is possible as John fixed the problem of the laser. And indeed it works great; we get perfect images, although not very spectacular, apart from a few seacucumbers and fishes. Time has gone fast and it is already dinner time. The weather has improved a lot, and the surface of the ocean is quite smooth. We take this chance to take another pistoncore. At first we think it is a failure again, as the pipe is a bit imploded. But as we push the inner pipe out of the core with hydraulic force, it proves that we have 2 meters of sediment. This great news is a bit overshadowed by the computer network crash. John tries to get it working again.

Henko laughing as a farmer with a toothache (as we say in the Netherlands) with the first failed attempt with the pistoncorer. But the second (right) was worth a round in the bar.

28 Sept 2010 Tuesday

Before breakfast we contact the BOBO-lander. It answers immediately and releases its weights on our command, but strangely enough it rises to the surface at half the normal speed. So the bunch of people on the bridge doing a competition who will spot the first, have to wait much longer as usual. Jan-Dirk who up-to-now always lost this competition, got special fancy glasses designed and fabricated by the crew to help him. And this helped. He spotted the lander at 10:45 local time. At the same time a Spanish fishing vessel with long angling rods passed us close by. The BOBO lander is hoisted on board safely. In rainy weather we steam in northerly direction to the 1500m CTD station. There we deploy the CTD rosette lander. For calibration reasons we attached 3 dataloggers (AE, C5 and BD) with 3 of Henko's turbidity devices (OBS) and one Wetlabs (combines turbidity and fluorescence). Water samples are taken at 7 different depths, and at each depth the CTD stays for 15 minutes to give the dataloggers time to store enough data. So it takes quite a long time, and it is on deck just before dinnertime at 18:00. The planned video survey at this spot is therefore cancelled. After dinner I am reading out all dataloggers, and all worked fine. Henko has a big job of filtering all the water, and will be busy till late this night. Nina typed out all the remarks we made during the video surveys so far.

Another ship with impressive angling gear very close by.

29 Sept 2010 Wednesday

We are back at the deeper part of the canyon, to be exactly at the northern cross transect at about 3900m depth. From the video we learned that there was a lot of fluffy material on the sediment, that was easily blow away by the bow effect of the camera frame. With a multicore we will try to catch this fluff to be able to analyse it. Does this fluff contain a lot of fresh food? In spite of the expected hard clay bottom in the middle of the canyon, the multicore does come-up with a fine set of sediment samples. Only one of the 12 cores is disturbed because of a leakage. The cores are immediately sliced in the cool container. This is a pity for Evaline as she just finished cleaning this container. As spilling sediment is unavoidable we make a complete mess of it again. The 3 larger cores are drained to 1cm above the sediment, then the over standing water (1 cm) is sucked off and kept together with the sliced off upper 3 mm. This will be the sample with a fluffy signature. The rest of the sediment is sampled by pushing in a syringe of 50ml, which is stored in the -80 freezer, to be sliced later at the institute. When the slicing is ready the next multicore sample from the slope of the canyon comes already on board. Also a good sample (again only one core failed). We alter our slicing technique slightly to be quicker and more accurate. After the draining the syringe is inserted immediately. Extra material from the surface is sampled by sucking and scraping till 3mm depth around the syringe. At 17:00 the third multicore is back with a 100% score. This was taken on our middle transect in the canyon. In the mean time the BOBO lander is made ready for its long-term deployment in the canyon. All equipment is programmed and the sedimenttrap filled with fresh vials. The deployment which normally takes only a few minutes is a bit prolonged because the safety pin of the quick release got stuck. But after pushing and turning the lander with a long pole it gets free and sinks to the bottom. Before dinner the last multicore is ready to be launched. At 20:00 it is back on the deck, and taking the syringes and the extra surface material from the 3 large cores is now routine. Henko is still busy with the triangulation of the BOBO, to get a very precise location of the position on the bottom. When he is finally content that the BOBO has landed safely on the right spot in the Canyon, the ship can head for Vigo. Our sampling program for this expedition has now ended.

Gerard and Marc at the multicore. Right: a very successful sample from the canyon

30 Sept 2010 Thursday

In quite a swell we steam in southern direction to NW Spain. It is cleaning and packing time. List of samples in freezers and formalin are assembled, and finally the custom lists are made.

A core from a boxcore sample sliced vertically to show the complicated nature of the layering. Right: the storage container almost half full.

