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Wienberg, C., L. Beuck, M. Coughlan, W. Dimmler, M. Eisele,
A. Freiwald, M. Klann, G. Ruhland, J. Stone

REPORT AND PRELIMINARY RESULTS OF RV POSEIDON CRUISE POS400 "CORICON - COLD-WATER CORALS ALONG THE IRISH CONTINENTAL MARGIN", VIGO - CORK, JUNE 29 - JULY 15 2010.

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Reports can be ordered from:

Monika Bachur

DFG-Forschungszentrum MARUM

Universität Bremen

Postfach 330 440

D 28334 BREMEN

Phone: (49) 421 218-65516

Fax: (49) 421 218-65515

e-mail: MBachur@uni-bremen.de

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Wienberg, C. and cruise participants

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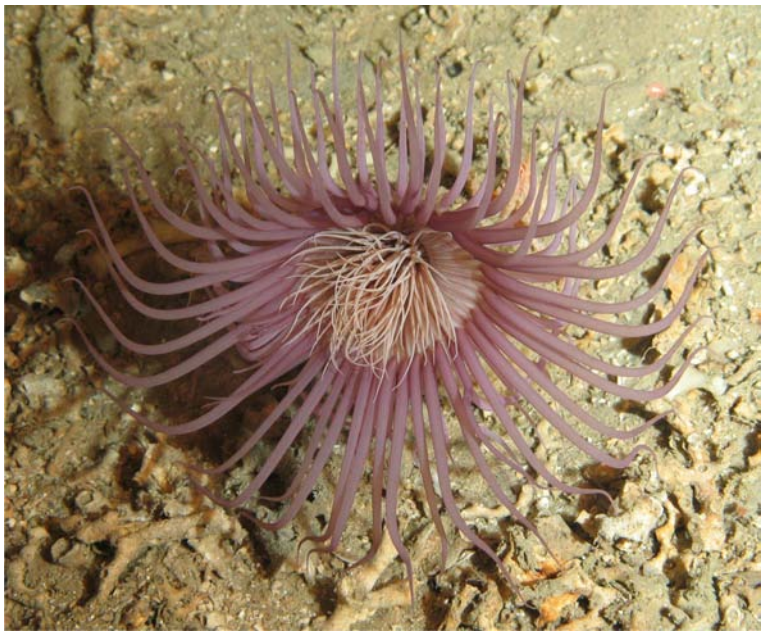
Cruise Report

RV POSEIDON cruise POS400

CORICON

Cold-Water Corals along the Irish Continental Margin



Vigo - Cork

29 June - 15 July 2010

by

Wienberg C, Beuck L, Coughlan M, Dimmler W, Eisele M,

Freiwald A, Klann M, Ruhland G, Stone J


The scientific crew
Götz
Lydia
Mark
Markus
André
Jana
Claudia
Werner
Marco

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1 Research programme

The **focus** of RV POSEIDON expedition POS400 was on the investigation of cold-water coral mounds of the Belgica Mound Province within the Porcupine Seabight along the Irish margin, where coral mounds are aligned as chains that stretch from north to south parallel to the slope (Beyer et al. 2003; Van Rooij et al. 2003). The coral mound chains are more or less restricted to distinct water depth intervals of ~700-900 m (shallow mound chain: e.g., Poseidon Mound, Challenger Mound) and 900-1,050 m (deep mound chain: e.g., Galway Mound, Pollux Mound). The shallow and deep coral mound chains show significant variations in their recent coral coverage with the deeper mounds hosting the most vivid coral communities in the area (Foubert et al. 2005; De Mol et al. 2007; Dorschel et al. 2007), whereas it is assumed that the mounds of the shallow mound chain are dominated by coral rubble and dead coral framework. This points to a displacement of the vital coral communities towards deeper waters in former times that might be related to changes in the water mass structure.

The **aim** of RV POSEIDON cruise POS400 was therefore the reconstruction of the Holocene development of the Belgica Mounds with special emphasis on the relation between changes of the regional oceanography (and/or other environmental parameters) and the vitality of cold-water coral ecosystems. Existing data revealed that the onset of an interglacial current regime with increased bottom currents has favoured the re-settlement of cold-water corals in the Porcupine Seabight after the last glacial period (Dorschel et al. 2005). But there is still little knowledge about the dynamic development of these ecosystems primarily on millennial timescales during the Holocene. The scientific work during cruise POS400 concentrated on three major scientific questions:

(**1**) ***Do any larger living cold-water coral communities exist on coral mounds of the shallow mound chain of the Belgica Mound Province?*** During former ROV video surveys, it was identified that some of the most vivid cold-water coral ecosystems along the Irish margin thrive on coral mounds of the deep coral mound chain of the Belgica Mound Province (e.g., Foubert et al. 2005). In contrast, the rather limited video footage available for coral mounds of the shallow mound chain revealed that almost no living cold-water corals today grow on these mounds. Overall the facies on these mounds seems to be dominated by coral rubble and dead coral framework (e.g., Foubert et al. 2005). *Method: Further detailed video documentation and surface sampling is required to prove this preliminary assumption. The video surveys and sampling will be accomplished by CTD measurements (covering a complete tidal cycle) to determine the recent structure of the water column in the area.*

(**2**) ***Are the Holocene coral growth periods of the deep and shallow mound chains temporally linked (concurrent, overlapping or alternating growth periods)?*** With the re-establishment of an interglacial circulation in the North Atlantic at the onset of the Holocene, cold-water coral started to re-colonise the Irish margin. It is assumed that the re-establishment of coral growth, and thus, of coral mound growth was mainly triggered by enhanced bottom currents which are

related to the Mediterranean Outflow Water (MOW) that nowadays penetrates further north into the Porcupine Seabight than during the last glacial (McCartney & Mauritzen 2001). The recent coexistence of live and dead (Holocene) cold-water corals on closely adjoined coral mound chains of the Belgica Mound Province points to a vertical displacement of optimal coral growth conditions during the Holocene. *Method: To trace the Holocene coral growth periods of the two mound chains, sediment cores will be collected from various coral mounds in different water depths and a set of coral fragments sampled from different stratigraphic levels within these cores will be selected for radiocarbon dating.*

(**3**) ***How did the structure of the water column change in the Belgica Mound Province during the Holocene?*** The assumed displacement of vital cold-water coral ecosystems towards deeper waters during the Holocene might be caused by a small-scale but essential change in the structure of the water column. It is hypothesised that an intensification of the Eastern North Atlantic Water (ENAW) during the Holocene caused a lowering of the boundary layer between ENAW and Mediterranean Outflow Water (MOW) which was identified to be the preferred depth interval of sustained cold-water coral growth along the Irish margin (Freiwald 2002). *Method: To reconstruct changes of the water mass structure over the past ~12 kyr, a set of so-called 'off-mound' (coral-barren) sediment cores will be collected over a depth transect of ~500-1,000 m to conduct palaeoceanographic studies (stable isotopes, faunal assemblages, grain size distribution).*

2 Working programme

The working programme during RV POSEIDON cruise POS400 focussed on the application of the remotely operated vehicle (ROV) Cherokee (MARUM, Bremen), and the sampling of long sediment cores and surface samples by a gravity corer and a grab sampler. The video surveys and sediment sampling were accomplished by yoyo CTD measurements, during which the CTD was continuously lowered and raised for a ~12 hours period to trace tidal fluctuations.

The first sampling location within the Belgica Mound Province was a so-called **'off-mound' area** (**Area A**), where a series of coral-barren sediment cores covering a water depth transect between 550 and 1,050 m was collected (Fig. 2.1). The area is situated in the north, and thus, in the direct vicinity of the cold-water coral mounds investigated during expedition POS400. The 'off-mound' sediment cores will offer the opportunity to reconstruct the Holocene palaeoceanographic history of the area as they are composed of rather undisturbed sediment sequences, whereas former studies showed that coral-bearing sediment cores collected from coral mounds are often characterised by several hiatuses that mark different coral growth periods (Dorschel et al. 2005; Eisele et al. 2008). The sediment sampling in this area was accomplished by a yoyo CTD station at a water depth of around 1,000 m.

