Cruise Report

Belgica 10/17b

Belgica BiSCOSYSTEMS II, Leg 2

Whittard Canyon

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June 19 - June 28, 2010

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1. Cruise reference

Belgica 10/17b
La Rochelle (F) – Zeebrugge (B)
19.06.2010 – 28.06.2010

2. Framework and objectives

2.1 Framework

The research programme of Belgica cruise 2010/17b frames into several international and national projects. They all build upon achievements of previous projects such as FWO Genesis, EC FP6 HERMES, ESF EuroDIVERSITY MiCROSYSTEMS,...

- **EC FP7 IP HERMIONE (2009-2012)**

  HERMIONE is the ecological follow-up of the EC FP6 IP HERMES project and stand for "*Hotspot Ecosystem Research and Man's Impact on European Seas*". Together with its 38 partners, it will focus on ecosystem research along key sites on the European margin (Weaver *et al.*, 2009). The main aims of this project are to investigate the dimensions, distribution and interconnection of deep-sea ecosystems, as well as to understand the influence of climate change, anthropogenic impact and large-scale episodic events (hydrologic or geologic). The results of this project will be directly coupled to the EU policy (among others). By multidisciplinary sampling in one of the Whittard Canyon branches by means of ROV, CTD including Niskin water samples, MUC and seismic surveys, a complete insight into the ecological, biogeological, geophysical and biogeochemical characteristics of the site are achieved.

- **PhD project L. De Mol (IWT-Vlaanderen): "*Mound-4D: an ROV supported study of the 4D architecture of carbonate mounds*" (2008-2012)**

  The aim of this research is a detailed study of the 4D architecture of carbonate mounds based on ROV footage, side-scan sonar data, boxcores and gravity cores within canyons and mounds. It focuses on the study of the characteristics of individual coral plates, including their spatial (3D) characteristics, their present colonization and the related sedimentological and (micro)biological processes. The main topic are the cold-water coral mounds in the El Arraiche mud volcano field in the Gulf of Cadiz (Foubert *et al.*, 2008; Van Rooij *et al.*, in review) but we will also have a look at the cold-water corals in the Bay of Biscay (De Mol *et al.*, in press).

- **FWO post-doctoral project D. Van Rooij: "*Influence on deep-water ecosystems by the Plio-Pleistocene variability of bottom currents generated by intermediary water mass dynamics*" (2008-2011)**

  This project focuses on three main objectives, studied on less known key sites along the pathway of intermediate water masses such as the MOW;

  (a) Determination of the Plio-Pleistocene spatial and temporal variability of bottom currents generated by intermediate water masses (Van Rooij *et al.*, 2010b).

  (b) Assessment of the direct and indirect consequences of this variability on palaeo-ecological level (influence on deep-water ecosystems) and on the level of co-occurent sedimentary processes (contourite genesis).

  (c) Exploration of poorly-known, drift-associated deep-water coral ecosystems along the entire Atlantic margin, and specifically in the Bay of Biscay (Van Rooij *et al.*, 2010a).

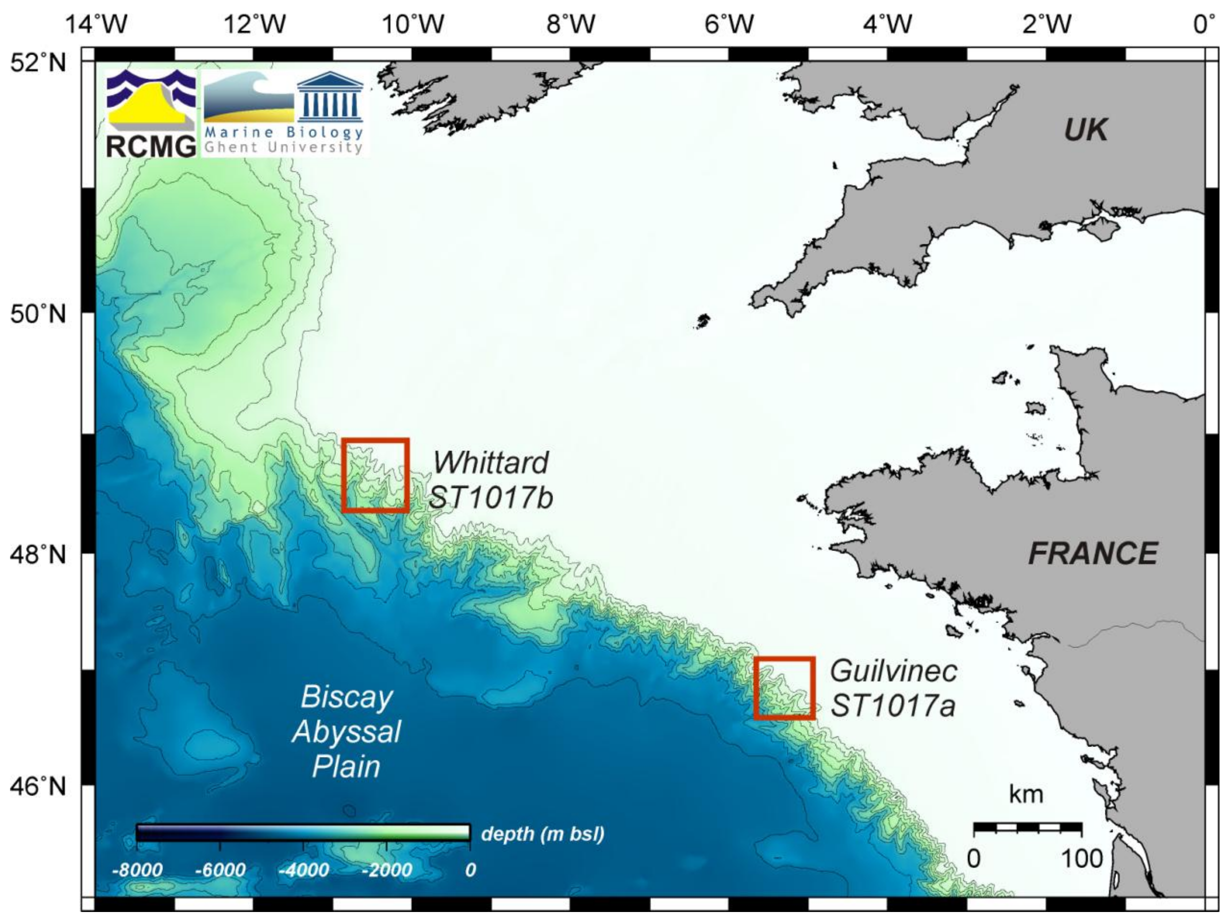

Figure 1: *Location map of the study areas (red boxes) during the R/V Belgica BiSCOSYSTEMS II campaign. This second leg, ST1017b, focuses on the Whittard Canyon within the Irish EEZ.*

2.2 Objectives

2.2.1 Deep-water canyon ecosystem research

The continental margin of the Bay of Biscay, cut by many canyons (Fig. 1), can be considered as one of the hotspots for deep-water ecosystems along the European margin (Weaver *et al.*, 2004; Reveillaud *et al.*, 2008; Weaver *et al.*, 2009). During the R/V Belgica campaign ST0613 in 2006, the central branch of the Whittard canyon system was already partly surveyed by high-resolution seismic profiling and at several locations, multicores were acquired (Vanreusel *et al.*, 2006). Within the course of the past EC FP6 HERMES project and the present EC FP7 HERMIONE project, this area was the subject of research cruises with the R/V Pelagia, R/V Celtic Explorer and R/V James Cook. During the R/V James Cook campaign in June-July 2009 (Huvenne, 2009), parts of the central branch were surveyed by high-resolution TOBI sidescan sonar and EM120 multibeam imagery (Fig. 2). BiSCOSYSTEMS II builds upon the previously acquired data and focused on two upper central branches (Fig. 3), specifically on (a) deep-water ecosystem habitat characterization and (b) deep-water sedimentary processes. The 2nd leg of BiSCOSYSTEMS II (ST1017b) emphasised on further visual mapping with ROV Genesis and (accurate) sampling of benthic habitats. Additionally, CTD casts and a continuation of the seismic network were scheduled. More specifically, R/V Belgica ST1017b aimed to perform:

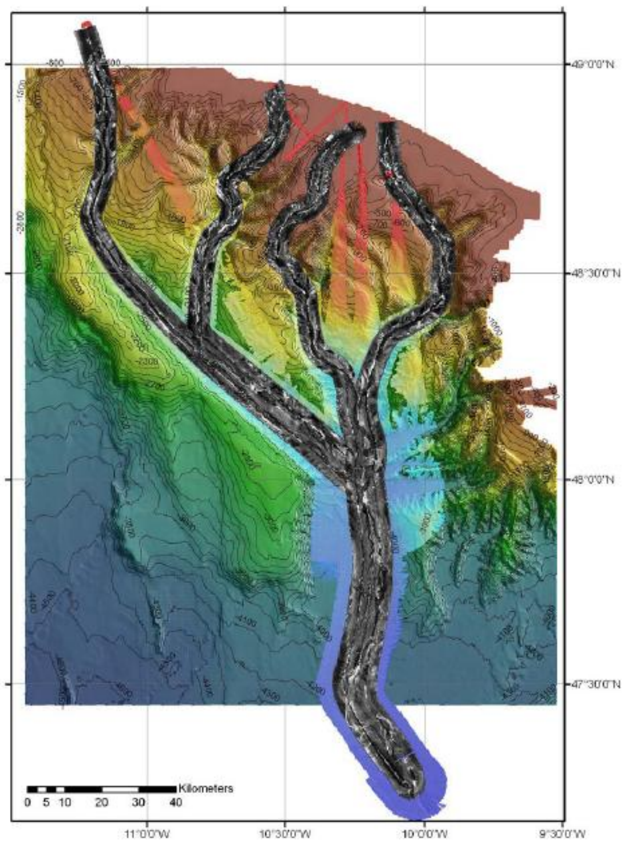

Fig. 2: *JC35 (June 2009) EM120 multibeam and TOBI sidescan sonar coverage on the central Whittard canyon system (Huvenne, 2009).*

- ***High-resolution single channel sparker seismic profiling:*** investigation of the stratigraphic framework and the sedimentary environment. This will mainly focus on the canyon heads, in order to investigate their formation and (active) sedimentary processes.

Additionally, marked morphologies (mass wasting, terraces, escarpments) within the canyon will be also be subject of seismic profiling.

- ***MUC sampling:*** The objective was to sample 8 locations with a minimum of 3 successful deployments per location. These stations are situated between 800 and 1100 m depth and will cover 2 branches of the Whittard Canyon head. These samples will be used to identify the meiofauna community and environmental variables (Sulphides, Chl-a and phaeophytines, grain size, TOC, C:N, sediment porewater biogeochemistry (sulphides, nutrients) and if possible stable 13C isotope signatures and PLFA of the bulk sediment). Full characterization of the environment and the meiofauna taxa present will allow us to chart heterogeneity of biodiversity in these canyon branches. This is achieved by sampling across the canyon branches rather than completing transects along the axis of the branches. At these locations we also intend to retrieve sediment cores with the MUC to perform ex-situ dispersion/selectivity experiments. With this we aim to investigate to what extent the meiofauna can disperse passively when resuspended by sediment disturbance processes and if there are signs of active dispersal within this group. During these experiments various substrates will be offered to investigate selectivity during passive/active dispersal processes.

- ***Hydrography:*** The Bay of Biscay hosts a large number of known and potential sites with deep-water fauna. The aim of this study is to measure the present-day environmental setting at possible sites of cold-water coral reef and/or deep-sea oyster bank occurrences. As deep-water coral skeletons and oyster shells also represent a climate archive of up to several decades, we intent to sample skeletons and/or shells where possible to use these for reconstructing palaeoenvironmental parameters. During this campaign, the following questions will be addressed:

    1) Are possible cold-water coral occurrences in the Whittard and Guilvinec Canyon related to the seawater density envelope described by Dullo *et al.* (2008)?

    2) Can we use seawater density data (including other parameters) to possibly find new sites of coral occurrences?

    3) What are the environmental characteristics of possible coral and deep-sea oyster sites?

    4) What is the role of the Mediterranean Outflow Water in these areas?

    These investigations will form a basis for a HERMIONE cruise with R/V METEOR (S. Flögel, IFM-GEOMAR, March-April 2011) to study deep-water corals in the Bay of Biscay and its controlling environmental parameters. This cruise aims to set the Biscay coral sites into the context of global CWC distribution by comparing similarities and differences of their distribution and environmental setting.