1 Oct 2010 Friday

In the afternoon we already arrive near Vigo, and in the protection of the offshore islands everybody enjoys the barbecue that John prepared. The chief scientist thanks everybody for the good cooperation. The two students Libby and Nina both get a book about the seashore, and to make it a real souvenir to this trip all participants autograph it.

After a speech of the chief scientist in which he thanked everybody for the successful cruise, the barbecue can begin.

2 Oct 2010 Saturday

The new participants for the leg to Las Palmas, for testing the Multibeam and USBL system are brought from Vigo to the Pelagia by a pilot boat. On the way back the pilot boat takes the first people to Vigo. Of course the young people have a first go to get a chance to have a look at the city and do some shopping. Gerard also takes the first boat, because of an appointment with a dentist, as he broke off a tooth a few days ago. Magda is accompanying him in case of complications. The technicians, Henko and Marc have still some business to do and besides have been in Vigo before, so they don't mind to take the next pilot boat, 2 hours later. The wind has picked up, so the ride is a bit rough. But we all arrive safely in Vigo. After a 1 night stay in Hotel Bahia de Vigo we all get up very early to catch a flight to Amsterdam on the third of October.

The first group of participants is picked up by the pilot both to be brought to Vigo.

CRUISE 64PE324 LOGBOOK - BELGICA MOUNDS

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
1	CTD with samples	Begin	15/09/2010 06:44:31	N 51° 19.57926'	W 11° 46.47522'	1182	South transect
1	CTD with samples	Bottom	15/09/2010 09:41:33	N 51° 19.57248'	W 11° 46.4733'	1183	
1	CTD with samples	End	15/09/2010 10:24:40	N 51° 19.57074'	W 11° 46.53582'	1181	
2	Hopper camera	Begin	15/09/2010 12:16:27	N 51° 19.54554'	W 11° 44.02698'	1040	South transect
2	Hopper camera	End	15/09/2010 14:27:49	N 51° 19.58664'	W 11° 46.5156'	1180	last 30 min of video lost
2	Large Boxcore	Bottom	15/09/2010 14:28:53	N 51° 19.58478'	W 11° 46.5231'	1180	South transect
3	BOBO lander	Deployment	15/09/2010 15:31:56	N 51° 19.60944'	W 11° 46.47438'	1186	
4	Hopper camera	Begin	15/09/2010 17:24:03	N 51° 19.5906'	W 11° 40.203'	751	South transect
4	Hopper camera	End	15/09/2010 18:55:56	N 51° 19.5948'	W 11° 42.04986'	889	only first 10min of video retrieved, Boxcore taken
5	CTD with samples	Begin	16/09/2010 06:17:33	N 51° 19.6185'	W 11° 41.13726'	716	
5	CTD with samples	Bottom	16/09/2010 06:39:07	N 51° 19.63914'	W 11° 41.12208'	718	South transect
5	CTD with samples	End	16/09/2010 07:04:58	N 51° 19.6305'	W 11° 41.14464'	718	
6	ALBEX 1 lander	Deployment	16/09/2010 07:36:04	N 51° 19.63368'	W 11° 41.10522'	720	Deploy 1
7	ALBEX 4 lander	Recovery	16/09/2010 09:17:20	N 51° 26.9352'	W 11° 45.55902'	931	long-term lander released
7	ALBEX 4 lander	Recovery	16/09/2010 10:01:49	N 51° 27.08994'	W 11° 44.92626'	820	on deck, 9:32 on surface