The second working area covers **Pollux Mound** (also known as BEL32; 51°24.89'N, 11°45.80'W; **Area B**) (De Mol et al. 2007) that belongs to the deep coral mound chain of the Belgica Mound

Province (Fig. 2.1). The top of Pollux Mound comprises one distinct peak at a water depth of 910 m with a base at around 990-1,000 m water depth. The mound has an almost circular shape and measures ~1.3 km from north to south and ~1.1 km from west to east. The mound has a steeply inclined western flank and a rather smoothly dipping eastern flank which grades into the surrounding off-mound sediments. As Pollux Mound is out of the diving range of the ROV Cherokee (max. diving depth: 850 m), solely sediment samples were collected comprising ten grab samples and three gravity cores.

The third location observed was **Lion's Head Mound** (51°20.40'N, 11°41.65'W; **Area C**). This mound belongs to the shallow mound chain of the Belgica Mound Province (Fig. 2.1) and is located in a water depth between 720 and 840 m. Lion's Head Mound has an ovate shape and measures ~1.4 km from north to south and 0.7 km from west to east. As this coral mound was not described before, an extensive sediment sampling (nine grab samples, three gravity cores) and video survey (three ROV dives à 6.5 hours) programme was conducted. In the northwest of Lion's Head Mound a second yoyo CTD measurement was performed (Fig. 2.1) during which the CTD was continuously lowered to a water depth of ~850 m.

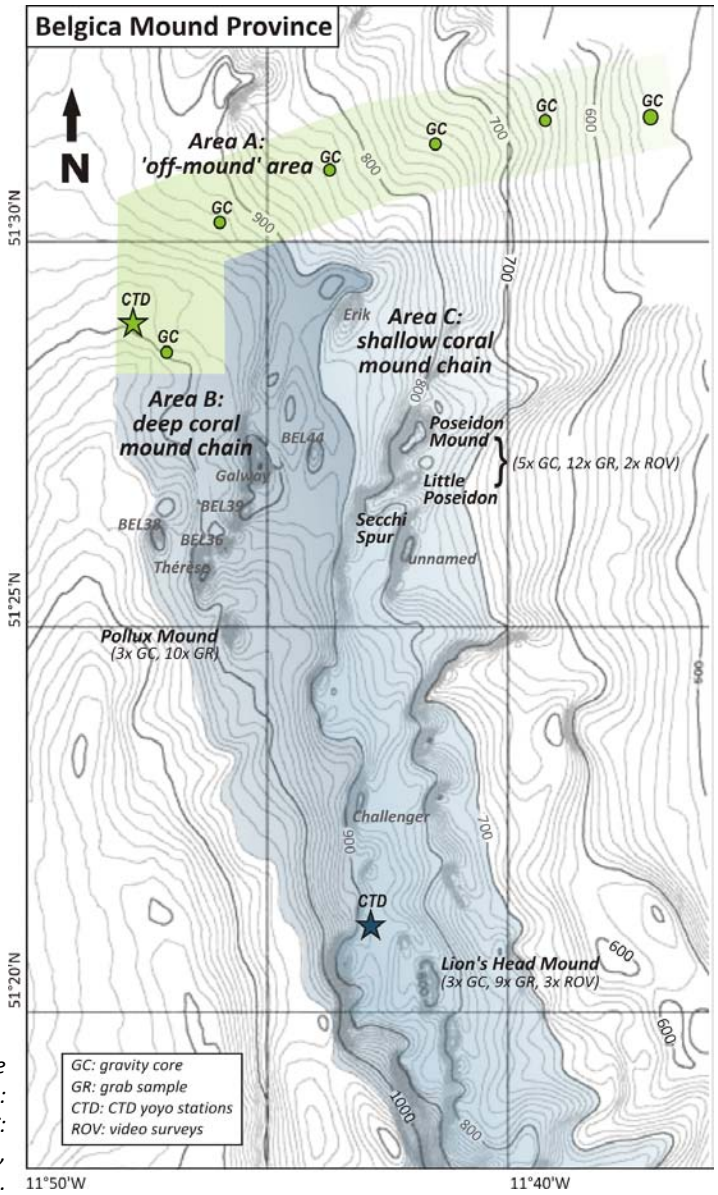


Figure 2.1. Map of the Belgica Mound Province showing the studied areas A: off-mound, B: deep mound chain, Pollux Mound, and C: shallow mound chain, Lion's Head, Poseidon, Little Poseidon Mounds.

Another target of the shallow mound chain was **Poseidon Mound** (51°27.5'N, 11°42'W) which is situated 13 km to the north of Lion's Head Mound (Fig. 2.1). This SW-NE elongated mound measures ~2.2 km from southwest to northeast and 1.3 km from northwest to southeast and has an elevation of ~130 m with a base at around 820 m water depth. Directly to the south of Poseidon Mound a rather small coral mound called **Little Poseidon Mound** (51°26.9'N, 11°42'W) is developed. This mound has a height of 50-60 m and a diameter of around 700 m, its

western flank extends to an E-W elongated spur which was named **Secchi Spur**. Two ROV dives with a total bottom time of ~10 hours were conducted across Little Poseidon Mound and Poseidon Mound. Moreover, five gravity cores and twelve grab samples were successfully collected in the Poseidon area.

The fourth working area (**Area D**) covered an area connected to the eastern border of the Belgica Mound Province (Fig. 2.2). Here, numerous small mound-like structures are developed those origin is up to now unknown. The so-called **Macnas Mounds** (51°27.5'N, 11°32'W) are near circular with diameters ofbetween 50 and 100 m rising only around 5-10 m above the ambient seabed. The study area is on a general west-facing slope between 300 and 500 m depth (Wilson et al. 2007). Towards the north-west the gentle slope, where most of the mounds occur becomes a wider, steeper slope which opens into a channel (Wilson et al. 2007). Two ROV dives were conducted across some of the Macnas Mounds and along the northwest and southeast slopes of the channel in the northwest of the Macnas Mounds.

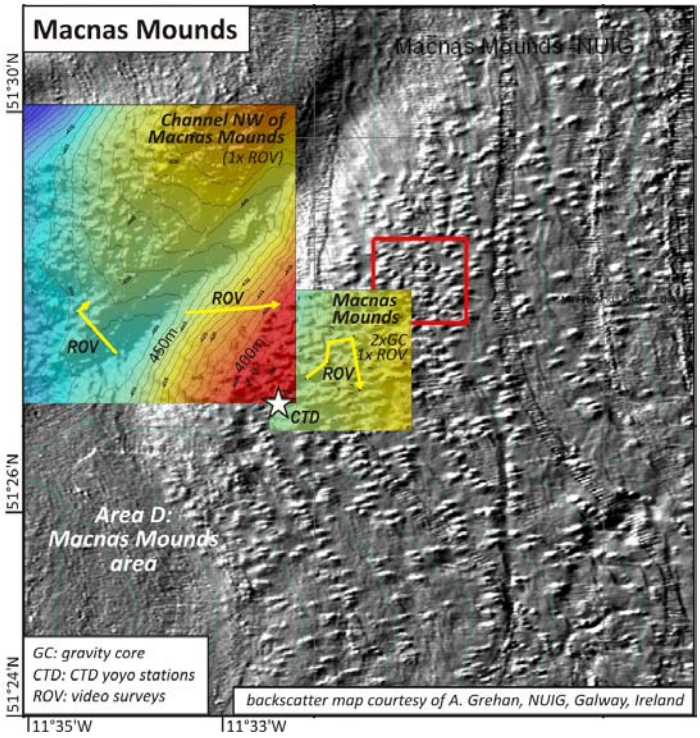


Figure 2.2. Macnas Mounds area (Area D).

The video surveys were accomplished by two successful gravity cores collected from the top of two Macnas Mounds and a yoyo CTD station at a water depth of around 380 m.

3 Narrative of RV POSEIDON cruise POS400

June 27th–July 1st Container Loading & Transit

On June 27th, eight scientists and technicians of two German marine institutes (MARUM: Center for Marine Environmental Sciences, Bremen; SaM: Research Institute Senckenberg am Meer, Wilhelmshaven) and the Irish Observer (UCC: University College Cork) arrived in Vigo (Spain) in the late afternoon. June 28th was spent with the unloading of the scientific equipment that was send from Bremen (Germany) with two containers. The MARUM ROV Cherokee work unit was installed and the onboard laboratories were prepared.