- ***ROV Genesis observations:*** 3 selected transects, located within and out the canyon will be investigated for benthic habitat mapping and groundtruthing of previously observed acoustic features. Besides video mapping and high-resolution stills imagery, continuous CTD profiling will be performed, as well as selected water sampling on cold-water coral sites and tests will be performed with a push-core device.

2.2.2 Whale watching

The aim of the project is to collect data (species, abundance, behavior, location,…) on cetaceans (dolphins and whales) during the presence of the Belgica in the Bay of Biscay and to correlate such data with oceanographic parameters (suspented matter, chlorophyl, water temperature,….). Previously, in 2007, 2008 and 2009, similar cetaceans observation programmes were organized from Cadiz or La Coruna (Spain) to Zeebrugges in collaboration with Kevin Ruddick (MUMM) and the Belcolour-2 project that provided the oceanographic data. Most of the observations were reported in the Bay of Biscay, near the continental margin. One of the previous campaigns conclusion was that the Belgica was a good platform of opportunity for cetaceans observation. The present campaign being almost on the continental margin of the Bay of Biscay should be interesting. Indeed, previous studies have reported higher abundance of cetaceans at the margin of continents or in area of deep-sea canyons.

2.2.3 Additional sampling

Additional sampling of surface waters in the study area will be performed upon request of Prof. Dr. Lei Chou (ULB). For this purpose, 195 L of (sieved) sea water will be transferred in containers. The location of sampling will be near the shelf break into nutrient-poor waters.

This multidisciplinary campaign was executed in cooperation with the MUMM, University College Cork (Ireland) and the University of La Rochelle (France). IFM-Geomar (Germany) and the ULB (Belgium) are shorebased partners in this campaign.

3. Departure and arrival of the cruise

Departure: La Rochelle (F)	19.06.2010, at 12.00h.
Arrival: Zeebrugge (B)	28.06.2009, at 08.00h.

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4. Working area

The study area is located on the Irish continental margin in the Bay of Biscay, in water depths between 200 and 2000 m depth, 170 nautical miles South of Ireland (Figs. 1, 3).

4.1 Coordination at Sea

Chief scientist:	Dr. David VAN ROOIJ Renard Centre of Marine Geology (RCMG), Ghent University, Belgium
Co-chief scientists:	Drs. Lies De Mol & Dr. Jeroen Ingels

4.2 Scientific staff

Dr. David VAN ROOIJ	Ghent University, RCMG,
Willem VERSTEEG	Ghent University, RCMG,
Drs. Lies DE MOL	Ghent University, RCMG,
Brigitte CROWE	University College Cork (Ireland)
Guy DE SMET	Ghent University, Marine Biology,
Bart BEUSELINCK	Ghent University, Marine Biology,
Dr. Andres RÜGGEBERG	Ghent University, RCMG,
Dr. Jeroen INGELS	Ghent University, Marine Biology,
Dries BOONE	Ghent University, RCMG,
Jeroen VERCRUYSSE	Ghent University, RCMG,
Drs. Jelle VAN CAMPENHOUT	Ghent University, Marine Biology
Dr. Thierry JAUNIAUX	ULg & MUMM,
Ghislain DOREMUS	Université La Rochelle (France)

4.3 Operations

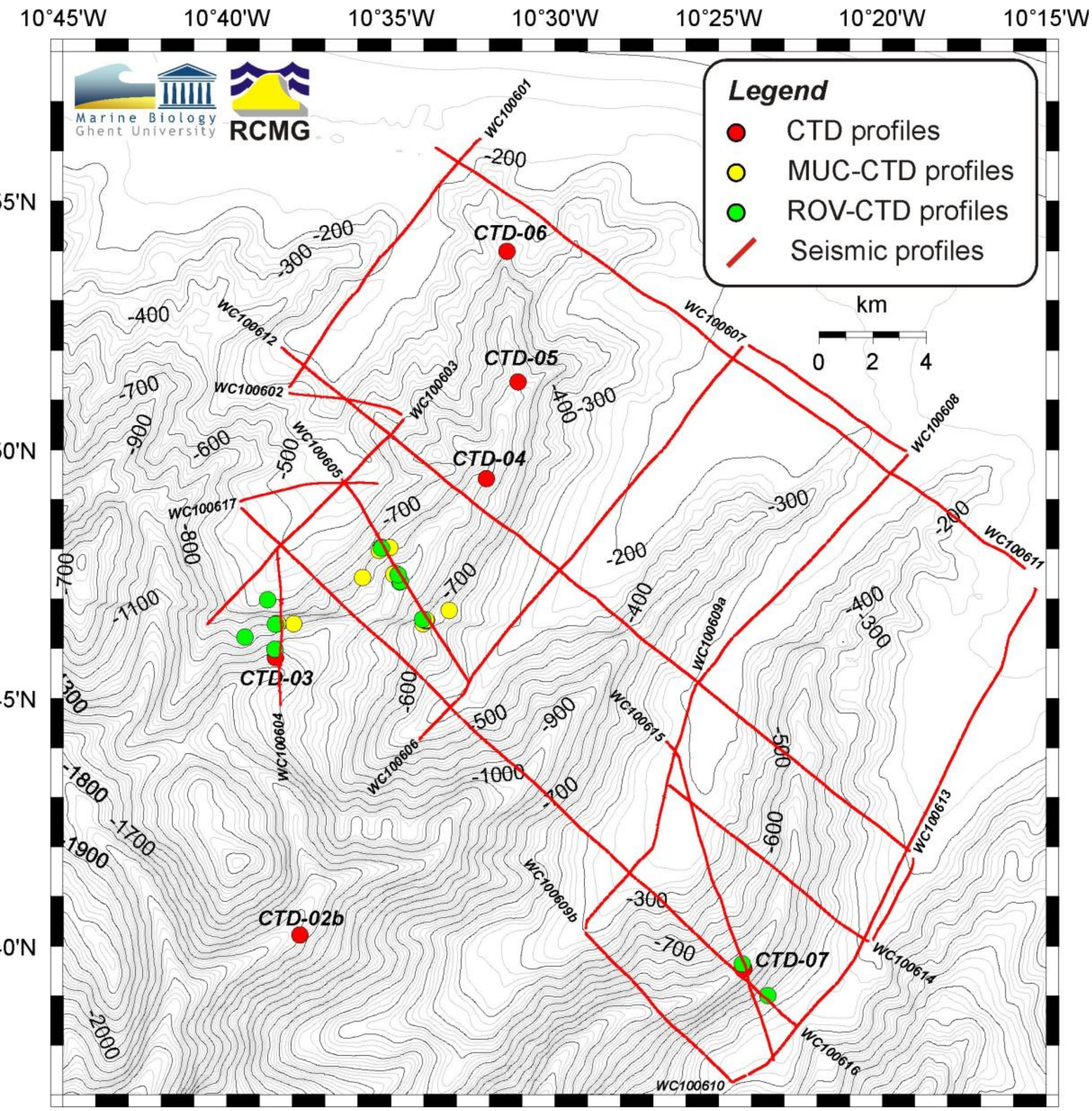


Figure 3: *Location of seismic profiles (red line), CTD station (red circle), MUC stations (yellow circle) and the start/end of each ROV dive (green circle) within the middle branch of the Whittard Canyon system (INSS multibeam bathymetry).*

4.3.1 Seismic survey

The single channel reflection seismic profiling was performed with a SIG sparker source (120 electrodes), and recorded through single channel surface streamer using Delph Seismic 2.7.0.0 (Ixsea). The sparker source was triggered every 2.5 s reaching 600 J energy. The sampling frequency was set at 10 kHz and a record length of 2 s TWT was used. The data was filtered using a 80-2500 Hz analogue bandpass filter. The velocity of the ship during surface sparker seismics was maintained at about 3.5 knots.

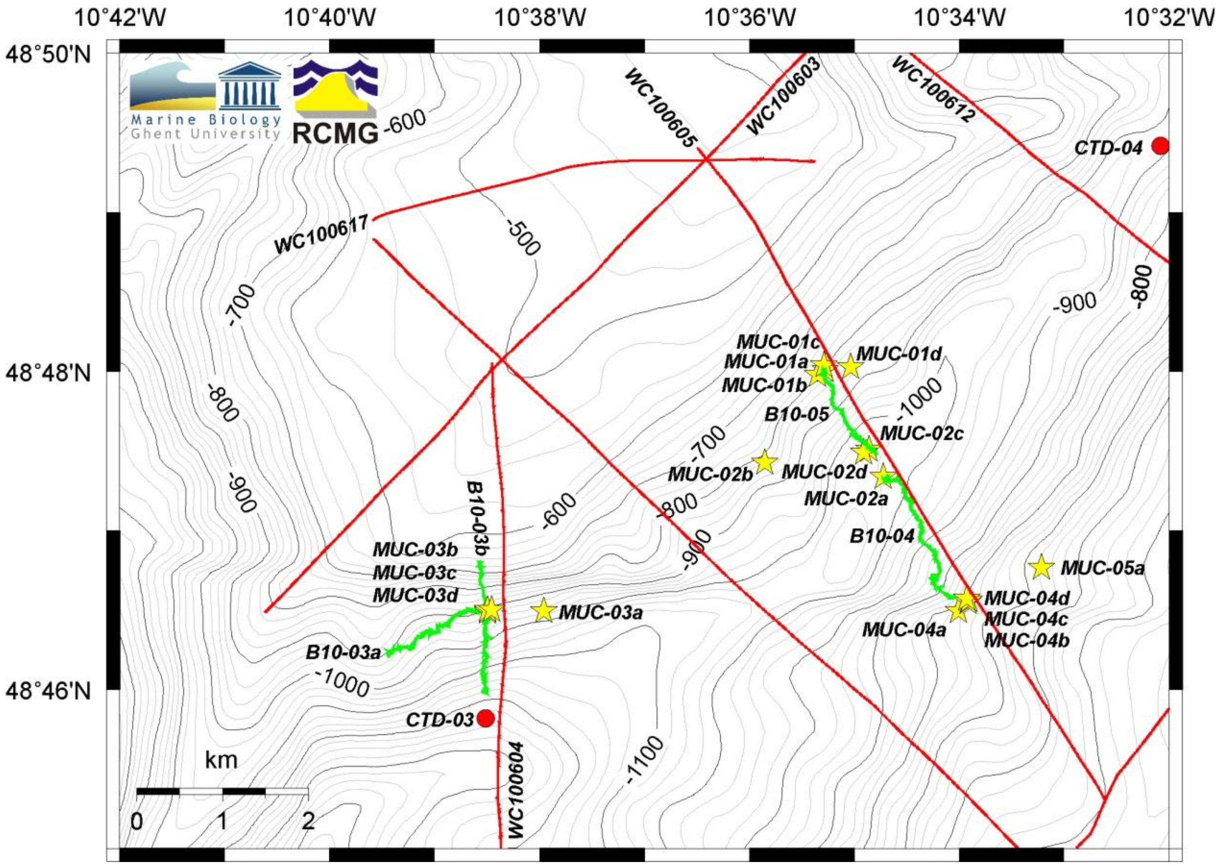


Figure 4: *Detailed view on the observations made during ST1017b within the westernmost canyon; seismic profiles (red line), MUC station (yellow star), CTD cast (red circle) and ROV track (green).*

4.3.2 CTD measurements

CTD measurements during this campaign were acquired from 3 different sources. Initially, it was scheduled that the CTD measurements and water sampling were acquired using the Seacat SBE-19 Plus deep-water CTD profiler of the MUMM. Due to problems with the oceanographic cable during this campaign, this system could only be used in battery operating mode. However, collected data were recorded in time intervals due to programming of the CTD. Instead, the RCMG's spare Sea & Sun CTD48M system was also used in a stand-alone (battery operated) mode, attached to the MUMM CTD frame. As such, at every site, still 5L Niskin bottles could be acquired.

Additional CTD measurements were performed during each MUC deployment, where the Sea & Sun CTD48M was also attached to the MUC frame. Also during each ROV dive, the onboard CTD Sea & Sun CTD90M was activated, recording additional turbidity, dissolved oxygen and chlorophyll a.