8	Hopper camera	Begin	16/09/2010 10:08:41	N 51° 27.06384'	W 11° 44.93922'	820	Poseidon mound
8	Hopper camera	End	16/09/2010 13:39:31	N 51° 28.24002'	W 11° 41.0733'	738	
8	Large Boxcore	Bottom	16/09/2010 13:59:48	N 51° 28.2687'	W 11° 41.17254'	735	
9	Vertical Net	Begin	16/09/2010 14:24:25	N 51° 26.7519'	W 11° 40.8963'	694	
9	Vertical Net	Start Heave	16/09/2010 14:28:35	N 51° 26.75646'	W 11° 40.89906'	694	plankton 100m depth
9	Vertical Net	End	16/09/2010 14:33:52	N 51° 26.73786'	W 11° 40.88508'	693	
10	Vertical Net	Begin	16/09/2010 14:46:15	N 51° 26.70858'	W 11° 40.91094'	695	
10	Vertical Net	Start Heave	16/09/2010 14:46:20	N 51° 26.70798'	W 11° 40.91022'	695	plankton 200m depth
10	Vertical Net	End	16/09/2010 14:56:54	N 51° 26.72412'	W 11° 41.00916'	700	
11	Hopper camera	Begin	16/09/2010 17:51:35	N 51° 26.98074'	W 11° 41.0847'	710	Poseidon Mound
11	Hopper camera	End	16/09/2010 19:33:09	N 51° 27.87306'	W 11° 43.0413'	877	
11	Large Boxcore	Bottom	16/09/2010 19:34:46	N 51° 27.86598'	W 11° 43.05186'	878	
12	CTD with samples	Begin	17/09/2010 06:12:58	N 51° 19.60608'	W 11° 36.02706'	612	
12	CTD with samples	Bottom	17/09/2010 06:13:03	N 51° 19.60686'	W 11° 36.0273'	612	South transect
12	CTD with samples	End	17/09/2010 06:51:44	N 51° 19.63116'	W 11° 36.02586'	613	
13	ALBEX 1 lander	Recovery	17/09/2010 08:38:56	N 51° 19.8246'	W 11° 40.8759'	788	Deploy 1
14	Hopper camera	Begin	17/09/2010 09:07:36	N 51° 19.5915'	W 11° 40.16358'	748	South transect
14	Hopper camera	End	17/09/2010 11:10:47	N 51° 19.5744'	W 11° 42.51588'	935	
14	Large Boxcore	Bottom	17/09/2010 11:11:17	N 51° 19.5741'	W 11° 42.5142'	934	
15	ALBEX 1 lander	Deployment	17/09/2010 12:23:33	N 51° 19.61028'	W 11° 36.01374'	614	Deploy 2
16	Hopper camera	Begin	17/09/2010 14:38:27	N 51° 26.8683'	W 11° 48.38616'	1062	NW corner
16	Hopper camera	End	17/09/2010 16:18:06	N 51° 28.10178'	W 11° 50.63436'	988	
16	Large Boxcore	Bottom	17/09/2010 16:19:44	N 51° 28.10892'	W 11° 50.64972'	988	
17	CTD with samples	Begin	18/09/2010 06:15:00	N 51° 19.56738'	W 11° 30.79392'	386	
17	CTD with samples	Bottom	18/09/2010 06:15:06	N 51° 19.56684'	W 11° 30.79302'	386	with samples
17	CTD with samples	End	18/09/2010 06:37:43	N 51° 19.50696'	W 11° 30.76848'	385	
18	ALBEX 1 lander	Recovery	18/09/2010 07:41:34	N 51° 19.55352'	W 11° 35.68104'	616	Deploy 2
19	Hopper camera	Begin	18/09/2010 09:34:41	N 51° 19.59612'	W 11° 29.97174'	362	
19	Hopper camera	End	18/09/2010 11:34:05	N 51° 19.54674'	W 11° 32.51658'	435	
19	Large Boxcore	Bottom	18/09/2010 11:34:52	N 51° 19.5483'	W 11° 32.50638'	434	
20	ALBEX 1 lander	Deployment	18/09/2010 12:57:36	N 51° 19.54314'	W 11° 41.05944'	732	Deploy 3, exact position N 51° 19.541', W 11° 41.115'
21	Vertical Net	Begin	18/09/2010 13:46:38	N 51° 19.58304'	W 11° 35.11854'	624	
21	Vertical Net	Start Heave	18/09/2010 13:57:12	N 51° 19.56618'	W 11° 35.11578'	624	plankton 100m depth
21	Vertical Net	End	18/09/2010 13:57:15	N 51° 19.56648'	W 11° 35.11908'	623	sample lost
21	Vertical Net	Begin	18/09/2010 13:59:59	N 51° 19.52616'	W 11° 35.20644'	626	