RV POSEIDON left the port of Vigo (42°N) at 07:00 (05:00 UTC) on June 29th heading northwards to the working area of this cruise: the Belgica coral mounds along the eastern slope of the Porcupine Seabight (see Appendix A - Cruise track). In the early morning on June 30th, RV

POSEIDON crossed the Bay of Biscay facing fair weather conditions and calm sea state. Here, we came to an unexpected stop when buoyancy material with a kind of mounting or anchorage appeared in front of the RV POSEIDON. The ship was stopped to retrieve the material which was identified to be the remnants of a fishing net that was densely colonised by barnacles and hydrozoans (Fig. 3.1). The interruption was used to check the ROV system which was deployed for a 30-minutes dive around the ship's hull. After a total interruption of 2 hours the transit was continued towards the study area off Ireland.

Figure 3.1. Recovery of an 'old' fishing net/buoyancy material in the Bay of Biscay. The line was densely colonised by barnacles and hydrozoans (photos: J. Stone, MARUM).

During the night the weather got worse and the wind increased causing waves with heights of up to 4 meters. Towards the morning of July 1st the sea calmed down a little bit and even the sun came out again. Over the day the waves still reached heights of 2-3 m and often swashed over the working deck.

July 2nd Area C: shallow coral mound chain – CTD yoyo

Due to the weather conditions the arrival in the Porcupine Seabight was delayed of about 6 hours. The first station in the south of the Belgica Mound study area (Area C: shallow coral mound chain) was arrived during the night on July 2nd. It was planned to start the first CTD measurement at 06:00, but due to the again increasing wind conditions with wind speed of up to 8 Bft. and wave heights of 3-4 m, the first CTD deployment was postponed of about five hours. At 10:50 we started the first CTD station (**GeoB 14501-1**) at a water depth of ~850 m (Fig. 2.1). For the next 12 hours, the CTD was continuously lowered each 30 minutes. This so-called yoyo CTD allows to determine changes in temperature, salinity and oxygen content during a complete tidal cycle.

After finishing the CTD measurements at around 23:00 we steamed ~10 nm north to an off-mound area (Area A; Fig. 2.1) where it was intended to collected a series of sediment cores from different water depth levels the next day.

July 3rd Area A: off-mound area – Gravity coring

In the morning of July 3rd still high wave conditions persisted being critical for any work on deck. However, after a briefing at the bridge, we decided to try a first coring attempt. Due to the

excellent and professional teamwork of nautical and decks crew sampling of five off-mound cores (**GeoB 14502, GeoB 14504-14507**) covering a depth transect of 550 to 1,050 m (Fig. 2.1) was conducted within seven hours. In total, 24 m core meters were collected. These cores are mainly composed of clayey to silty sediments with some of them showing dropstones on their top. One coring attempt at ~650 m water depth was not successful (**GeoB 14503**). Due to sandy sediment that stuck at the core pipe it is assumed that rather coarse sediments (probably an extended sandy patch or dropstone pavement) dominate this coring site.

July 4th Area A: off-mound area – CTD yoyo

During the night wind speeds tremendously increased to 7 Bft., again causing an almost sleepless night for all participants on board. Although the weather calmed down until the morning of July 4th, it was decided to operate the CTD probe for a second time as the waves were still too high to deploy any of the other devices. The CTD yoyo station (**GeoB 14508**) was conducted in the off-mound area (Area A), in close vicinity to the coring sites of the day before (Fig. 2.1). This time the CTD was continuously lowered to a water depth of around 1,000 m. At around 21:00, we finished station work and steamed south to a so far unnamed coral mound which belongs to the shallow coral mound chain of the Belgica Mound Province. There, the collection of a series of grab samples was planned for the next day.

July 5th Area C: Lion's Head Mound – Sediment sampling

At 08:00 of July 5th, we started with an extensive grab sampling across a coral mound of the shallow mound chain. We named this coral mound 'Lion's Head Mound' after the famous mountain in Cape Town, where the World Cup of 2010 took place. Lion's Head Mound has a height of ~100 m and elevates from 840 up to 720 m water depths. So far nothing was known about the coral coverage of this mound. We selected eight stations for grab sampling (Fig. 3.2), which all were successful (**GeoB 14509-14516**).The samples were dominated by dead *Madrepora* framework and *Madrepora* rubble whereas *Lophelia* was rather a minor component.

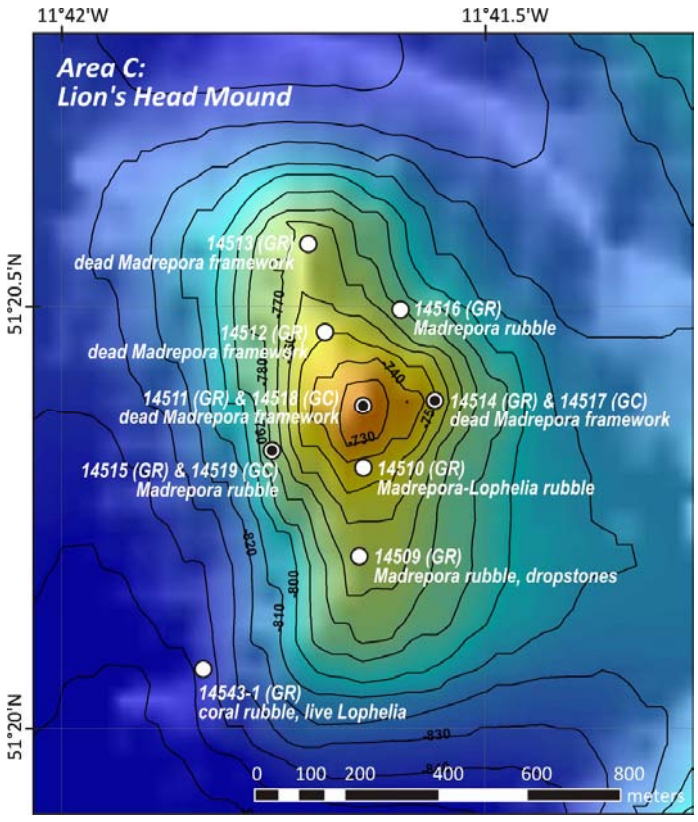


Figure 3.2. Sediment sampling sites on Lion's Head Mound. GeoB station numbers are indicated (GR: grab sample, GC: gravity core).

In the afternoon, we started with gravity coring on Lion's Head Mound. The positions of the coring sites were based on the results of the grab sampling (Fig. 3.2), as it was intended to primarily collect cores that are made up of coral fragments to study the growth history of Lion's Head Mound. Three coral-bearing sediment cores were successfully collected from the eastern and western flanks of Lion's Head Mound (**GeoB 14517, GeoB 14519**) and from its top (**GeoB 14518**) with a total recovery of 14.5 m. All cores showed *Madrepora* coral rubble on top.

As the weather was still very good with calm wind conditions and as the weather forecast predicted increasing winds for the next day, we decided to prepare everything for our first ROV dive (**GeoB 14520**). The dive started at the eastern foot of Lion's Head Mound at a water depth of around 810 m. Here we observed numerous dropstones of different origin and size (Fig. 3.3). Unfortunately, very strong bottom currents inhibited the ROV to follow the scheduled track westwards over the slope of the coral mound and drifted away. Therefore, it was decided to abort the dive after two hours.

Figure 3.3. Dropstones observed at the eastern base of Lion's Head Mound (ROV image ©MARUM).

During the night, we steamed west to Pollux Mound which belongs to the deep coral mound chain of the Belgica Mound Province. There, a similar sampling strategy as conducted on Lion's Head Mound - starting with grab samples and continuing with gravity cores whose positions will be selected based on the results of the grab sampling - was planned for the next day.

July 6th-7th Area B: Pollux Mound – Grab sampling & gravity coring

At 08:00 of July 6th, we started an extensive grab sampling on Pollux Mound that lasted the entire day (Fig. 3.4). With its top being situated in water depth of 910 m, Pollux Mound belongs to the deep mound chain. In total, nine grab samples were collected (**GeoB 14521-14529**) that revealed that the eastern and northeastern flanks are dominated by dead coral framework, whereas the western and southwestern flanks are covered by a mixture of live and dead coral framework (*Lophelia pertusa* and *Madrepora oculata*). On top of Pollux Mound, large live scleractinian coral colonies exist that are mainly made up of *Lophelia pertusa*. All coral framework samples were accompanied by a highly diverse associated fauna (e.g., sponges, octocorals, gorgonians, polychaetes, echinoids, crustaceans, molluscs). The description, sieving, and sub-sampling work on deck was quite challenging for the scientists as the weather conditions with rain, strong winds (6-7 Bft.) and rough sea remained unfavourable the entire day. However, on the base of these grab samples, three positions for gravity cores were selected scheduled for the next day.