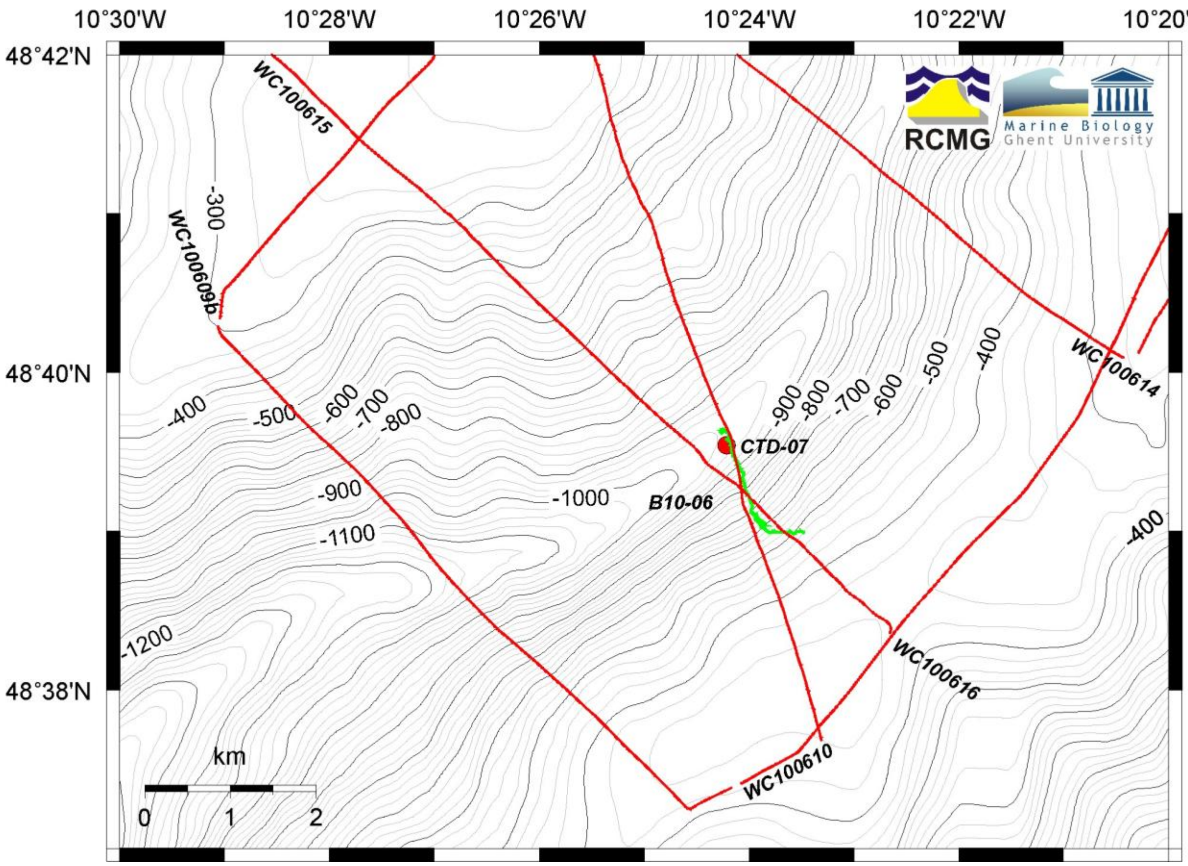


Figure 5: *Detailed view on the observations made during ST1017b within the westernmost canyon; seismic profiles (red line), MUC station (yellow star), CTD cast (red circle) and ROV track (green).*

4.3.3 ROV observations

The RCMG acquired a Sub-Atlantic Cherokee-type ROV "Genesis", with TMS and shipboard winch. This winch hosts a reinforced cable of 1600 m which can bring the TMS and ROV to a safe depth prior to ROV launch (with a maximum tether of 200 m). The winch cable is connected to a pilot control interface which was installed in the ROV container. This encompasses the physical control of the ROV and its instruments, as well as the observation (and navigation cameras). 5 cameras and 1 still camera were active: one on the TMS (ROV launch & re-entry control), a backward looking within the ROV (for TMS re-entry and tether inspection), a camera on the ROV looking at the arm and tray, and the two forward-looking black & white and colour (with overlay) cameras. An overlay on the screen with navigation control information could be put on an arbitrary camera display. The main sampling tool on the ROV is the controlled grab arm and a deployable tray in which samples can be stored. An additional 5L Niskin bottle was present in this tray for water sampling. During the first dive

(B10-03), a first test was performed using a pushcoring device. The ROV also contains a depth control, an altimeter and a forward-looking sonar for detection of seabed objects.

Positioning of the TMS and ROV was done through the GAPS positioning system (IXSEA). This Global Acoustic Positioning System, GAPS, is a portable Ultra Short Base Line (USBL) with integrated Inertial Navigation System (INS) and Global Positioning System (GPS). The GAPS was deployed at the side and a transponder fixed on the TMS and on the ROV, resulting in the position of the Belgica, TMS and ROV. Navigation from the GAPS software is stored in raw format. During the deployments, the ship's, TMS and ROV navigation was also recorded through the OFOP software (J. Greinert, Royal NIOZ, The Netherlands).

During ROV survey, the control is performed by the pilot and the PI scientist (scientist, co-pilot/navigator), assisted by 2 shipboard scientists for stills capture and logging of operations. A copy of the navigation screen (OFOP) was relayed towards the bridge for navigation purpose, coordinated by the watch officer and the chief scientist. Propulsion of the ship remained diesel which enables to handle the ship in a very controlled manner, even though dynamic positioning is not available.

4.3.4 Seafloor sampling: MUC cores

Biological and biogeochemical sampling was performed with a Midicorer (MUC, Ocean Scientific International Ltd, kindly on loan by VLIZ). The MUC is designed to take 4 undisturbed sediment cores of 100mm inner diameter. The core tubes are driven into the sediment by the weight of the corer head and its attached lead weights and the rate of descent is controlled by a hydraulic damper. The success of the MUC during several previous cruises has been variable. This cruise, a total of 35 cores were retrieved out of a maximum of 68 (>50%). Occasional unsuccessful deployments were ascribed to unsuitable seafloor conditions (coarse sediments, current activity) or blockages preventing the bottom catchers to close the corer tubes upon retrieval from the seafloor. Precise subsea positioning and navigation of MUC was aided through combination of an IXSEA GAPS transponder attached to the MUC frame (Figs. 6, 7). Simultaneously, the RCMG S&S CTD system was also mounted for CTD measurements. The CTD measurements could prove very useful since the multiple deployments at the same locations

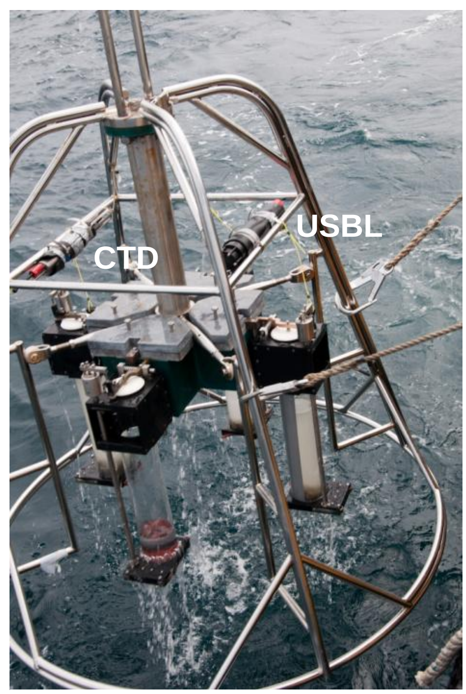


Figure 6: *MUC retrieval with indication of position USBL transponder and CTD.*

may provide small time-scale variations in CTD measurements and hence, an insight into the daily variations in water mass characteristics.

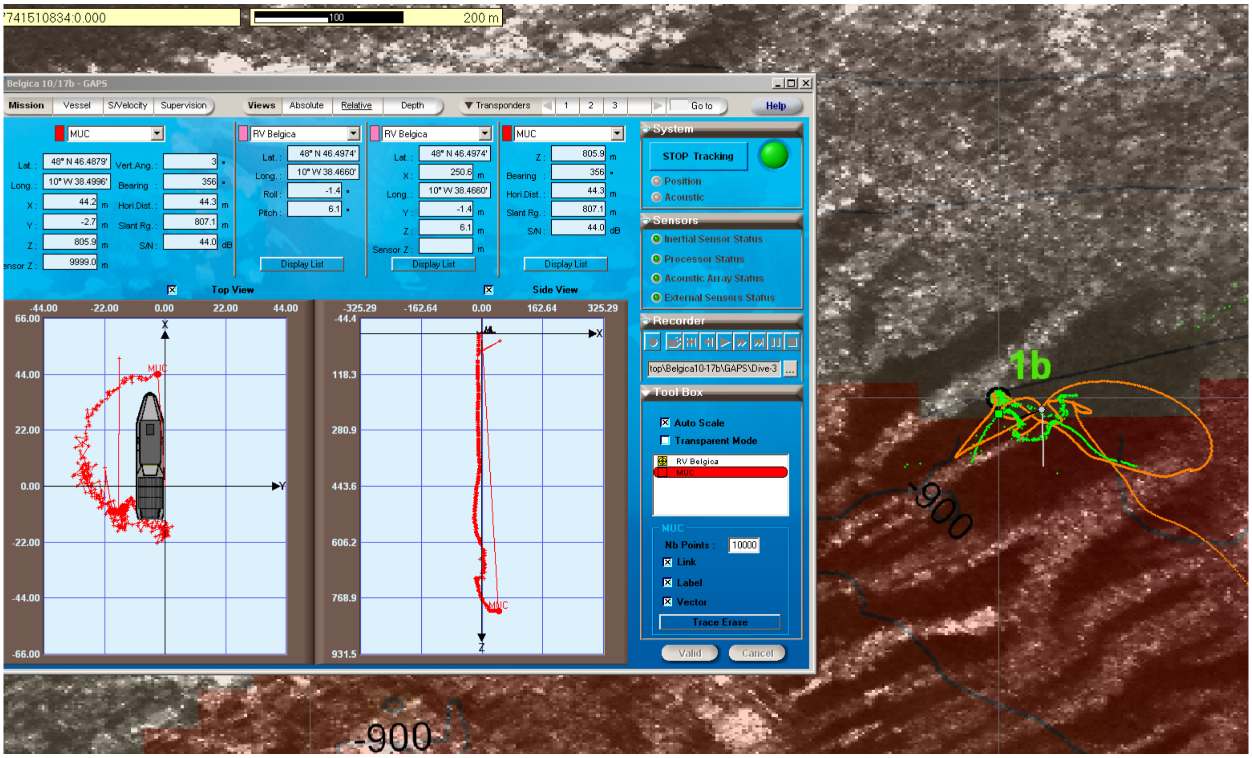


Figure 7: *Screenshot from the combined OFOP and IXSEA GAPS navigation software, showing, in the background, the track of R/V Belgica (orange) and ROV Genesis (green). The IXSEA GAPS software shows the location of the ROV with respect to R/V Belgica in both horizontal as vertical plains. This screen was available both on the ROV container as on the bridge of R/V Belgica, assisting the navigation officers.*

During deployments communication was maintained between the boatswain at the winch, the scientists at the GAPS transponder system in the ROV van and the bridge, to 1) secure that the ship remained on position, 2) confirm water depth relative to paid out cable, and 3) confirm the exact position of the MUC in the water column and relative to the ship. Together with the preceding ROV surveys of the sampling stations, these led to efficient MUC use.

The deployment protocol consisted of 5 phases. 1) Deployment of the MUC at 40m/min, 2) stabilisation phase of 1-2 min at 20-50m above bottom, 3) Bottom approach at 10m/min, 4) 1-2 min penetration time on seafloor, and 5) haul back at 50m/min.

4.3.5 Operational Report

It is worth noting that the time used in this cruise report and on the seismic survey sheets is the Belgian Summer time (BRAVO TIME = UTC+2hours). The whale watching survey took place every day from 08:00 to 22:30.

Saturday 19.06.2010

Meteo: Sea state 3 to 4, in a general clear and dry weather.

12:00 Departure of R/V Belgica towards Whittard Canyon

13:30 Safety briefing in wetlab

14:00 Scientific briefing in wardroom; an additional test of the CTD system is planned from the moment R/V Belgica reaches water depths in excess of 400 m (scheduled for 20/06/10 about noon).

Whale watching: no observation

Sunday 20.06.2010

Meteo: Sea state 3 to 4, in a general clear and dry weather with a gentle Atlantic swell

08:30 Replacement of SBE19 CTD batteries, check of the internal memory and data download trials. Discussion of CTD sampling strategy for hydrography and MUC sampling stations

11:55 Whale watching: observation of 4 striped dolphins (*Stenella coeruleoalba*)

12:25 Whale watching: observation of 6 groups of bottlenoses dolphins (*Tursiops truncatus*) for of total of 122 individuals.

13:30 Approach CTD test site, water depth 1390 m (47°24.047'N; 6°52.408'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s

14:10 B1017-CTD-01 reaches a depth of 1000 m, triggering of Niskin bottle

14:25 Winding problems with hydrographic cable, several re-tries are executed

14:45 CTD is back on board, after download of data, there still seems to be a problem with the data quality. The data is sent to MUMM for evaluation.