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
21	Vertical Net	Start Heave	18/09/2010 14:03:53	N 51° 19.52598'	W 11° 35.16786'	625	plankton 200m depth
21	Vertical Net	End	18/09/2010 14:18:43	N 51° 19.56546'	W 11° 35.16222'	626	sample lost
22	Hopper camera	Begin	18/09/2010 14:48:35	N 51° 19.5777'	W 11° 34.98912'	608	
22	Hopper camera	End	18/09/2010 16:32:46	N 51° 19.57956'	W 11° 37.623'	633	
22	Large Boxcore	Bottom	18/09/2010 16:35:15	N 51° 19.5687'	W 11° 37.63266'	634	
23	Triangular Dredge	Begin	18/09/2010 17:38:46	N 51° 19.54806'	W 11° 32.98008'	449	
23	Triangular Dredge	Bottom	18/09/2010 18:01:25	N 51° 19.44432'	W 11° 33.7542'	480	coral rubble
23	Triangular Dredge	Start Heave	18/09/2010 18:24:39	N 51° 19.35402'	W 11° 34.5507'	550	
23	Triangular Dredge	End	18/09/2010 18:45:16	N 51° 19.3356'	W 11° 35.0904'	623	
24	CTD with samples	Begin	19/09/2010 06:12:23	N 51° 19.53822'	W 11° 43.63896'	1028	
24	CTD with samples	Bottom	19/09/2010 06:35:12	N 51° 19.56756'	W 11° 43.69368'	1033	with samples
24	CTD with samples	End	19/09/2010 07:05:44	N 51° 19.56978'	W 11° 43.72014'	1036	
25	ALBEX 1 lander	Recovery	19/09/2010 07:56:36	N 51° 19.54332'	W 11° 40.78956'	781	Deploy 3
26	Hopper Camera	Begin	19/09/2010 09:38:22	N 51° 20.26482'	W 11° 41.16366'	806	
26	Hopper Camera	End	19/09/2010 09:43:57	N 51° 20.26524'	W 11° 41.20992'	807	
26	Large Boxcore	Bottom	19/09/2010 12:28:00	N 51° 20.65326'	W 11° 43.23708'	822	box taken
27	ALBEX 1 lander	Deployment	19/09/2010 13:36:59	N 51° 20.51112'	W 11° 43.21434'	841	Deploy 4, exact position N 51° 20.542, W 11° 43.361'
28	Triangular Dredge	Begin	19/09/2010 14:13:44	N 51° 20.62008'	W 11° 41.87316'	799	
28	Triangular Dredge	Bottom	19/09/2010 14:51:26	N 51° 19.80264'	W 11° 41.80788'	865	
28	Triangular Dredge	Start Heave	19/09/2010 14:51:29	N 51° 19.80162'	W 11° 41.80704'	865	
28	Triangular Dredge	End	19/09/2010 15:26:04	N 51° 19.4592'	W 11° 41.8287'	861	
29	Hopper Camera	Begin	19/09/2010 17:09:36	N 51° 21.19242'	W 11° 43.3785'	927	
29	Hopper Camera	End	19/09/2010 18:59:02	N 51° 19.6929'	W 11° 43.3509'	907	box failed
30	CTD with samples	Begin	20/09/2010 06:12:10	N 51° 19.58532'	W 11° 17.99166'	208	
30	CTD with samples	Bottom	20/09/2010 06:18:06	N 51° 19.56588'	W 11° 18.00648'	208	with samples