The weather on the morning of July 7th was still not suitable for an ROV dive and even to explore the gravity corer was quite a challenge as we still faced a swell of up to 4 m.

Nevertheless, two sediment cores form the top and the western flank of Pollux Mound (**GeoB 14530, GeoB 14531**) were successfully collected with recoveries of 4.5 and 5 m, respectively. Both cores contain abundant coral fragments in the downcore record and *Madrepora* rubble on top. On the western flank, the first attempt of coring failed and the second attempt just revealed 1 m of coral fragments in a sandy sediment matrix (**GeoB 14532**).

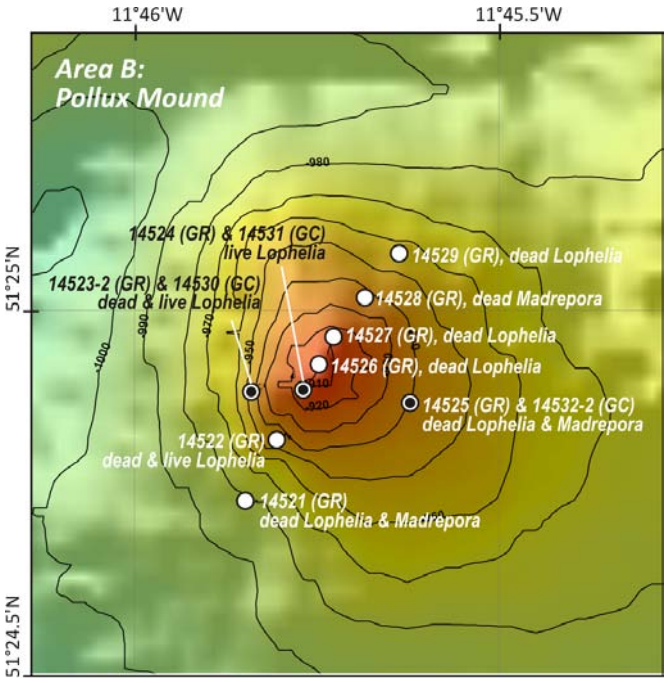


Figure 3.4. Sampling sites on Pollux Mound. GeoB station numbers are indicated (GR: grab sample, GC: gravity core).

July 7th-8th Area C: Poseidon & Little Poseidon Mounds – Grab sampling

In the afternoon of **July 7th**, we steamed again eastward to the shallow mound chain and started grab sampling on Poseidon Mound (Fig. 3.5). One grab collected from the eastern flank revealed a barnacle plate-dominated facies (**GeoB 14533**). On the top and western flank of Poseidon Mound (**GeoB 14534-GeoB 14536**), we found *Madrepora*-dominated coral rubble and few live *Lophelia* polyps. In the morning of July 8th, we continued the grab sampling in the shallow mound area as the weather conditions and high swell allowed no gravity coring or even the deployment of the ROV. We collected two grab samples from Secchi Spur (**GeoB 14537, GeoB 14538**), the extension of the western flank of Little Poseidon Mound, that revealed coral rubble. One grab sample was collected from the top of Little Poseidon Mound that was composed of *Madrepora*-dominated coral rubble (**GeoB 145391**). Before lunch time, the first grab sampling series ended with two grabs collected from the western flank of Poseidon Mound again composed of *Madrepora*-dominated coral rubble and few live *Lophelia* polyps (**GeoB 14540, GeoB 14541**).

After lunch, the wind direction turned causing a turbulent cross-sea. Therefore, the planned gravity cores were skipped and instead grab sampling was continued. We could collect one more grab sample from the western flank of an unnamed mound in the south of the Poseidon Mound area (**GeoB 14542**; Fig. 3.5).

However, as the ship had serious problems to hold the position due to the increasing disadvantageous current and wind conditions, we decided to stop the grab sampling. As the weather forecast predicted a considerable enhancement of the weather conditions on July 9th, we started to plan a second attempt for a video survey across Lion's Head Mound for the next day.

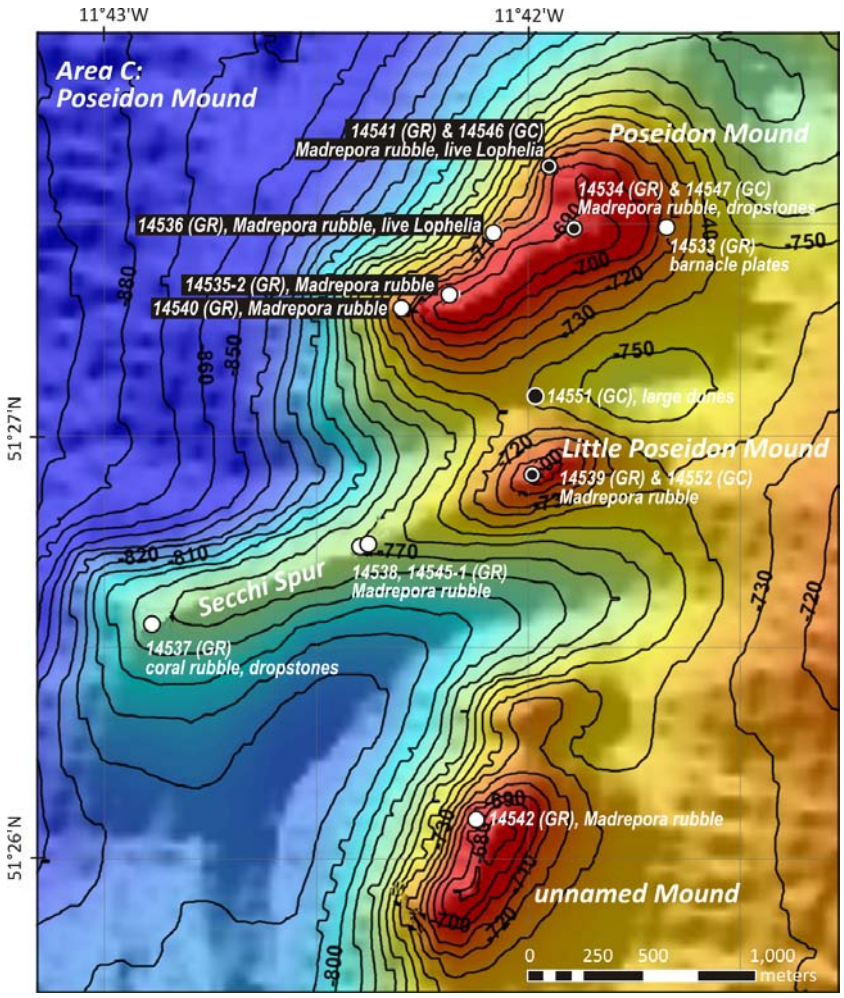


Figure 3.5. Sampling sites on Poseidon and Little Poseidon Mounds. GeoB station numbers are indicated (GR: grab sample, GC: gravity core).

July 9th Area C: Lion's Head Mound – ROV dives

As predicted, the swell and wind speed decreased considerably during the night. Therefore, in the morning of July 9th, the ROV was prepared for its second dive. To test the current conditions, we started with a grab sample (**GeoB 14543-1**) at the starting point of the scheduled diving track. The sample revealed coral rubble and – surprisingly – several live *Lophelia* polyps. At 10:00, we deployed the ROV and lowered it to a water depth of ~850 m (**GeoB 14543-2**). The track started at the southwestern foot of Lion's Head Mound, went uphill in NE direction and crossed the top in a northward direction. A total of 3.5 hours of video footage and ~230 still images were recorded during this dive, and two samples of *Lophelia-Madrepora* colonies were sampled with the ROV (Fig. 3.6).

Figure 3.6. Cold-water corals collected with the ROV from Lion's Head Mound (photo: J. Stone, MARUM).

Another ROV dive, crossing Lion's Head Mound this time from west to east was conducted in the afternoon (**GeoB 14544**). It was intended to start the dive at the western foot of Lion's Head Mound at a water depth of ~840 m, but as the current conditions were again quite disadvantageous and the ROV could not reach the scheduled starting point, instead it was decided to start the dive at the upper western flank at a water depth of 780 m. The dive ended at the eastern base of Lion's Head Mound at a water depth of 820 m. During the dive 1 hour of video footage and ~140 still images were recorded.