15:00 Continuation of transit towards the Whittard Canyon.

15:16 Whale watching: observation of 2 groups of bottlenoses dolphins for of total of 21 individuals

18:40 Whale watching: observation of 2 fin whales (*Balaenoptera physalus*), an adult and a juvenile, probably a female and a calf.

22:20: Whale watching: observation of 4 bottlenoses dolphins

Monday 21.06.2010

Meteo: Sea state 1 to 2, in a general clear and dry weather with a (very) gentle Atlantic swell

08:00 Start of ROV operations, replacing CTD batteries of ROV

08:15 GAPS is launched, site approach towards ROV waypoint 1a

08:33 TMS + ROV are in the water

09:03 Launch of ROV

09:07 Seafloor is reached at 854 m bsl; start of Dive B10-03a

09:25 Pushcore trial 1: only small amount of sediment is recovered at 800 m water depth (48°46.26'N; 10°39.33'W): first RCMG pushcore B1017-push-01

09:40 Whale watching: observation of a sperm whale (*Physeter macrocephalus*)

10:07 Pushcore trial 2: failure

11:34 End of Dive B10-03a, ROV is returned to TMS

11:35 TMS+ROV are raised 100 m for transit to waypoint 1c

12:20 2nd ROV site approach

12:41 Launch of ROV

12:46 Seafloor is reached at 1119 m bsl; start of Dive B10-03b

14:07 No GAPS positioning

14:15 End of Dive B10-03b, ROV is returned to TMS

14:33 TMS+ROV are on board of R/V Belgica, GAPS is retracted, start of transit to points 2a-2c

15:08 GAPS is launched, site approach towards ROV waypoint 2a

15:34 ROV stills camera does not operate; operation is aborted until system is restored. CTD profiling still not on-line, waiting for answer of MUMM

15:45 Transit to start of seismic line S1a

16:30 Switch from diesel to electric propulsion

17:00 Start of line WC100601, heading 210° (av. speed 2.8 knots)

19:04 End of line WC100601

19:08 Start of line WC100602, heading 100° (av. speed 3.6 knots)

19:15 Meeting with RSS Discovery, performing physical oceanographic profiling for the University of Liverpool over ROV sites 2a-b-c (Chief scientist; Prof. Dr. Jonathan Sharples).

19:48 End of line WC100602

19:50 Start of line WC100603, heading 235 (av. speed 3.2 knots)

21:36 End of line WC100603

22:00 ROV is still under repair; probably refitting to initial configuration is needed. The CTD problem will be solved by attaching the spare ROV CTD to the MUMM-CTD frame, still enabling to finish the CTD programme.
22:15 Start of line WC100604, heading 003 (av. speed 2.6 knots)
23:30 End of line WC100604
23:38 Start of line WC100605, heading 147 (av. speed 2.9 knots)

Tuesday 22.06.2010

Meteo: Sea state 3 to 4, in a general clear and dry weather with a very gentle Atlantic swell

01:40 End of line WC100605
02:13 Start of line WC100606, heading 47 (av. speed 3.3 knots)
05:40 End of line WC100606
05:43 Start of line WC100607, heading 124 (av. speed 3.1 knots)
06:56 End of line WC100607
06:48 Start of line WC100608, heading 220 (av. speed 3.3 knots)
08:50 End of line WC100608, switch from electric to diesel propulsion
10:06 Approach CTD BG site, water depth 1230 m (48°40.226'N; 10°37.770'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s
10:54 B1017-CTD-02 reaches a depth of 1000 m, triggering of Niskin bottle
11:30 CTD+Niskin back on board, check of both CTD data files
12:30 Approach CTD W5 site, water depth 1130 m (48°45.813'N; 10°38.514'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s
13:16 B1017-CTD-03 reaches a depth of 1000 m, triggering of Niskin bottle
13:40 CTD+Niskin back on board, transit to BG site
14:45 Approach CTD BG site, water depth 1230 m (48°40.226'N; 10°37.770'W), CTD is lowered at a velocity of 0.5 m/s
15:30 B1017-CTD-02b reaches a depth of 930 m, winching problem is noticed. The mechanical drum guidance seems to be defective.
18:35 CTD is back on board, transit to R3 seismic line
19:25 Arrival on site, switch from diesel to electric propulsion.
19:37 Start of line WC100609a, heading 228 (av. speed 3.1 knots)
21:31 End of line WC100609a
21:32 Start of line WC100609b, heading 139 (av. speed 4.0 knots)
22:45 End of line WC100609b
22:46 Start of line WC100610, heading 30 (av. speed 3.2 knots)

Wednesday 23.06.2010

Meteo: Sea state 2 to 3, in a partly cloudy to sunny, but dry weather with a gentle Atlantic swell

02:13 End of line WC100610

02:25 Start of line WC100611, heading 291 (av. speed 2.9 knots)

07:10 End of line WC100611

08:00 Site approach MUC site 2b; preparation of MUC with connections of CTD and GAPS transponder

08:55 GAPS is launched

08:58 1st deployment MUC at station 2

09:27 Stop at 722 m for stabilization of MUC

09:29 Start bottom approach MUC

09:33 B1017-MUC-01a reaches the seafloor at a depth of 813 m (48°48.0086N; 10°35.2805'W)

09:35 Extraction MUC

09:55 MUC on deck

10:31 2nd deployment MUC at station 2

10:52 Stop at 740 m for stabilization of MUC

10:53 Start bottom approach MUC

10:56 B1017-MUC-01b reaches the seafloor at a depth of 794 m (48°47.9783'N; 10°35.3490'W)

10:58 Extraction MUC

11:18 MUC on deck

12:18 3rd deployment of MUC at station 2

12:35 Stop at 700 m for stabilization of MUC

12:38 Start bottom approach MUC

12:41 B1017-MUC-01c reaches the seafloor at a depth of 792 m (48°48.0361'N; 10°35.2833'W)

12:43 Extraction MUC

13:03 MUC on deck

13:06 4th deployment of MUC at station 2

13:24 Stop at 700 m for stabilization of MUC

13:25 Start bottom approach MUC

13:31 B1017-MUC-01d reaches the seafloor at a depth of 783 m (48°48.0238'N; 10°35.0355'W)

13:33 Extraction MUC

13:59 MUC on deck, transit to MUC station 3. Mechanical problem at hydrographic winch has been repared.

14:36 1st deployment of MUC at station 3

15:01 Stop at 993 m for stabilization of MUC

15:09 Start bottom approach MUC

15:12 B1017-MUC-02a reaches the seafloor at a depth of 1025 m (48°47.3345'N; 10°34.7238'W)

15:14 Extraction MUC

15:39 MUC on deck

15:48 2nd deployment of MUC at station 3

16:12 Correction for drift

16:43 Stop at 995 m for stabilization of MUC

16:44 Start bottom approach MUC

16:47 B1017-MUC-02b reaches the seafloor at a depth of 1035 m (48°47.4238'N; 10°35.8535'W)

16:48 Extraction MUC

17:13 MUC on deck

17:35 3rd deployment of MUC at station 3

18:00 Stop at 842 m for stabilization of MUC

18:25 Start bottom approach MUC

18:31 B1017-MUC-02c reaches the seafloor at a depth of 1036 m (48°47.5103'N; 10°34.8620'W)

18:34 Extraction MUC

18:56 MUC on deck

19:07 4th deployment of MUC at station 3

19:30 Stop at 1000 m for stabilization of MUC

19:31 Start bottom approach MUC

19:33 B1017-MUC-02d reaches the seafloor at a depth of 1032 m (48°47.4910'N; 10°34.9063'W

19:36 Extraction of MUC, retraction of GAPS

20:04 MUC on deck; transit towards CTD station W3

20:11 Approach CTD W3 site, water depth 921 m (48°49.414'N; 10°32.085'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s

20:40 Whale watching: observation of 3 bottlenoses dolphins

20:50 Additional problems occur with the hydrographic winch

21:10 B1017-CTD-04 reaches a depth of 800 m, triggering of Niskin bottle

21:26 CTD+Niskin back on board

21:52 Approach CTD W4 site, water depth 830 m (48°51.358'N; 10°31.116'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s

22:28 B1017-CTD-05 reaches a depth of 750 m, triggering of Niskin bottle

22:32 CTD+Niskin back on board

23:07 Approach CTD W5 site, water depth 367 m (48°53.980'N; 10°31.448'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s

23:23 B1017-CTD-06 reaches a depth of 325 m, triggering of Niskin bottle

23:30 CTD+Niskin back on board, transit towards starting point for seismic profiling

Thursday 24.06.2010

Meteo: Sea state 1 to 2, in a sunny and dry weather with a gentle Atlantic swell

00:17 Start of line WC100612, heading 128 (av. speed 3.0 knots)

05:20 End of line WC100612

05:23 Start of line WC100613, heading 225 (av. speed 3.2 knots)

05:56 End of line WC100613

05:58 Start of line WC100614, heading 311 (av. speed 3.5 knots)

07:23 End of line WC100614

08:30 Start of ROV operations, site 2c approach, launch of GAPS

08:45 TMS+ROV are in the water

09:13 Launch of ROV

09:18 Seafloor is reached at 1021 m bsl; start of Dive B10-04

09:56 Cable problem TMS; check-up by ROV

10:03 Dive is continued

10:44 Sampling of a cold-water coral & water sample at a water depth of 842 m bsl (48°46.8250'N, 10°34.2189'W)

11:22 A fishnet (long-line) is caught up in the TMS; check-up by ROV

11:31 End of Dive B10-04, ROV is returned to TMS

11:45 Due to interference of fishnet, the ROV was not able to fully dock inside the TMS (probably for 50%). During retrieval, the main propulsion of the ship is stopped, in order to avoid possible interference with unidentified fishing gear attached to TMS+ROV. Navigation and stabilisation on ship by thrusters.

12:00 TMS+ROV are successfully retrieved on board of R/V Belgica. Fishing gear is caught in cable drum of TMS and around ROV, with important by-catch of cold-water corals and oysters. Removal of lines (kept for investigation) and corals. GAPS is retracted.

13:15 Inspection and check-up of possible damage of long-line and coral fragments to TMS+ROV systems, preparation for Dive B10-05.

14:00 Site 2a approach, launch of GAPS

14:05 TMS+ROV are in the water

14:37 Launch of ROV

14:42 Seafloor is reached at 1041 m bsl; start of Dive B10-05

15:31 End of Dive B10-05, ROV is returned to TMS

16:00 TMS+ROV are on board of R/V Belgica, retraction of GAPS transit towards site 3a

17:14 Site 3a approach

17:17 GAPS is launched

17:24 TMS+ROV are in the water

17:44 Positioning problem on TMS; reboot on deck is needed

18:04 TMS+ROV are on board R/V Belgica, check-up systems

18:11 TMS+ROV are in the water

18:43 Launch of ROV

18:47 Seafloor is reached at 1021 m bsl; start of Dive B10-06

20:43 End of Dive B10-06, ROV is returned to TMS

21:00 TMS+ROV are on board of R/V Belgica, retraction of GAPS

21:25 Approach CTD E4 site, water depth 1013 m (48°39.539'N; 10°24.215'W), CTD with 5L Niskin bottle is lowered at a velocity of 0.5 m/s

22:00 B1017-CTD-07 reaches a depth of 950 m, triggering of Niskin bottle

22:15 CTD+Niskin back on board, transit towards starting point for seismic profiling

23:01 Start of line WC100615, heading 170 (av. speed 2.9 knots)

Friday 25.06.2010

Meteo: Sea state 1 to 2, in a (very) sunny and dry weather with a gentle Atlantic swell. The weather becomes cloudy in the afternoon.