30	CTD with samples	End	20/09/2010 06:49:34	N 51° 19.71378'	W 11° 20.21286'	220	
31	CTD with samples	Begin	20/09/2010 07:04:26	N 51° 19.58712'	W 11° 21.10236'	225	
31	CTD with samples	Bottom	20/09/2010 07:12:10	N 51° 19.58208'	W 11° 21.13752'	226	bottomwater Henko
31	CTD with samples	End	20/09/2010 07:20:13	N 51° 19.59828'	W 11° 21.13692'	226	surface water Evaline
32	CTD with samples	Begin	20/09/2010 07:42:16	N 51° 19.64046'	W 11° 24.0819'	255	
32	CTD with samples	Bottom	20/09/2010 07:52:23	N 51° 19.5654'	W 11° 24.2787'	257	bottomwater Henko
32	CTD with samples	End	20/09/2010 08:09:28	N 51° 19.5777'	W 11° 24.36072'	257	
33	CTD with samples	Begin	20/09/2010 08:36:15	N 51° 19.59108'	W 11° 27.49716'	310	
33	CTD with samples	Bottom	20/09/2010 08:45:38	N 51° 19.58412'	W 11° 27.5379'	310	bottomwater Henko
33	CTD with samples	End	20/09/2010 08:53:02	N 51° 19.57608'	W 11° 27.52476'	310	
34	CTD with samples	Begin	20/09/2010 09:21:50	N 51° 19.58724'	W 11° 30.70908'	380	
34	CTD with samples	Bottom	20/09/2010 09:31:15	N 51° 19.57842'	W 11° 30.7263'	381	bottomwater Henko
34	CTD with samples	End	20/09/2010 09:40:56	N 51° 19.56996'	W 11° 30.74712'	383	
35	CTD with samples	Begin	20/09/2010 10:14:52	N 51° 19.57272'	W 11° 33.88554'	484	
35	CTD with samples	Bottom	20/09/2010 10:25:43	N 51° 19.5606'	W 11° 33.92118'	487	bottomwater Henko
35	CTD with samples	End	20/09/2010 10:39:08	N 51° 19.5498'	W 11° 33.97668'	490	
36	CTD with samples	Begin	20/09/2010 11:07:33	N 51° 19.57242'	W 11° 37.0734'	631	
36	CTD with samples	Bottom	20/09/2010 11:21:08	N 51° 19.55538'	W 11° 37.08888'	633	bottomwater Henko
36	CTD with samples	End	20/09/2010 11:39:42	N 51° 19.5375'	W 11° 37.32804'	633	
37	CTD with samples	Begin	20/09/2010 12:03:15	N 51° 19.55436'	W 11° 40.30728'	758	
37	CTD with samples	Bottom	20/09/2010 12:17:52	N 51° 19.5444'	W 11° 40.31526'	760	bottomwater Henko
37	CTD with samples	End	20/09/2010 12:37:06	N 51° 19.56762'	W 11° 40.27368'	757	
38	CTD with samples	Begin	20/09/2010 13:02:36	N 51° 19.5648'	W 11° 43.46952'	985	
38	CTD with samples	Bottom	20/09/2010 13:21:31	N 51° 19.54578'	W 11° 43.53588'	1006	bottomwater Henko
38	CTD with samples	End	20/09/2010 13:46:25	N 51° 19.53444'	W 11° 43.5597'	1014	

Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
39	ALBEX 1 lander	Recovery	20/09/2010 14:36:30	N 51° 20.48928'	W 11° 43.11984'	862	Deploy 4
40	CTD with samples	Begin	20/09/2010 15:22:16	N 51° 19.59468'	W 11° 46.6287'	1180	
40	CTD with samples	Bottom	20/09/2010 15:41:43	N 51° 19.62438'	W 11° 46.6278'	1181	bottomwater Henko
40	CTD with samples	End	20/09/2010 16:04:47	N 51° 19.60056'	W 11° 46.66314'	1179	
41	CTD with samples	Begin	20/09/2010 16:40:50	N 51° 19.60674'	W 11° 49.83258'	1124	
41	CTD with samples	Bottom	20/09/2010 16:59:57	N 51° 19.5942'	W 11° 49.81866'	1125	bottomwater Henko
41	CTD with samples	End	20/09/2010 17:23:00	N 51° 19.60188'	W 11° 49.82718'	1124	
42	CTD with samples	Begin	20/09/2010 17:53:04	N 51° 19.60878'	W 11° 53.00526'	1054	
42	CTD with samples	Bottom	20/09/2010 18:10:30	N 51° 19.56636'	W 11° 53.02134'	1054	bottomwater Henko
42	CTD with samples	End	20/09/2010 18:40:24	N 51° 19.53348'	W 11° 53.04'	1054	
43	CTD with samples	Begin	21/09/2010 06:15:42	N 51° 19.59342'	W 11° 24.34338'	258	
43	CTD with samples	Bottom	21/09/2010 06:21:30	N 51° 19.57938'	W 11° 24.34998'	258	bottomwater Henko
43	CTD with samples	End	21/09/2010 06:32:49	N 51° 19.5918'	W 11° 24.35286'	257	
44	Triangular Dredge	Begin	21/09/2010 08:17:03	N 51° 21.25044'	W 11° 41.92884'	821	
44	Triangular Dredge	Bottom	21/09/2010 08:59:38	N 51° 20.53584'	W 11° 41.87382'	844	stones
44	Triangular Dredge	Start Heave	21/09/2010 09:00:39	N 51° 20.5032'	W 11° 41.87238'	811	
44	Triangular Dredge	End	21/09/2010 09:37:27	N 51° 20.0403'	W 11° 41.6985'	793	
45	Vertical Net	Begin	21/09/2010 10:04:56	N 51° 20.4894'	W 11° 42.68118'	866	
45	Vertical Net	Start Heave	21/09/2010 10:10:12	N 51° 20.47704'	W 11° 42.61146'	861	plankton 100m depth
45	Vertical Net	End	21/09/2010 10:14:21	N 51° 20.54796'	W 11° 42.62286'	862	
45	Vertical Net	Begin	21/09/2010 10:15:36	N 51° 20.55234'	W 11° 42.64014'	862	
45	Vertical Net	Start Heave	21/09/2010 10:20:59	N 51° 20.54622'	W 11° 42.58488'	858	plankton 200m depth
45	Vertical Net	End	21/09/2010 10:30:54	N 51° 20.5047'	W 11° 42.4977'	851	
46	Triangular Dredge	Begin	21/09/2010 11:28:55	N 51° 20.68602'	W 11° 41.88186'	818	
46	Triangular Dredge	Bottom	21/09/2010 11:50:01	N 51° 20.39232'	W 11° 41.90628'	821	coral rubble
46	Triangular Dredge	Start Heave	21/09/2010 12:08:33	N 51° 19.99254'	W 11° 41.8662'	837	
46	Triangular Dredge	End	21/09/2010 12:46:18	N 51° 19.40994'	W 11° 41.92818'	862	
47	ALBEX 4 lander	Deployment	21/09/2010 14:14:24	N 51° 20.5365'	W 11° 43.37022'	793	Deploy 5
48	Hopper Camera	Begin	21/09/2010 15:49:23	N 51° 15.2721'	W 11° 45.9378'	1168	
48	Hopper Camera	End	21/09/2010 17:37:07	N 51° 16.25646'	W 11° 43.5699'	1053	
48	Large Boxcore	Bottom	21/09/2010 17:43:51	N 51° 16.21554'	W 11° 43.59666'	1055	sandy
49	ALBEX 4 lander	Recovery	22/09/2010 06:10:02	N 51° 20.7396'	W 11° 43.01934'	860	Deploy 5
50	Hopper Camera	Begin	22/09/2010 08:03:06	N 51° 27.07572'	W 11° 45.19476'	783	
50	Hopper Camera	End	22/09/2010 08:42:05	N 51° 27.0756'	W 11° 45.2118'	783	box taken
51	Hopper Camera	Begin	22/09/2010 09:04:50	N 51° 27.0693'	W 11° 45.22512'	783	
51	Hopper Camera	End	22/09/2010 09:39:35	N 51° 27.07842'	W 11° 45.20148'	782	box taken
52	Hopper Camera	Begin	22/09/2010 11:47:06	N 51° 27.0714'	W 11° 45.1836'	782	
52	Hopper Camera	End	22/09/2010 12:00:03	N 51° 27.06696'	W 11° 45.18438'	782	box taken
53	Hopper Camera	Begin	22/09/2010 12:23:36	N 51° 27.06594'	W 11° 45.17406'	782	
53	Hopper Camera	End	22/09/2010 13:20:15	N 51° 27.1278'	W 11° 45.06858'	789	box taken
54	BOBO lander	Recovery	22/09/2010 17:27:01	N 51° 19.6002'	W 11° 46.3122'	1183	
55	ALBEX 1 lander	Deployment	22/09/2010 18:45:05	N 51° 27.06846'	W 11° 45.2433'	787	Best position: 51.451451/-11.753590 Triangulation: 51.451117/-11.751583