July 10th Area C: Little Poseidon Mound – ROV dive

As the weather conditions remained calm on 10th July, we prepared the ROV for another dive. This time, the target was Little Poseidon Mound which is situated 6 nm to the north of Lion's Head Mound. Before deploying the ROV, we collected again one grab sample (**GeoB 14545-1**) at the starting point of the scheduled diving track to test the current conditions. The sample revealed sandy sediment with a few coral rubble. Afterwards, the ROV was deployed for the fourth time during expedition POS400 (**GeoB 14545-2**). The dive started at the extension (Secchi Spur) of the southwestern flank of Little Poseidon Mound at a water depth of 780 m and continued uphill towards its top. At the top of Little Poseidon, the diving track turned northwards going downhill the northern flank of the mound. After 5.5 hours of video mapping, we had to abort the ROV dive for safety reasons as the break of the ROV winch was not working properly anymore. The ROV dive was immediately recovered and was safe on deck at around 15:00, and the ROV technicians started to look for the failure.

To use the rest of the day and to take advantage of the good weather conditions, it was decided to collect two gravity cores from Poseidon Mound that were actually scheduled for the next day. One core was retrieved from the NW-flank (**GeoB 14546**) with a recovery of 1.7 m containing abundant coral fragments in a silty sediment matrix. The second core (**GeoB 14547**) with a recovery of 4.3 m was collected from the northeastern top area of Poseidon Mound (Fig. 3.5). The core contained very few coral fragments and the top was covered by dropstones and barnacle plates. Finally, the ROV technician could find the failure of the ROV's winch break and fixed it, therefore another ROV dive was scheduled for the next day.

July 11th Area C: Poseidon Mound – ROV dive & gravity coring

At 08:00 on July 11th, we deployed the ROV for its 5th dive (**GeoB 14548**). The dive started at the western foot of Poseidon Mound at a water depth of 800 m, went uphill the western flank, crossed the top of Poseidon from west to east and continued downhill its northern flank. The dive ended after 5 hours of diving time at the northeastern foot of Poseidon Mound. Over 300 still images and two samples comprising a colonised dropstones and a small *Lophelia* colony were collected during the dive. Afterwards, station work was continued with gravity coring. The first coring attempt at the western flank of Poseidon Mound failed (**GeoB 14549**). The core pipe bended probably because it hit a large rocky boulder on the seafloor (Fig. 3.7).

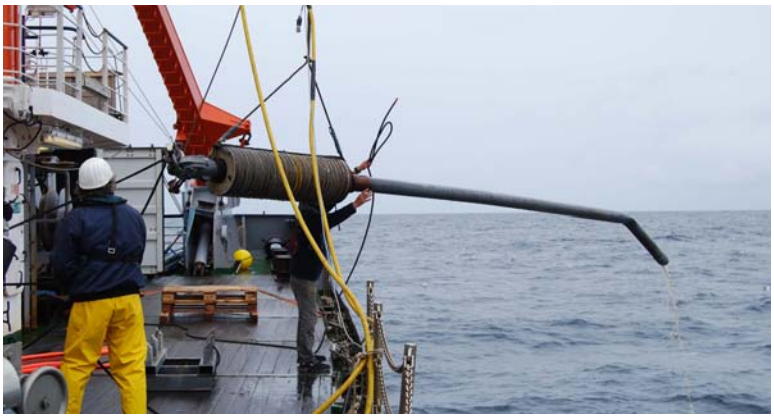


Figure 3.7. The attempt to collect a gravity core from the southwestern flank of Poseidon Mound failed. The core pipe bended, probably because it hit a large rocky boulder on the seafloor (photo: J. Stone, MARUM).

A second sediment core collected from the southwestern top of Poseidon Mound was more successful and yielded 5.6 core metres (**GeoB 14550**). However, it seems that the core contained almost no corals fragments, just the top of the core was covered with few coral fragments and dropstones. The third core (**GeoB 14551**) was collected from the depression between Little Poseidon and Poseidon Mound (Fig. 3.5), where large dunes covered with abundant dead coral framework were developed. Again, no coral fragments were recognized in the downcore record, but dropstones and barnacle plates covered the top of the core. The last gravity core was collected from the top of Little Poseidon Mound (**GeoB 14552**). A total of 5.8 core metres was recovered with abundant coral fragments from core top to core bottom. After coring, RV POSEIDON started steaming ~10 nm to the east towards our last working area (Area D), the Macnas Mounds, where we intended to start with an ROV dive followed by sediment sampling.

July 12th Area D: Macnas Mounds – ROV dives

At 08:00 on July 12th, we started our 6th ROV dive in the Macnas Mound area (**GeoB 14553**; Fig. 2.2). The Macnas Mounds comprise numerous low-relief mounds (height: 5-10 m) that occur on a general west-facing slope in a water depth between 300 and 500 m. During the dive, we crossed five of these mounds and recorded a total of 2 hours video footage and ~120 still images.

Northwest of the Macnas Mounds, the gentle slope on which most of the mound-like structures occur becomes a wider, steeper slope which opens into a channel. This channel was the target of the second ROV dive (**GeoB 14554**) in the Macnas Mound area (Fig. 2.2). The dive started at a water depth of 470 m at the lower north-western slope of the channel and continued uphill. After 1.5 hours, the dive was interrupted at a water depth of 460 m as almost no coral fragments and absolutely no live cold-water corals were observed. We decided to move to the western slope of the channel. The ROV was heaved of about 100 m above the seafloor and the vessel drifted slowly to the east, and thus, to the opposite slope of the channel. There, we continued the dive at a water depth of 450 m, again going uphill the slope. After 2 hours without finding any evidence for the existence of cold-water corals, the dive was aborted at a water depth of 400 m.

July 13th Area D: Macnas Mounds – Gravity cores & CTD yoyo

At 06:00 on July 13th we started with three stations for gravity coring in the Macnas Mounds area. The aim was to collect coral-bearing sediment cores from these up to 10 m high mounds. Two attempts to core through one of these mounds failed as the pipe could not penetrate into the sediment. Just a few coral fragments comprising *Lophelia* and *Madrepora* fragments were found in the core catcher (**GeoB 14555-1, GeoB 14555-2**). Two further coring attempts on the tops of two other mounds were more successful as the collected cores had a recovery of 5.3 m (**GeoB 14556**) and 4.1 m (**GeoB 14557**). However, no coral fragments were recognised, instead the cores are composed of medium to coarse sandy sediments. It appears that the Macnas Mounds are rather large dunes than 'coral mounds' which at their crests being colonised by cold-water corals rather than being build up by corals.

The last station of expedition POS400 was a third CTD yoyo station (**GeoB 14558**). This time the CTD was continuously lowered to a water depth of ~380 m in the Macnas Mounds area. The measurements started at 09:00 and ended at 21:00. As a gale warning with 10 Bft. was predicted for our study area for the 14th of July, we skipped further plans to collect grab samples in the Macnas Mounds area and RV POSEIDON set sail to Cork.

July 14th-15th Transit to Cork, Departure

During the 14th July, the scientific crew loaded the scientific equipment and the samples obtained during the cruise into the container, and cleaned the laboratories. The ROV Cherokee will stay on board as it will be applied during one of the next expeditions. RV POSEIDON arrived the harbour of Cork at 18:30. The next day (15th July), the container with the scientific equipment was picked up to transport it back to Bremen. The scientific crew disembarked on 16th July.

Fig. 3.8. RV POSEIDON in the harbour of Cork.

For further information about work and life during expedition POS400 on board the research vessel POSEIDON, please have a look on following webpage:

http://www.marum.de/en/Log_POS400.html

Above: J. Stone preparing the text for the daily cruise blog, photo and video documentation of the expedition (contact: jstone@marum.de).

4 Equipment, deployments and preliminary results

4.1 Gravity Corer

A gravity corer with a pipe length of 6 m and a weight of 1.2 tons was applied to recover long sediment sequences from various coral mounds of the Belgica Mound Province (Fig. 4.1). Before using the coring tools, the liners had been marked lengthwise with a straight line in order to retain the orientation of the core. Once on board, the sediment core was cut into 1-m-sections, closed with caps on both ends and labelled according to a standard scheme (Fig. 4.2).