01:15 End of line WC100615

01:27 Start of line WC100616, heading 307 (av. speed 2.8 knots)

06:12 End of line WC100616

06:15 Start of line WC100617, heading 110 (av. speed 3.3 knots)

07:07 End of line WC100617

08:00 Site approach MUC station 1, preparation of tools

08:29 GAPS is launched

08:33 1st deployment of MUC at station 1

08:50 Stop at 730 m for stabilization of MUC

08:51 Start bottom approach MUC

08:55 B1017-MUC-03a reaches the seafloor at a depth of 800 m (48°46.4944'N; 10°37.9565'W)

08:57 Extraction of MUC

09:17 MUC is on deck

09:34 2nd deployment of MUC at station 1

09:51 Stop at 720 m for stabilization of MUC

09:52 Start bottom approach MUC

09:55 B1017-MUC-03b reaches the seafloor at a depth of 805 m (48°46.4901'N; 10°38.4933'W)

09:58 Extraction of MUC

10:17 MUC is on deck

10:27 3rd deployment of MUC at station 1

10:41 Stop at 770 m for stabilization of MUC

10:43 Start bottom approach MUC

10:46 B1017-MUC-03c reaches the seafloor at a depth of 812 m (48°46.5009'N; 10°38.4987'W)

10:49 Extraction of MUC

11:08 MUC is on deck

11:25 4th deployment of MUC at station 1

11:42 Stop at 740 m for stabilization of MUC

11:43 Start bottom approach MUC

11:46 B1017-MUC-03d reaches the seafloor at a depth of 801 m (48°46.5014'N; 10°38.4528'W)

11:48 Extraction of MUC

12:05 MUC is on deck, retraction of GAPS, transit to MUC station 4

13:13 GAPS is in the water

13:17 1st deployment of MUC at station 4

13:55 B1017-MUC-04a reaches the seafloor at a depth of 720 m (48°46.4930'N; 10°34.0078'W)

13:57 Extraction of MUC

14:17 MUC is on deck

14:22 2nd deployment of MUC at station 4

14:46 B1017-MUC-04b reaches the seafloor at a depth of 705 m (48°46.5490'N; 10°33.9172'W)

15:06 MUC is on deck

15:15 3rd deployment of MUC at station 4

15:39 B1017-MUC-04c reaches the seafloor at a depth of 703 m (48°46.5591'N; 10°33.9083'W)

15:59 MUC is on deck

16:09 4th deployment of MUC at station 4

16:33 B1017-MUC-04d reaches the seafloor at a depth of 708 m (48°46.5734'N; 10°33.9313'W)

16:54 MUC is on deck, transit to additional coring site, located NE upslope from station 4

18:33 1st deployment of MUC at station 4bis

18:52 B1017-MUC-05a reaches the seafloor at a depth of 574 m (48°46.7648'N; 10°33.2168'W). This is accompanied with an unexpected rise in cable tension.

18:56 MUC is carefully extracted from seafloor. Main propulsion is stopped, in case the MUC should retrieved unexpected load such as fishing gear

19:07 MUC is (safely) on deck; no damage on device. The error is probably located to the Marelec starboard winch

19:10 Retraction of GAPS

19:13 End of campaign, start of transit towards Zeebrugge

19:24 Taking of water samples (filtered) for Prof. Dr. Lei Chou (ULB)

Saturday 26.06.2010

Meteo: Sea state 1 to 2, in a (very) sunny and dry weather with a gentle Atlantic swell.

10:08 Whale watching: observation of 5 harbour porpoises (*Phocoena phocoena*)

11:06 Whale watching: observation of 3 harbour porpoises

16:30 Whale watching: observation of 4 Risso's dolphins (*Grampus griseus*), 3 adults and 1 juvenile

17:26 Whale watching: observation of 1 harbour porpoise

20:12 Whale watching: observation of 1 harbour porpoise

All day: check-up of equipment, back-up of acquired data and preparation for demobilization

Sunday 27.06.2010

Meteo: Sea state 0 to 1, in a very sunny and dry weather.

All day: check-up of equipment, back-up of acquired data and preparation for demobilization

Monday 28.06.2010

Meteo: Sea state 0 to 1, in a very sunny and dry weather.

08:00 Arrival in the Zeebrugge Naval base

08:30 Start of demobilization and disembarkation of scientific staff

4.4 Operational remarks

First of all, we want to thank the captain and crew for their tremendous efforts and the fine cooperation for this campaign. The on-board skilfulness really contributed greatly to this success of this campaign. We would like to acknowledge their effort in the reparation and fine-tuning the hydrographic winch with the means that were necessary.

4.5 Data processing and preliminary results

In this section, a brief review is given regarding the obtained datasets during the campaign. The location of these data is given in Figs. 3, 4 and 5.

4.5.1 Water mass stratification

Name	***Latitude***	***Longitude***	***Water depth***	***CTD depth***	***Comment***
B1017-CTD-01	47°25.047'N	06°52.408'W	1390 m	1000 m	Bad data
B1017-CTD-02	48°40.226'N	10°37.770'W	1230 m	1000 m	Bad data
B1017-CTD-03	48°45.813'N	10°38.514'W	1130 m	1000 m	Success
B1017-CTD-02b	48°40.226'N	10°37.770'W	1230 m	930 m	Success
B1017-CTD-04	48°49.414'N	10°32.085'W	921 m	800 m	Success
B1017-CTD-05	48°51.358'N	10°31.116'W	830 m	750 m	Success
B1017-CTD-06	48°53.979'N	10°31.448'W	367 m	325 m	Success
B1017-CTD-07	48°39.539'N	10°24.215'W	1013 m	950 m	Success

Table 1: *Coordinates and depth of the CTD casts with Niskin samples from deepest water depth .*

The obtained hydrographic data was acquired from 3 sources. Standard CTD profiling was performed using the shipboard hydrographic cable, attached to the CTD frame. Due to problems with the SBE19Plus CTD, the Sea & Sun CTD48M system was additionally used (both on batteries). 8 standard CTD casts were performed (Table 1), each with triggering of a water sample at the seafloor. Comparison of temperature and salinity data of the SBE19Plus (records in time intervals) and the CTD48M (continuous) yielded coefficients with a linear fit. Downcast measurements were used for further processing of data applying SBE Data Processing Version 5.30a, Sea & Sun Technology SDA Software and Ocean Data View mp-Version 3.3.2 for visualisation. Additional CTD data was acquired from the same CTD48M, mounted to the MUC, allowing a nearly 12 h cycle at some station (see MUC operation and Table 3). Also during all ROV dives, CTD measurements were performed with 2 additional water samples near cold-water coral reefs. However, the problems with the pressure sensor resulted to a larger scatter of salinity data.

The distribution of water masses at the Whittard Canyon can be identified using the potential temperature-salinity plot through the water column (Fig. 8). Below the surface water mass (SW, upper 100 m) down to 400 m water depth, temperature and salinity decrease to values of T = 11°C and S = 35.58 psu. Between 400 and 750 m salinity remains constant while teperature further decreases. These waters correspond to the Eastern North Atlantic Water (ENAW) being formed mainly during the winter months in the Bay of Biscay and carried northwards adjacent to the NE Atlantic margin (Pollard *et al.* 1996). Higher salinity values below 750 m mark the Mediterranean Outflow Water (MOW) being slightly deeper than at the Guilvinec Canyon of the first leg.

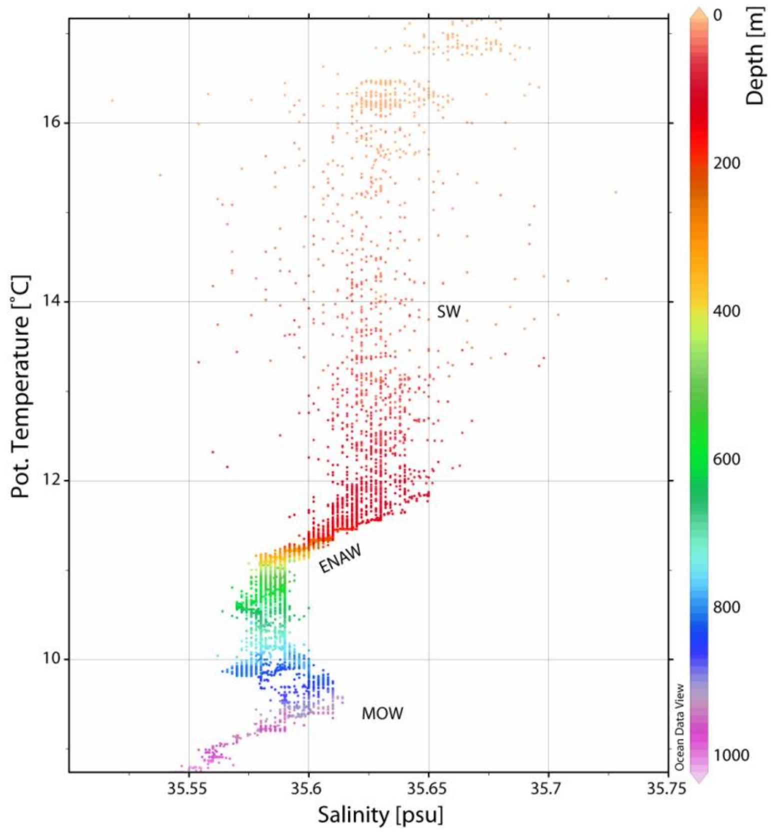


Figure 8: *Potential temperatur-salinity-depth plot of CTD cast 2-7 indicating the different water masses: SW = Surface Water (0–100 m), ENAW = Eastern North Atlantic Water (100–750 m), MOW = Mediterranean Outflow Water (below 750 m).*

According to Dullo *et al.* (2008), live cold-water coral ecosystems in the Nordic and Irish margin are located in a potential density (sigma-theta) envelope between 27.35 and 27.65 kg/m^3. Using our CTD data, the predicted optimal depth for cold-water coral occurrences with sigma-theta = 27.5 kg/m^3 would be at about 900 m water depth (Fig. 9). ROV Dives at investigated sites show maximum living coral occurrences at ~850 m water depth, corresponding to sigma theta values of 27.45 kg/m^3.

Figure 9 presents the CTD casts collected with the multi-corer during MUC stations 1 and 2 on 23.06.2010. These casts can be used to identify internal waves or tides at the depths of the coral reefs in phase with tidal cycle at the sea surface, measured at St. Mary's, Isle of

Scilly, England. The amplitude is an order of magnitude larger than that of the surface tides and adds an important contribution of the environmental dynamics to the cold-water coral ecosystem at that site, as it has been presented at other locations (e.g., Rüggeberg *et al.*, in press)

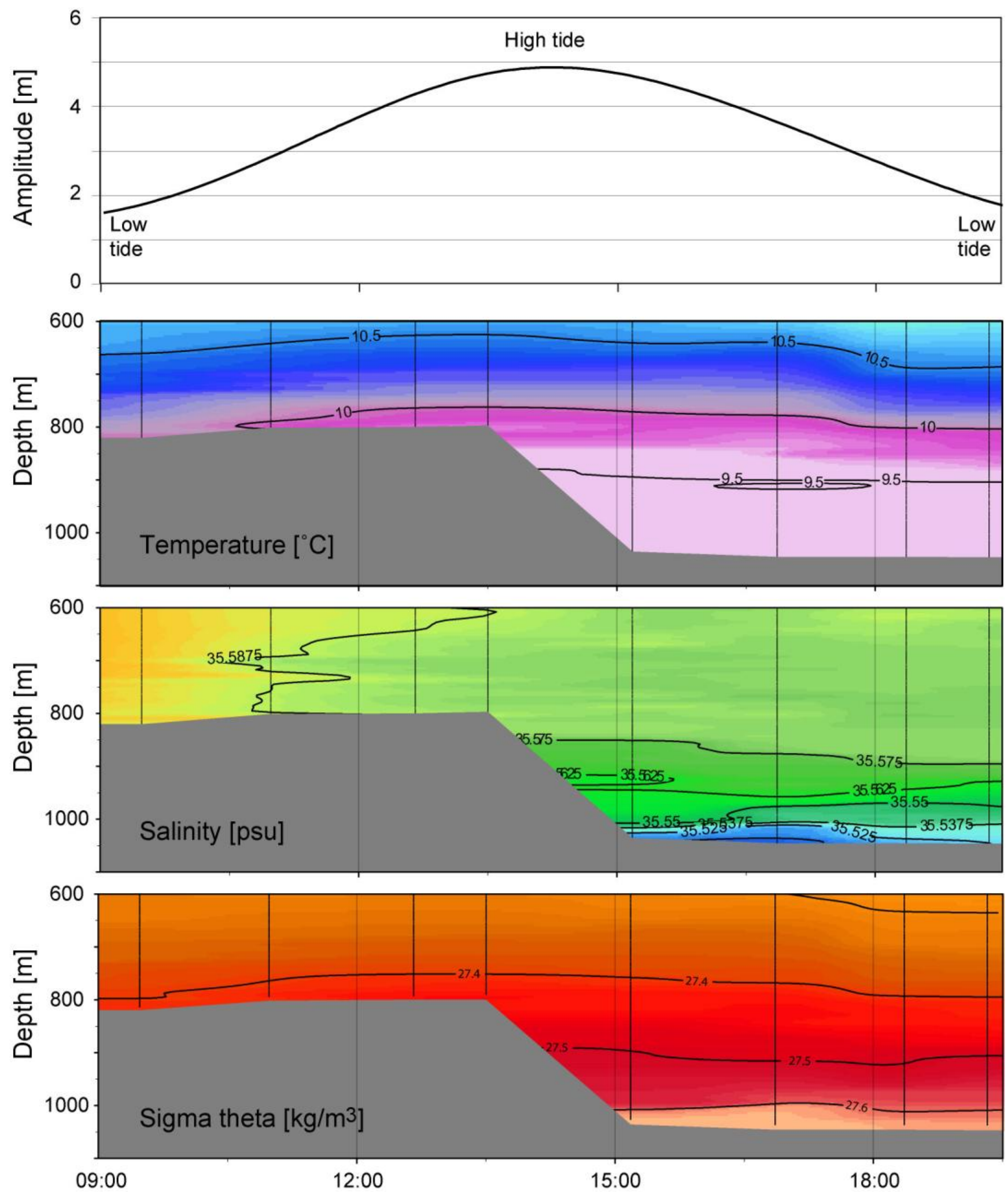


Figure 9: *CTD casts collected with MUC between 09:00 a.m. and 19:30 p.m. (UTC) in relation to the tidal cycle from St. Mary's, Isles of Scilly, England. All presented parameters follow the tidal cycle at ~800 m water depth with an amplitude of ~50 m.*