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Station	Instrument	Action	Date	Latitude	Longitude	Depth	Remark
57	Hopper Camera	Begin	23/09/2010 10:02:03	N 49° 15.03846'	W 11° 0.08346'	173	
57	Hopper Camera	End	23/09/2010 10:16:33	N 49° 15.02664'	W 11° 0.0762'	174	box failed
58	Hopper Camera	Begin	23/09/2010 11:15:33	N 49° 14.98926'	W 11° 0.02058'	174	
58	Hopper Camera	End	23/09/2010 11:23:54	N 49° 14.9814'	W 11° 0.01806'	174	only box
59	Hopper Camera	Begin	23/09/2010 12:35:51	N 49° 9.9591'	W 10° 59.90892'	173	
59	Hopper Camera	End	23/09/2010 12:55:14	N 49° 9.9609'	W 10° 59.93154'	173	box failed
60	BOBO lander	Deployment	23/09/2010 19:21:04	N 48° 10.53306'	W 10° 35.02536'	3567	19:18GMT: release position 48.175467/10.583536
61	Hopper Camera	Begin	24/09/2010 06:29:28	N 47° 45.93834'	W 10° 9.60906'	4167	
61	Large Boxcore	Bottom	24/09/2010 07:39:05	N 47° 45.95364'	W 10° 9.68496'	4169	box taken
61	Hopper Camera	End	24/09/2010 08:36:00	N 47° 45.95862'	W 10° 9.61728'	4163	no lasers, no lights, no video
62	Small Boxcore	Bottom	24/09/2010 10:24:09	N 47° 45.94236'	W 10° 9.59598'	4179	
63	Hopper Camera	Begin	24/09/2010 12:03:34	N 47° 45.8889'	W 10° 9.59424'	4164	
63	Hopper Camera	End	24/09/2010 15:08:18	N 47° 46.7169'	W 10° 12.32244'	3888	
63	Large Boxcore	Bottom	24/09/2010 15:28:26	N 47° 46.77066'	W 10° 11.94924'	3914	box taken
64	Hopper Camera	Begin	25/09/2010 06:17:25	N 47° 22.60386'	W 10° 14.8101'	4274	
64	Hopper Camera	End	25/09/2010 09:19:25	N 47° 23.89542'	W 10° 14.03724'	4392	box taken at 09:35
65	Small Boxcore	Bottom	25/09/2010 12:52:54	N 47° 22.60848'	W 10° 14.75478'	4271	small box only
66	Hopper Camera	Begin	25/09/2010 15:27:34	N 47° 23.88834'	W 10° 14.05728'	4394	
66	Hopper Camera	End	25/09/2010 17:35:33	N 47° 25.30296'	W 10° 13.4244'	4270	
66	Large Boxcore	Bottom	25/09/2010 17:38:54	N 47° 25.28994'	W 10° 13.42974'	4270	box taken at 17:36
67	Hopper Camera	Begin	26/09/2010 06:27:32	N 47° 55.52244'	W 10° 13.43418'	3720	
67	Hopper Camera	End	26/09/2010 09:16:30	N 47° 56.41932'	W 10° 12.68928'	3988	
68	Small Boxcore	Bottom	26/09/2010 12:19:27	N 47° 56.00136'	W 10° 12.30354'	3981	small box no video
69	Hopper Camera	Begin	26/09/2010 14:02:48	N 47° 55.90482'	W 10° 12.31362'	4004	
69	Hopper Camera	End	26/09/2010 17:07:57	N 47° 56.67882'	W 10° 11.1144'	3951	
69	Large Boxcore	Bottom	26/09/2010 17:09:48	N 47° 56.68932'	W 10° 11.1249'	3950	
70	Pistoncorer d=110	Bottom	27/09/2010 07:02:45	N 47° 23.715'	W 10° 14.27604'	4387	35 cm
71	Hopper Camera	Begin	27/09/2010 11:29:03	N 47° 25.09836'	W 10° 13.31268'	4272	
71	Hopper Camera	End	27/09/2010 14:34:30	N 47° 23.7036'	W 10° 14.12676'	4368	
71	Large boxcore	Bottom	27/09/2010 14:40:22	N 47° 23.70768'	W 10° 14.07348'	4364	box taken
72	Pistoncorer d=110	Bottom	27/09/2010 18:13:53	N 47° 21.50388'	W 10° 15.51162'	4241	about 2 m
73	BOBO lander	Recovery	28/09/2010 05:34:27	N 48° 10.953'	W 10° 34.38102'	1483	
74	CTD with samples	Begin	28/09/2010 12:26:35	N 48° 37.49052'	W 10° 29.5827'	1484	
74	CTD with samples	Bottom	28/09/2010 13:04:00	N 48° 37.48878'	W 10° 29.61414'	1489	calibration of 4 OBS
74	CTD with samples	End	28/09/2010 16:09:06	N 48° 37.48428'	W 10° 29.62602'	1568	
75	Multi Corer	Bottom	29/09/2010 07:40:37	N 47° 56.0361'	W 10° 12.33438'	4000	
76	Multi Corer	Bottom	29/09/2010 10:11:09	N 47° 55.4391'	W 10° 13.42818'	3717	
77	Multi Corer	Bottom	29/09/2010 13:43:20	N 47° 45.90384'	W 10° 9.6291'	4166	
78	BOBO lander	Deployment	29/09/2010 15:01:59	N 47° 45.89802'	W 10° 9.60354'	4166	long term
79	Multi Corer	Bottom	29/09/2010 16:41:23	N 47° 46.6926'	W 10° 12.3'	3887	