Figure 4.1. Recovery of the gravity corer. The plastic liners filled with sediment are cut into 1–m-segments and closed with caps (from left to right; photos: J. Stone, MARUM).

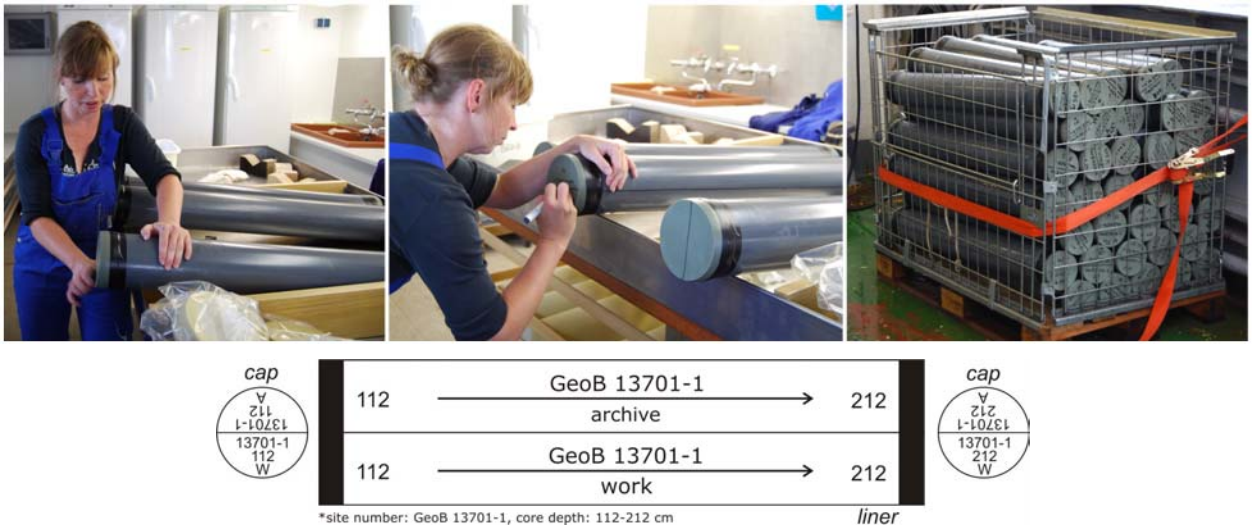


Figure 4.2. The core segments were closed with caps on both ends (upper left and central images), labelled according to standard scheme for GeoB cores of the MARUM (lower graph), and stored onboard RV POSEIDON (right image) (photos: J. Stone, MARUM)

During RV POSEIDON cruise POS 400, the gravity corer was used at 24 stations, of which 18 coring attempts were successful with sediment recoveries between 103 and 587 cm resulting in total core recovery of 77.94 m (Table 4.1). None of the gravity cores were opened on board. All sediment cores collected during the cruise POS400 were transported to Bremen and stored in the MARUM core repository at the University of Bremen. The sediment cores will be opened, described, and photo-scanned, and further analyses (radiocarbon and U/Th age determination,

XRF scans, stable isotope measurements, grain size analyses etc.) will be done after the cruise under the responsibility of MARUM.

Table 4.1. Metadata of gravity cores collected during RV POSEIDON cruise POS400 (data are related to time of bottom contact).

Cast	Station-No.	Date (dd.mm.yy)	Time (UTC)	Lat (N)	Lon (W)	WD sounder	WD winch	REC	Remark
Area A: off-mound area									
01	GeoB 14502-1	03.07.10	07:15	51°32.07	11°36.65	526m	552m	335	clayey sediment
02	GeoB 14503-1	03.07.10	08:25	51°31.84	11°38.99	635m	666m	-/-	empty, coarse sand on pipe
03	GeoB 14503-2	03.07.10	08:55	51°31.81	11°38.98	635m	666m	-/-	empty
04	GeoB 14504-1	03.07.10	10:08	51°31.54	11°41.96	739m	775m	499	clayey sediment
05	GeoB 14505-1	03.07.10	11:05	51°31.03	11°43.85	832m	882m	540	2x pulled, dropstones on top
06	GeoB 14506-1	03.07.10	12:02	51°30.27	11°45.89	911m	963m	550	-/-
07	GeoB 14507-1	03.07.10	13:00	51°28.53	11°47.02	987m	1044m	476	dropstones on top
Area C: Lion's Head Mound (shallow coral mound chain)									
08	GeoB 14517-1	05.07.10	12:35	51°20.39	11°41.56	725m	787m	443	coral-bearing core
09	GeoB 14518-1	05.07.10	13:25	51°20.38	11°41.64	707m	750m	587	coral-bearing core, slightly over-penetrated, top undisturbed
10	GeoB 14519-1	05.07.10	14:17	51°20.33	11°41.76	794m	836m	397	coral-bearing core
Area B: Pollux Mound (deep coral mound chain)									
11	GeoB 14530-1	07.07.10	06:36	51°24.89	11°45.82	950m	988m	508	coral-bearing core
12	GeoB 14531-1	07.07.10	07:40	51°24.89	11°45.77	904m	950m	449	coral-bearing core
13	GeoB 14532-1	07.07.10	08:41	51°24.87	11°45.62	933m	980m	-/-	few Madrepora & Aphrocallistes fragments in core catcher
14	GeoB 14532-2	07.07.10	09:32	51°24.88	11°45.62	926m	980m	103	corals in sandy sediment matrix, top disturbed
Area C: Poseidon Mound (shallow coral mound chain)									
15	GeoB 14546-2	10.07.10	14:33	51°27.64	11°41.95	699m	755m	170	coral-bearing core
16	GeoB 14547-2	10.07.10	15:14	51°27.48	11°41.88	681m	715m	428	downcore few coral fragments, on top dropstones & barnacles plates
17	GeoB 14549-1	11.07.10	13:17	51°27.30	11°42.38	748m	785m	-/-	core pipe bended ("banana")
18	GeoB 14550-1	11.07.10	14:13	51°27.33	11°42.18	676m	715m	558	sandy sediment, dropstones & coral fragments on top (probably very few corals downcore)
Area C: Megabars between Poseidon Mound & Little Poseidon Mound (shallow coral mound chain)									
19	GeoB 14551-1	11.07.10	15:00	51°27.10	11°41.90	744m	780m	226	on top dropstones & barnacles, no corals to see
Area C: Little Poseidon Mound (shallow coral mound chain)									
20	GeoB 14552-1	11.07.10	15:39	51°26.91	11°41.99	692m	733m	583	coral-bearing core, slightly over-penetrated
Area D: Macnas Mounds									
21	GeoB 14555-1	13.07.10	04:11	51°27.41	11°31.99	374m	392m	-/-	large coral fragments and dropstones in core catcher (CC)
22	GeoB 14555-2	13.07,10	04:32	51°27.41	11°31.99	375m	392m	-/-	very few coral fragments in CC
23	GeoB 14556-1	13.07.10	05:00	51°27.63	11°31.91	375m	397m	529	sediment, no corals
24	GeoB 14557-1	13.07.10	06:09	51°27.44	11°31.72	369m	388m	413	sandy sediment, no corals

4.2 Grab Sampler

For qualitative samples of surface sediment and benthic fauna a grab sampler (Fig. 4.3) was deployed at a total of 31 stations, of which 29 deployments were successful (Table 4.2). The positions of the samples were selected to obtain a representative sample grid over distinct coral mounds of the Belgica Mound Province, and to accomplish potential gravity core stations. The grab samples were photographed and the sediment and faunal composition briefly

described. Living fauna was fixed in ethanol. The entire sample was washed through sieves of 4 mm, 2 mm, 1 mm, 0.5 mm and <0.5 mm mesh sizes. The sieve residue was dried in a drying oven on board and packed for further taxonomic analyses at the home laboratories (Fig. 4.3).

Figure 4.3. Grab sampling. After recovery, grab samples were photographed, the benthic fauna was identified, the sediment described. Finally the samples were sub-sampled and sieved on board (from left to right; photos: J. Stone, MARUM).

Table 4.2. Metadata of grab samples collected during RV POSEIDON cruise POS400 (data are related to time of bottom contact).