4.5.2 Preliminary results of the seismic survey

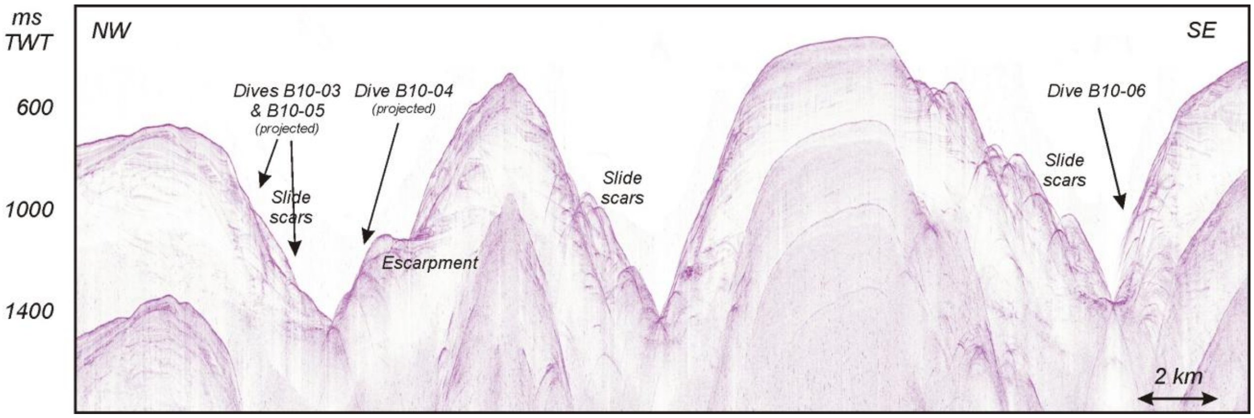


Figure 10: *seismic line WC100616 over the three, typically V-shaped, surveyed branches of the middle Whittard canyon system. All ROV Genesis dives were projected upon this profile (for location, see Figs. 3, 4 and 5). Only the track of ROV dive B10-06 fits with this profile.*

During the seismic survey, a total of 18 seismic lines were sailed over a distance of 237 km. Three sets of seismic lines were acquired, each with their own objectives. A basic set of lines across the canyons was acquired to reveal sedimentary processes, insight in canyon morphology, such as shown in Fig. 10. A second set is related to the previous one, but was generated over the ROV dive sites, in order to provide a seismic stratigraphic background on the ROV sites. Generally, the canyons are typically V-shaped. Towards the shallower part of the slope, several cut-and-fill structures were observed. The canyon flanks are generally steep, cut by probably glacially active turbiditic currents. On several occasions, large slide scars or slumps were documented. Specifically for the zones surveyed by the ROV, the "roots" of some large escarpments were visualized by the seismic profiling. A third set was acquired along the canyon interfluves, in order to better document the sedimentary processes and margin stratigraphy which would enable correlation with already published margin sequence stratigraphy.

4.5.3 ROV Observations

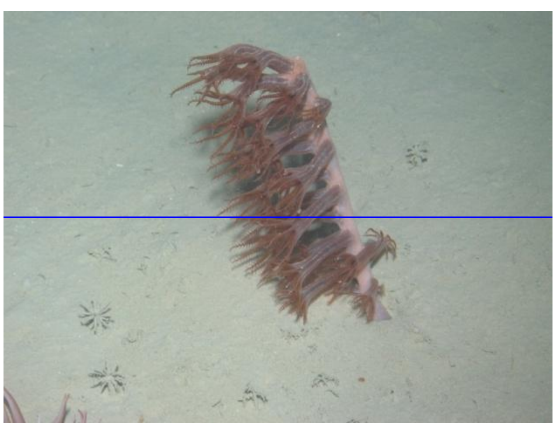
A total of 5 succesful transects were performed by ROV Genesis. Dives B10-03a and B10-03b focussed on a site previously sampled during the R/V Belgica 2006 campaign (Vanreusel *et al.*, 2006). The other 3 dives started from canyon floor towards canyon flank. During Dive B10-05, a "longline" was caught in the TMS of ROV Genesis, forcing to abort this dive. However, several corals and oysters were attached to this longline or within the TMS. All collected specimen were stored separately, and dried. All fishlines are also kept for cataloguing.

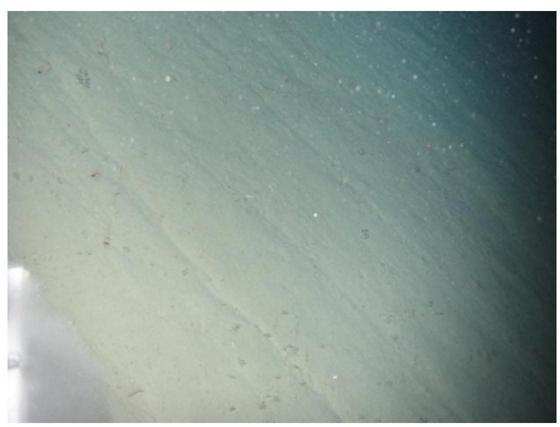
ROV Dive	Day	Event	Time	Latitude	Longitude	Depth
B10-03a	21/06/10	Start	09:07	48°46.2215'N	10°39.4438'W	853 m
		Stop	11:34	48°46.4890'N	10°38.5189'W	784 m
B10-03b	21/06/10	Start	12:46	48°45.9805'N	10°38.5364'W	1119 m
		Stop	14:15	48°46.9814'N	10°38.7500'W	553 m
B10-04	24/06/10	Start	09:18	48°46.3458'N	10°34.6962'W	1021 m
		Stop	11:31	48°46.5867'N	10°34.0216'W	710 m
B10-05	24/06/10	Start	14:42	48°47.4781'N	10°34.7728'W	1041 m
		Stop	15:31	48°48.0176'N	10°35.3307'W	787 m
B10-06	24/06/10	Start	18:47	48°39.6378'N	10°24.2747'W	1021 m
		Stop	20:43	48°38.9940'N	10°23.4969'W	448 m

Table 2: *For every ROV dive, coordinates, depth and time of start and end is displayed. The CTD profiler on board the ROV was active during all dives. The down- and up-cast profiles are considered to be located at respectively the start and stop locations of the ROV dive (position see Figs. 3, 4 and 5).*

Dive B10-03

During dive 03 the northern flank of the western branch was targeted. First, during dive 03a, a transect of 1.9 km was performed alongslope (around 800 m water depth) in W-E direction. During the second dive 03b an upslope transect of 1.7 km in S-N direction and between water depths of 1120 m and 550 m. During this dive mostly soft sediment was observed colonized by numerous penatulids (Phylum Cnidaria, Class Anthozoa, Order Octocorallia, Family Penatulacea, Genus Kophobelemnon) Within this area a very irregular topographic relief is present with steep slopes, sometimes indicating downslope transport, and cliffs/ridges made up of hard substrate, often highly bioturbated.





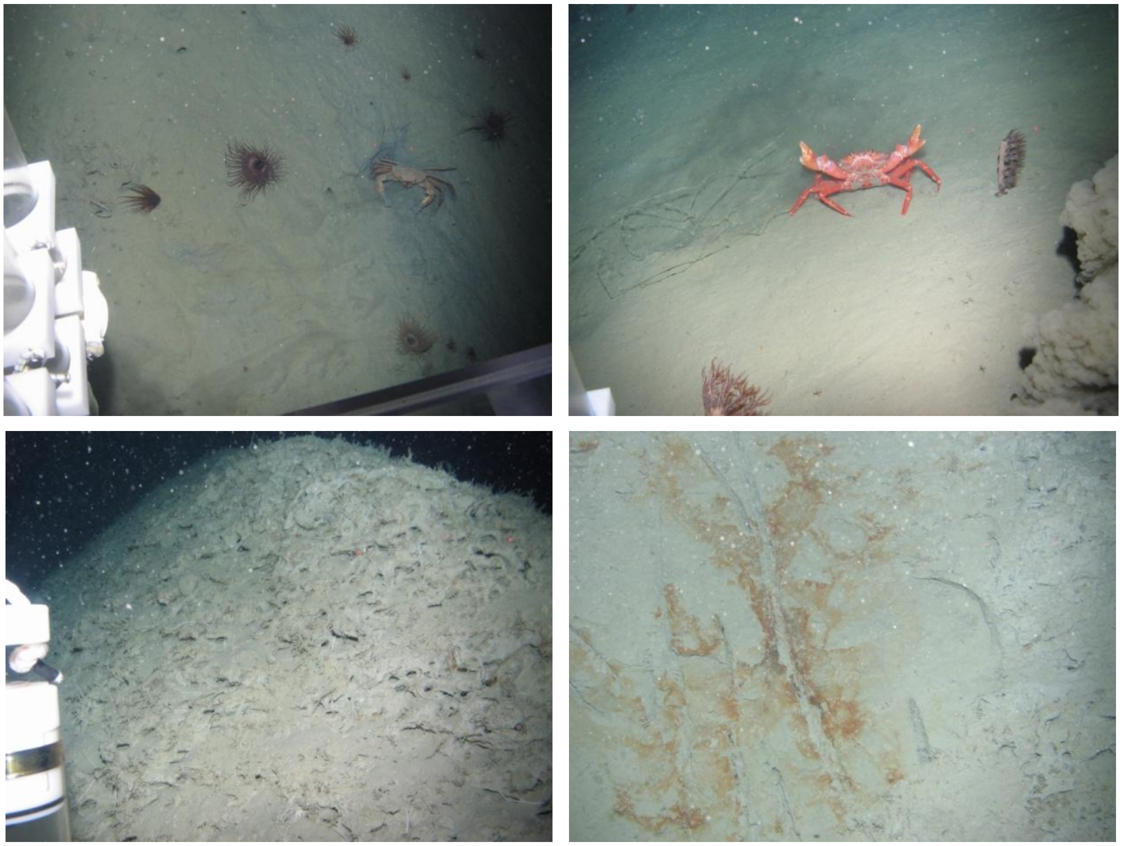
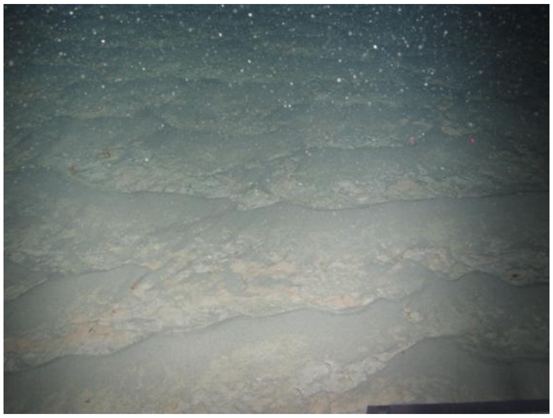
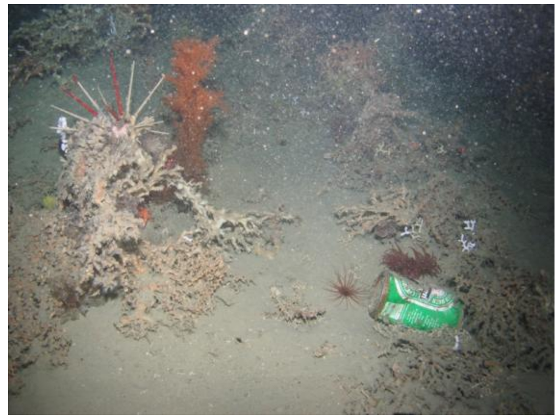
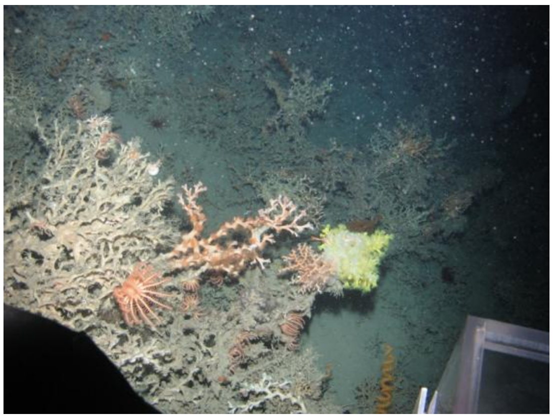
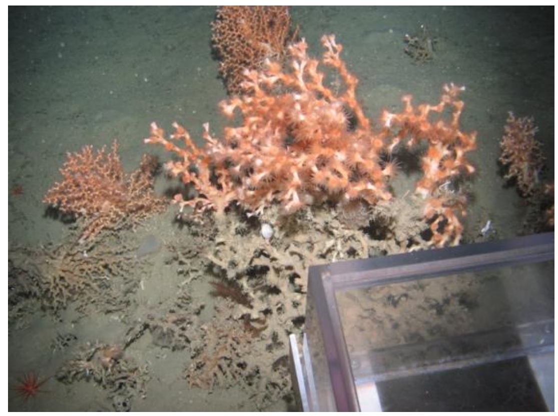
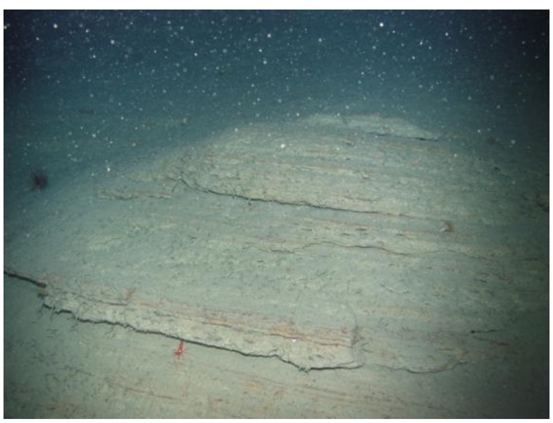