Cast	Station-No.	Date (dd.mm.yy)	Time (UTC)	Lat (N)	Lon (W)	WD sounder	WD winch	Description
Area C: Lion's Head Mound (shallow coral mound chain)								
01	GeoB 14509-1	05.07.10	06:10	51°20.20	11°41.64	758m	778m	Madrepora rubble, dropstones
02	GeoB 14510-1	05.07.10	07:07	51°20.32	11°41.67	720m	755m	Lophelia-Madrepora rubble
03	GeoB 14511-1	05.07.10	07:51	51°20.39	11°41.64	707m	730m	dead Madrepora framework
04	GeoB 14512-1	05.07.10	08:43	51°20.47	11°41.68	739m	750m	dead Madrepora framework
05	GeoB 14513-1	05.07.10	09:15	51°20.57	11°41.72	750m	758m	dead Madrepora framework
06	GeoB 14514-1	05.07.10	10:21	51°20.39	11°41.56	718m	728m	dead Madrepora framework/rubble
07	GeoB 14515-1	05.07.10	11:00	51°20.33	11°41.75	783m	800m	Madrepora rubble
08	GeoB 14516-1	05.07.10	11:42	51°20.50	11°41.60	764m	760m	Madrepora rubble
30	GeoB 14543-1	09.07.10	06:25	51°20.06	11°41.81	832m	848m	coral rubble, live Lophelia
Area B: Pollux Mound (deep coral mound chain)								
09	GeoB 14521-1	06.07.10	07:37	51°24.75	11°45.85	975m	982m	dead Madrepora-Lophelia framework
10	GeoB 14522-1	06.07.10	08:30	51°24.82	11°45.80	949m	952m	dead & live Lophelia framework
11	GeoB 14523-1	06.07.10	09:18	51°24.90	11°45.83	943m	947m	- not released -
12	GeoB 14523-2	06.07.10	10:33	51°24.89	11°45.84	958m	956m	dead & live Lophelia framework
13	GeoB 14524-1	06.07.10	11:16	51°24.89	11°45.79	899m	914m	live Lophelia framework (10% dead)
14	GeoB 14525-1	06.07.10	12:00	51°24.89	11°45.62	928m	955m	dead Lophelia-Madrepora framework
15	GeoB 14526-1	06.07.10	12:49	51°24.94	11°45.74	884m	905m	dead & live Lophelia framework
16	GeoB 14527-1	06.07.10	13:20	51°24.96	11°45.72	888m	910m	dead Lophelia framework
17	GeoB 14528-1	06.07.10	13:52	51°25.02	11°45.68	921m	929m	dead Madrepora framework
18	GeoB 14529-1	06.07.10	14:23	51°25.08	11°45.65	932m	947m	dead Lophelia framework
Area C: Poseidon Mound (shallow coral mound chain)								
19	GeoB 14533-1	07.07.10	11:26	51°27.49	11°41.67	687m	698m	barnacle plates
20	GeoB 14534-1	07.07.10	11:58	51°27.49	11°41.89	680m	693m	Madrepora rubble, dropstones
21	GeoB 14535-1	07.07.10	12:43	51°27.33	11°42.17	676m	680m	- not released -
22	GeoB 14535-2	07.07.10	13:08	51°27.33	11°42.18	675m	694m	Madrepora rubble
23	GeoB 14536-1	07.07.10	14:06	51°27.48	11°42.08	686m	720m	Madrepora rubble, live Lophelia
27	GeoB 14540-1	08.07.10	08:42	51°27.30	11°42.30	695m	731m	Madrepora rubble
28	GeoB 14541-1	08.07.10	09:29	51°27.64	11°41.95	715m	733m	Madrepora rubble, live Lophelia
Area C: Little Poseidon Mound (plus Secchi Spur) (shallow coral mound chain)								
24	GeoB 14537-1	08.07.10	06:19	51°26.55	11°42.86	774m	790m	Madrepora-Lophelia rubble
25	GeoB 14538-1	08.07.10	07:11	51°26.73	11°42.39	764m	767m	Madrepora rubble, live Lophelia
26	GeoB 14539-1	08.07.10	07:56	51°26.90	11°42.98	686m	714m	Madrepora rubble
31	GeoB 14545-1	10.07.10	06:19	51°26.76	11°42.47	769m	783m	few coral rubble
Area C: unnamed mound south of the Poseidon area (shallow coral mound chain)								
29	GeoB 14542-1	08.07.10	11:54	51°26.09	11°42.12	670m	736m	Madrepora rubble

4.2.1 Description of grab samples – Area C: Lion's Head Mound

GeoB 14509-1 (Lion's Head Mound, S-flank) *51°20.20'N, 11°41.64'W, 758 m*

sediment colour: 5Y5/3 olive
sediment: sandy silt (foraminiferan quartz sand)
live fauna: decapod, ophiuroid, polychaetes, *Hexadella* sp.
components: *Madrepora* rubble, gorgonian root, <10% *Lophelia*, *Caryophyllia* sp., dropstones up to 3 cm in diameter (polymict), mollusc shells, *Stenocyathus*, *Aphrocallistes*, bryozoans, otoliths, bivalves, echinoid spines

GeoB 14510-1 (Lion's Head Mound, S-flank) *51°20.32'N, 11°41.67'W, 720 m*

sediment colour: 5Y5/3 olive
sediment: foraminiferan sand (very few)
live fauna: octocorals, *Stenocyathus vermiformis*, sponges (amongst *Hexadella* sp.), polychaetes
components: dead *Madrepora* and *Lophelia* rubble, gastropods (amongst *Calliostoma*), molluscs, *Stenocyathus*, *Aphrocallistes*, pteropods, otoliths, *Asperarca*, echinoid spines
remarks: *Lophelia* bigger than in 14509-1

GeoB 14511-1 (Lion's Head Mound, top) *51°20.39'N, 11°41.64'W, 707 m*

sediment: few sediment
live fauna: octocorals, orange-coloured antipatharian, diverse sponges, *Munida*, *Eunice norvegica* (large individuals!), many polychaetes, *Asperarca* sp., *Caryophyllia* sp., ascidian, crustaceans, *Stenocyathus vermiformis*, ophiuroids, sand agglutinating foraminifera and bryozoans on skeleton, red sponge, *Filograna* sp., spirorbids
components: exclusively *Madrepora* frame-work/rubble, solitary corals (*Caryophyllia*, *Stenocyathus*), 1 valve of *Spondylus gussoni*, pectinids, echinoid spines, *Aphrocallistes*, gastropods
remarks: many polychaetes!

GeoB 14512-1 (Lion's Head Mound, N-flank) *51°20.47'N, 11°41.68'W, 739 m*

sediment colour: 5Y5/3 olive
sediment: foraminiferan sand (few sediment)
live fauna: *Madrepora*, few *Stenocyathus*, *Caryophyllia*, orange antipatharian, octocorals, *Hexadella* sp., many *Eunice norvegica*, *Munida* sp., ascidian, red sponge, ophiuroids, boring actinian, gastropod, bryozoans on skeleton, polychaetes, bivalves, hemichordate, *Rhapdopleura normanni*
components: *Madrepora* framework, few *Lophelia*, *Aphrocallistes*, molluscs, serpulids, echinoid spines (*Cidaris*), bryozoans
remarks: dead framework but many *Eunice*!

GeoB 14513-1 (Lion's Head Mound, N-flank) *51°20.57'N, 11°41.72'W, 750 m*

sediment: no sediment
live fauna: whip coral, *Hexadella* sp., *Bathynectes maravigna*, antipatharians, *Caryophyllia* sp., *Stenocyathus vermiformis*, zooantharia, *Rhapdopleura normanni*, crustacean, bristle worm
components: *Madrepora* framework, *Aphrocallistes*, gastropods, pteropods, molluscs, foraminifera

GeoB 14514-1 (Lion's Head Mound, E-flank) *51°20.39'N, 11°41.56'W, 718 m*

sediment: no sediment
live fauna: orange antipatharians, decapods, sponges, gastropods, ophiuroids, hydrozoans and bryozoans on skeleton, polychaetes, sponges (amongst bioeroding ones), *Lima*, *Verruca*
components: *Madrepora* framework/rubble (95% *Madrepora*), 1 large *Lophelia* (5%), molluscs, bryozoans, many *Cidaris* spines, *Stenocyathus vermiformis*

GeoB 14515-1 (Lion's Head Mound, W-flank) *51°20.33'N, 11°41.75'W, 783 m*

sediment: no sediment
live fauna: octocorals, polychaetes, pot. *Stenocyathus vermiformis*
components: *Madrepora* rubble, bivalve shells, pectinids, *Stenocyathus vermiformis*, agglutinated worm tube, large pteropods, *Aphrocallistes*, otoliths, echinoid spines, sponge spicules