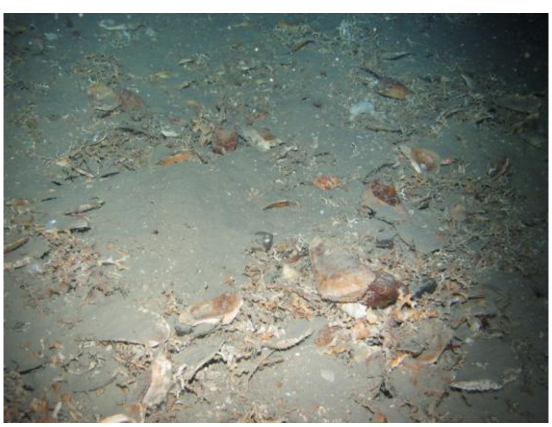
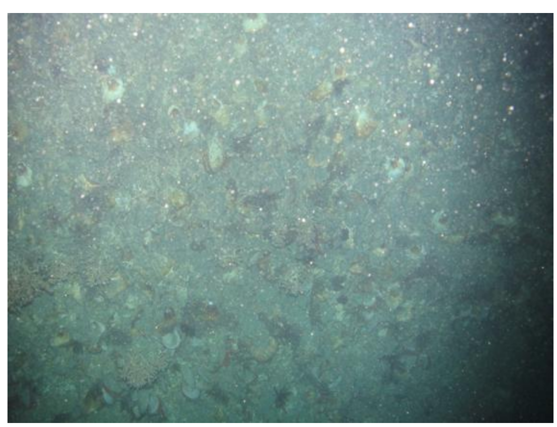
Figure 11: *(from upper left to lower right): (A) Soft sediment colonized by a pennatulid (Kophobelemnon sp.) (B) Steep slope with an indication of downslope transport, (C) Cliff colonized by a crab and cerianthids, (D) Steep slope colonized by a crab (Chaceon sp.?) and Kophobelemnon sp. (E) Ridge made of hard substrate with bioturbation holes, and (F) Cliff with bioturbation marks.*

Dive B10-04

Dive 04 is located on the southern flank in the western branch. An upslope transect of 2 km in water depths between 700 and 1020 m. During this dive an alternation was observed between rippled soft sediment and hard substrate (ridges and cliffs). Mostly coral rubble with still living cold-water corals on top was present with *Lophelia pertusa* and *Madrepora oculata* as the most common species. Also a few *Dendrophyllia sp.* species were observed. At the end of the dive, oysters were observed on a giant cliff (~ 50 m high).

Figure 12 (next page): *(from upper left to lower right): (A) Rippled soft sediment, (B) Coral rubble colonized by a black coral (Antipatharia, Leiopathes sp.?), sea-urchin (Poriocidaris sp.?), anemones, cerianthid and sponges together with a can of Heineken, (C) Dense coral rubble coverage with still living corals (Lophelia pertusa, Madrepora oculata and Dendrophyllia sp.) and colonized by Asteroids (Brisingidae, Novodinia sp.?), (D) Living Lophelia pertusa and Madrepora oculata (many tubeworms covered with sediment, (E-F) Hard substrate, (G) Dead coral rubble and oyster fragments at the foot of a very big cliff (probably around 50 m high), and (H) Cliff covered with oysters.*

Dive B10-05

Dive 05 is also located in the western branch but on the northern flank. A transect of 1.5 km was performed in water depths between 780 and 1040 m. Here, only soft sediment was observed with nearly no living fauna. At some locations ripples were observed or the soft sediment was covered with boulders.

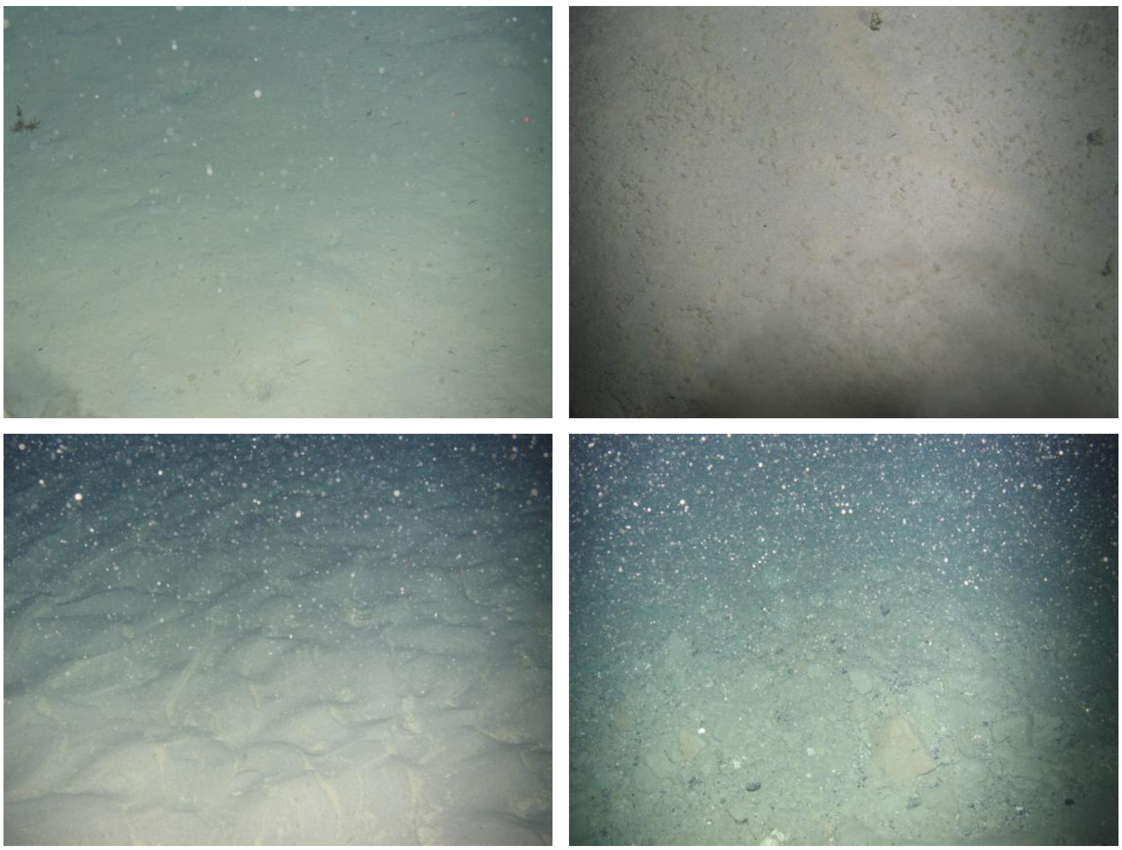


Figure 13: *(from upper left to lower right): (A) Soft sediment, (B) Bioturbated soft sediment, (C) Rippled soft sediment, and (D) Soft sediment covered with boulders.*

Dive B10-06

During the last dive, the eastern branch was targeted during a 2.1 km long upslope transect in water depths between 1020 and 450 m. Again, an alternation is observed between soft sediment (mostly rippled) and hard substrate expressed as small banks and large cliffs (3-8 m high). During this dive mostly dead cold-water coral rubble was observed. At some locations living *Lophelia pertusa*, *Madrepora oculata* and *Desmophyllum* were present.

Figure 14: *(from upper left to lower right): (A) Small bank (~10 cm high) (Cerianthus sp.), (B) Small bank with coral rubble, (C) Cliff (~1 m) mostly covered with dead corals and only one small living Lophelia pertusa, black coral (probably Cirrhipathes spiralis) and two species of echinoids, (D) Cliff colonized by dead corals and living Lophelia pertusa, Desmophyllum species, Anthomastus sp. (Fam. Alcyonacea) and anemones (Actinaria), (E) Cliff with Madrepora oculata, Desmophyllum and a soft coral and (F) Bioturbation.*

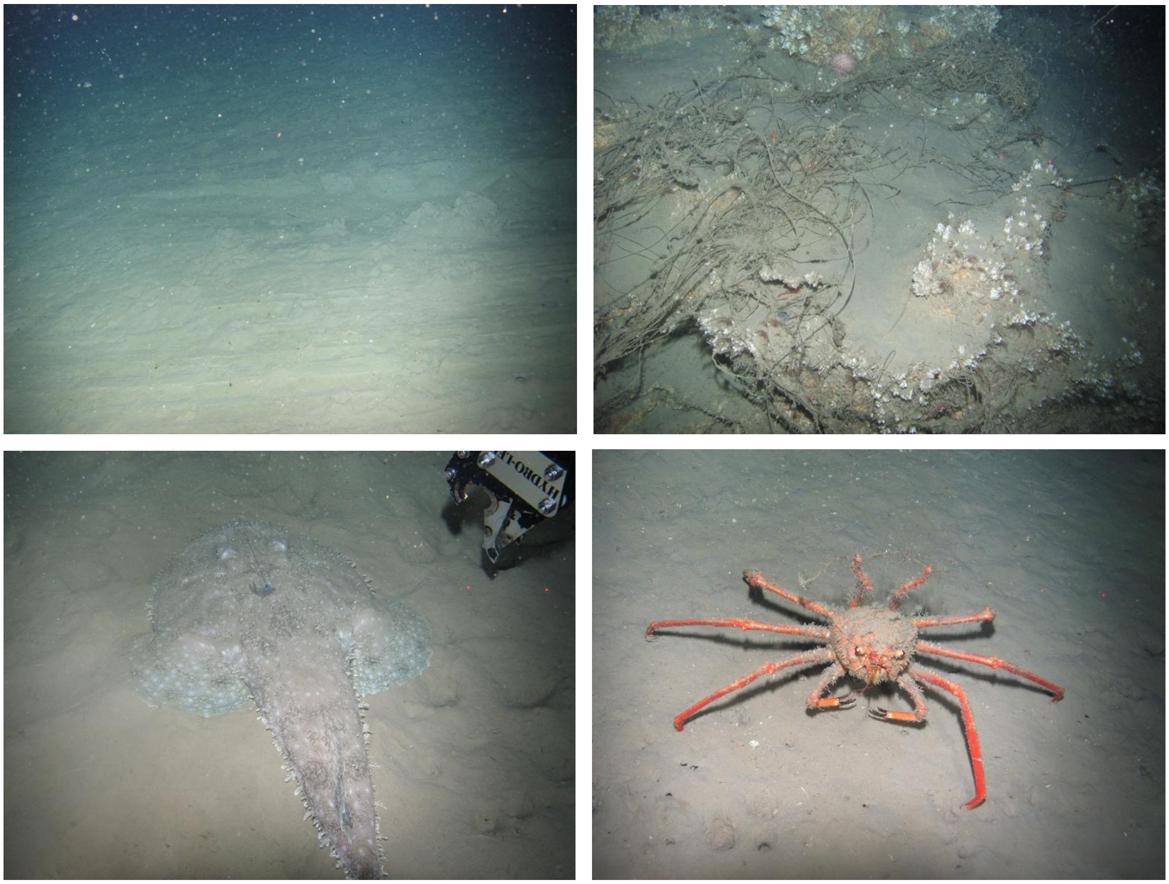


Figure 14 (continued): *(from upper left to lower right): (G) Trawl marks, (H) Fishing net, (I) Monkfish (Lophius sp.) and (J) a spider crab.*

4.5.4 MUC sampling

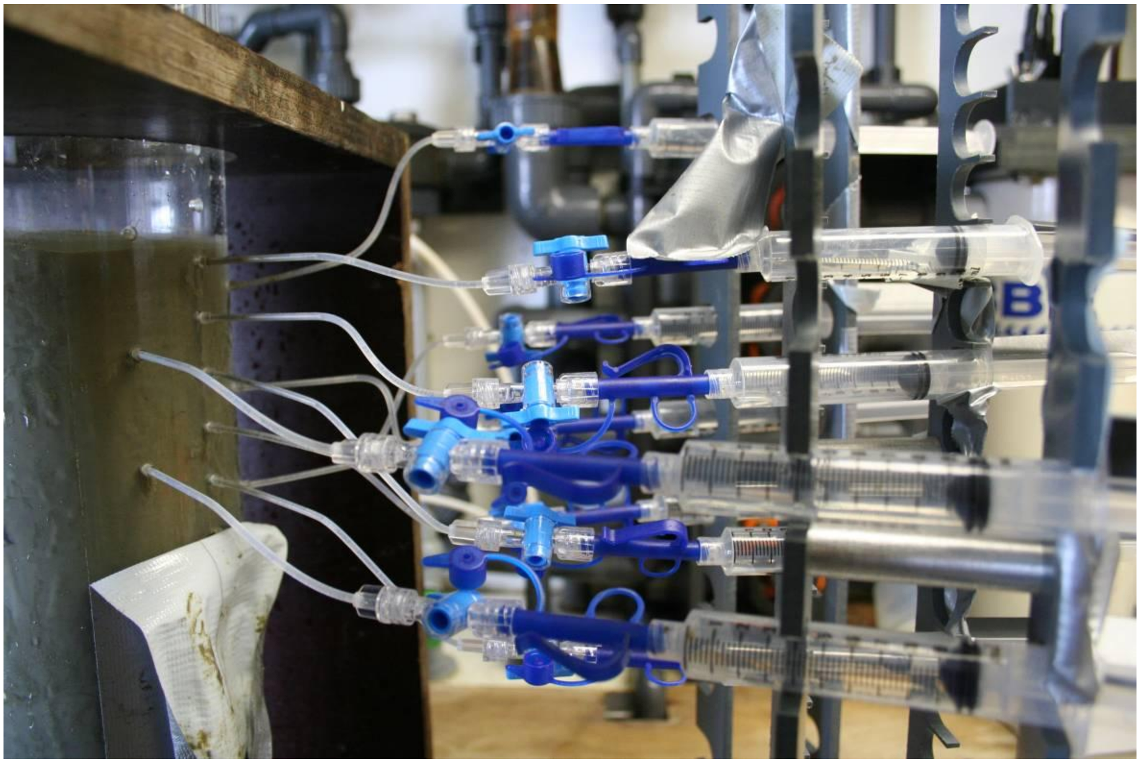
Characterisation of the meiofauna community and the environment.

The main aim of the MUC strategy was to collect samples to identify cross-canyon heterogeneity in terms of metazoan meiofauna and biogeochemistry of the sediments and interstitial water. In the Whittard Canyon head, hydrodynamic activity and a variable topography lead to high within-canyon heterogeneity. To what extent the infauna reflects this heterogeneity in terms of structural, ecological diversity and functioning, however, is unknown. By a multidisciplinary approach including CTD, ROV and seismic surveys, we aim to gain knowledge about how such heterogeneity affects the benthos and to elucidate what drives and maintains structural and ecological diversity in benthic ecosystems characterized by frequent hydrodynamic disturbance.

Name	***Depth***	***Latitude***	***Longitude***	***Site***	***Recovery***
B1017-MUC-01a	813	48°48.0086'N	10°35.2805'W	MUC 2b	3/4
B1017-MUC-01b	794	48°47.9783'N	10°35.3490'W	MUC 2b	2/4
B1017-MUC-01c	792	48°48.0361'N	10°35.2833'W	MUC 2b	0/4
B1017-MUC-01d	783	48°48.0238'N	10°35.0355'W	MUC 2b	4/4
B1017-MUC-02a	1025	48°47.3345'N	10°34.7238'W	MUC 3(2a)	0/4
B1017-MUC-02b	1035	48°47.4238'N	10°35.8535'W	MUC 3(2a)	4/4
B1017-MUC-02c	1036	48°47.5103'N	10°34.8620'W	MUC 3(2a)	0/4
B1017-MUC-02d	1032	48°47.4910'N	10°34.9063'W	MUC 3(2a)	1/4
B1017-MUC-03a	800	48°46.4944'N	10°37.9565'W	MUC (2b)	4/4
B1017-MUC-03b	805	48°46.4901'N	10°38.4933'W	MUC (2b)	0/4
B1017-MUC-03c	812	48°46.5009'N	10°38.4987'W	MUC (2b)	4/4
B1017-MUC-03d	801	48°46.5014'N	10°38.4528'W	MUC (2b)	4/4
B1017-MUC-04a	720	48°46.4930'N	10°34.0078'W	MUC (2c)	0/4
B1017-MUC-04b	705	48°46.5490'N	10°33.9172'W	MUC (2c)	2/4
B1017-MUC-04c	703	48°46.5591'N	10°33.9083'W	MUC (2c)	2/4
B1017-MUC-04d	708	48°46.5734'N	10°33.9313'W	MUC (2c)	2/4
B1017-MUC-05a	574	48°46.7648'N	10°33.2168'W	MUC (xx)	3/4

Table 3: *Overview of all MUC sampling sites with recovery rate. For location, see figures 3 –5.*

All samples were sliced in 1cm slices down to 10cm sediment depth (when available). Faunal samples were preserved in Borax-buffered formalin (4%) lengthened with filtered (32 μm) sea water. Cores suitable for environmental characterization were processed with rhizons to extract interstitial water (Fig. 15) and were subsequently stored at -20°C. 1ml of the water was injected in a Zinc Acetate solution (stored in a capped vial at -20°C) to capture the sulphide compounds whilst the left over water was stored at -20°C for nutrient analysis. Also molecular samples were collected and stored in 100% molecular grade ethanol for further study of connectivity and possible molecular identification of nematode-bacteria endosymbionts for certain nematode genera. Additional cores were used for experimental treatments or backup faunal characterization. The retrieved sediment cores gave visual confirmation of the heterogeneity of the seafloor in this area, as also observed by the ROV video footage. The efficiency of the MUC at the canyon walls was higher due to the presence of softer sediments, enabling easier penetration by the corers. In the thalweg of the canyon branch, sediment penetration was hampered by the presence of compacted layers of grey clay mixed with sandy turbidites and anoxic strata. All other sediment cores (apart from the last deployment) from other stations showed typical soupy, muddy surface layers with more compacted mud in deeper layers. The last station visited was the shallowest at 574 m water depth. Here, a coarser grain size was noticed in comparison with previously taken samples.



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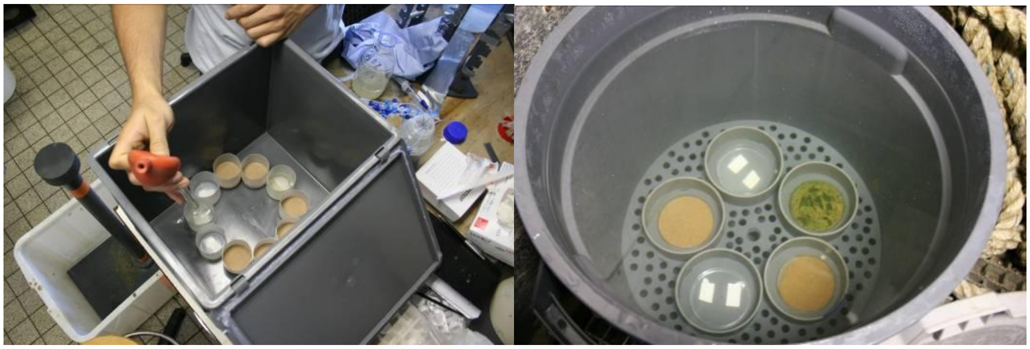
Nematode dispersal experiments

Free-living marine nematodes are often encountered in the water column, especially in high energy areas. Strong currents and turbidity events can cause nematodes to be resuspended after which they may resettle as particles depending on the intensity of the hydrodynamic environment. Such dislodgement is important for less-mobile taxa to achieve dispersal. The Whittard Canyon along the Irish continental margin is a physically disturbed environment that receives high amounts of sediments and organic material coming from the shelf or surface waters. The main aim of the experiments is to evaluate if the nematodes from this canyon area have the ability to select their habitat (substrates with different food sources: bacteria, diatoms, sulphide rich agar medium, control with and without anorganic sediment) when descending to the seafloor after a resuspension event, and to assess their ability to disperse actively towards different food sources. These experiments can be combined with the analysis of medium-scale cross-canyon samples to investigate nematode heterogeneity, diversity and ecofunctioning of this highly dynamic canyon environment. All experimental samples were stored in Borax-buffered formalin (4%) lengthened with filtered (32 µm) sweater.



Name	Metazoan meiofauna	Environmental variables (Rhizon treatment)	Molecular	Fauna (0-1 cm A. Rüggeberg)	Experiments
	(Borax buffered formalin 4%)	(-20°C)	(100% ethanol)	(Borax buffered formalin 4%)	(incubation)
B1017-MUC-01a	1	1	1	-	-
B1017-MUC-01b	1	1(1)	-	-	-
B1017-MUC-01c	-	-	-	-	-
B1017-MUC-01d	1	1(1)	1	1	-
B1017-MUC-02a	-	-	-	-	-
B1017-MUC-02b	1	1(1)	1	1	-
B1017-MUC-02c	-	-	-	-	-
B1017-MUC-02d	1	-	-	-	-
B1017-MUC-03a	1	1(1)	1	-	1
B1017-MUC-03b	-	-	-	-	-
B1017-MUC-03c	1	1(1)	1	-	1
B1017-MUC-03d	1	1(1)	1	1	-
B1017-MUC-04a	-	-	-	-	-
B1017-MUC-04b	1	1(1)	-	-	-
B1017-MUC-04c	1	-	1	-	-
B1017-MUC-04d	1	1	-	-	-
B1017-MUC-05a	1	1	1	-	-

Table 4: *Overview of all MUC sample purposes.*

4.5.5 Preliminary results of the whale watching survey

Species	**n**
Balaenoptera physalus	2
Grampus griseus	4
Phocoena phocoena	10
Physeter macrocephalus	1
Stenella coeruleoalba	4
Tursiops truncatus	150
Total	171

During the R/V Belgica ST1017b campaign, a total of 171 cetaceans (6 different species) have been observed, most of them when the ship was cruising. In addition (details not shown), 1247 seabirds (mostly gannets *Morus bassanus* formerly *Sula bassana* and northern fulmars *Fulmaris glacialis*), 4 sunfishes (*Mola mola*), 4 sharks, 1 turtle and 1 swordfish (*Xiphias gladius*) have been reported.

5. Data storage

During the Belgica 10/17b campaign, 17 seismic lines were acquired over approximately 237 km. These lines were recorded directly in SegY-Motorola format with associated navigation files (these are text files containing shot point, longitude, latitude, date and time). All CTD data has been stored under its original format, as well with processed data. A total of 4 ROV dives were performed. The ROV imagery (forward looking colour camera with/without overlay, black/white camera and stills camera) was recorded on DV tapes through Professional-DV recorders. After each dive the tapes were digitized through the Magix software and stored on an external hard dive. For more information about these data, please contact Dr. David Van Rooij (David.VanRooij@UGent.be)

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All MUC and sediment pore water samples have been stored at the Marine Biology Department, Ghent University. Samples still need to be processed for metazoan meiofauna (nematode assemblages) and biogeochemistry but may be available for collaborative work. For more information please contact Dr. Jeroen Ingels (Jeroen.Ingels@UGent.be)

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