GeoB 14516-1 (Lion's Head Mound, NE-flank) *51°20.50'N, 11°41.60'W, 764 m*

sediment colour: 5Y5/3 olive
sediment: foraminifera sand, few shell hash
live fauna: *Hexadella* sp.
components: *Madrepora* rubble (few *Lophelia*), verrucids, *Spondylus gussoni*, echnioid spines, *Caryophyllia* sp., gastropods, *Stenocyathus*, *Aphrocallistes*, pteropods, bivalves

GeoB 14543-1 (Lion's Head Mound, NW-flank) *51°20.06'N, 11°41.81'W, 832 m*

sediment colour: 5Y 5/2 light olive grey
sediment: medium sand
live fauna: *Lophelia*, hydrozoa, serpulids, octocorals, *Munida*, *Bathynectes maravigna*, amphipods, polychaetes, sponges
components: coral rubble (*Madrepora* 60%, *Lophelia* 40%), mm-sized dropstones, *Aphrocallistes*, gastropods, pteropods, sponge spicules, echinoid spines
remarks: test for current conditions

4.2.2 Description of grab samples – Area B: Pollux Mound

GeoB 14521-1 (Pollux Mound, SW-flank) *51°24.75'N, 11°45.85'W, 975 m*

sediment colour: 5Y4/3 olive
sediment: foraminifera sand
live fauna: various large sponges, ophiurids, stylasterids, bivalves, one *Caryophyllia*, encrusting organisms on skeleton (bryozoa, *Cibicides*, brachiopods), *Cibicides* on skeleton, *Pliobothrus*, *Rhapdopleura*, serpulids, bryozoans, brachiopods and live *Hyrrokkin* on *Lophelia* skeleton, polychaetes
components: dead coral framework (*Madrepora* & *Lophelia* 50/50), *Caryophyllia*, *Aphrocallistes* with yellow sponge turning blue/violet when dried, pectinid, molluscs, *Asperarca*, echinoid spines

GeoB 14522-1 (Pollux Mound, SW-flank) *51°24.82'N, 11°45.80'W, 949 m*

sediment: no sediment
live fauna: *Lophelia*, few small *Madrepora*, *Eunice*, *Munida*, *Cidaris*, *Eunice*, *Aphrocallistes*, hydro-zoans, polychaetes, echinoids, anemones, sponges, *Hyrrokkin*, octocorals amongst *Anthomastus grandiflorus*, verrucids, boring sponges
components: dead *Lophelia* and *Madrepora* framework, bryozoans, *Aphrocallistes*, molluscs, pteropods, sponge spicules, echinoid spines

GeoB 14523-2 (Pollux Mound, W-flank) *51°24.89'N, 11°45.84'W, 958 m*

sediment: no sediment
live fauna: 5% *Lophelia* with 6-7 polyp generations (massive skeleton, exposed septa), *Desmophyllum* & *Caryophyllia*, *Aphrocallistes* colonised by yellow actinians, octocorals, hydroids, crustacean (*Bathynectes*), polychaetes, serpulids, sponges, large *Eunice*, *Pliobothrus* (light pink coloured), verrucids, boring sponges
components: coral framework (75% *Lophelia*, 15% *Madrepora*), *Aphrocallistes beatrix*, molluscs, bryozoans, echinoid spines

GeoB 14524-1 (Pollux Mound, top) *51°24.89'N, 11°45.79'W, 899 m*

sediment: no sediment
live fauna: *Lophelia* framework with large *Eunice*, purple octocoral *Anthothela grandiflora*, few *Aphrocallistes*, gastropods (*Calliostoma*), ophiurids, crustacean, hydrozoa, *Hyrrokkin*
components: 10% dead *Lophelia*, *Aphrocallistes*

GeoB 14525-1 (Pollux Mound, E-flank) *51°24.89'N, 11°45.62'W, 928 m*

sediment colour: 5Y4/3 olive
sediment: foraminiferan sand
live fauna: *Caryophyllia*, 1.5 cm *Madrepora* colony with 3 polyps, diverse octocorals with *Solenogastres*, ophiurids, anemones, polychaetes, *Aphrocallistes*, ascidian, 2 gorgonian species, gastropod, hydrozoans
components: dead coral framework (*Lophelia* & *Madrepora* growing in each other), *Aphrocallistes*, bryozoans, molluscs, otoliths, pteropods, sponge spicules

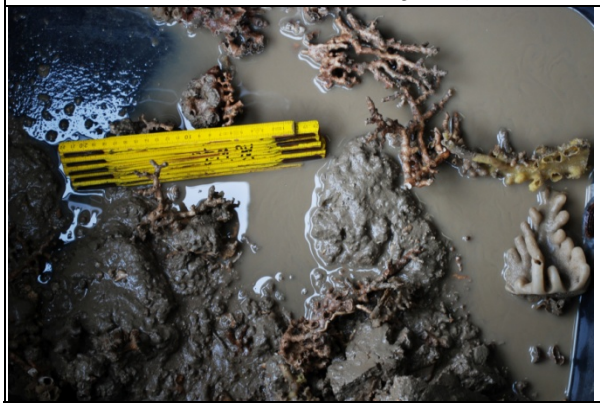
GeoB 14526-1 (Pollux Mound, top) *51°24.94'N, 11°45.74'W, 884 m*

sediment: no sediment
live fauna: *Lophelia* framework (10% live, 1-2% *Madrepora*), purple octocoral *Anthothela grandiflora*, *Caryophyllia* (2 individuals), polychaetes, ophiurids, hydrozoans, sponges, *Hyrrokkin*, *Rhapdopleura normanni*, gastropods, *Aphrocallistes*
components: *Lophelia*, *Madrepora*, *Desmophyllum*, *Aphrocallistes*, echinoid spines, *Stenocyathus*, gastropods, bivalves, otoliths

GeoB 14527-1 (Pollux Mound, top) *51°24.96'N, 11°45.72'W, 888 m*

sediment: no sediment
live fauna: 5% *Lophelia*, 10% *Madrepora*, small solitary corals (<1cm), *Anthothela grandiflora*, bryozoa, *Stenocyathus*, hydrozoa, sponges, polychaetes, ophiurids, anemones, pectinids, *Eunice*, nereid polychaetes
components: *Lophelia* (90%) and *Madrepora* (10%) framework, *Desmophyllum*, *Aphrocallistes*, molluscs, bryozoans

GeoB 14528-1 (Pollux Mound, N-flank) *51°25.02'N, 11°45.68'W, 921 m*



sediment colour: 5Y5/3 olive
sediment: foraminiferan sand
live fauna: *Caryophyllia* (2 individuals), *Aphrocallistes*, octocorals, actinians, polychaetes, ophiuroids
components: dead *Madrepora* framework (20% *Lophelia*), *Caryophyllia*, *Desmophyllum*, barnacle plates, *Aphrocallistes* with yellow sponge (oxidising blue), gastropods, bivalves, pteropods, otoliths, sponge spicules, echinoid spines
remarks: very scarce living fauna

GeoB 14529-1 (Pollux Mound, N-flank)	*51°25.08'N, 11°45.65'W, 932 m*
	**sediment:** no sediment **live fauna:** 5% *Lophelia* (orange coloured, various morphotypes), *Pliobothrus* (pinkish), polychaetes, *Aphrocallistes*, various octocorals of dark red colour, bryozoa, *Delectopecten*, antipatharian **components:** *Lophelia* and *Madrepora* framework, *Desmophyllum*, *Aphrocallistes*, *Stenocyathus*, gastropods, pteropods

4.2.3 Description of grab samples – Area C: Poseidon area

GeoB 14533-1 (Poseidon Mound, E-flank)	*51°27.49'N, 11°41.67'W, 687 m*
	**sediment colour:** 5Y4/3 olive **sediment:** coarse foram sand **live fauna:** echinoids, ophiuroids, *Munida* **components:** barnacle plates, few coral rubble (mainly *Madrepora*), dropstones (polymict), echinoid plates & spines, bivalves (amongst pectinids), *Lima marioni*, pteropods, otoliths, *Aphrocallistes*, bryozoans, serpulids **remarks:** very few sediment
GeoB 14534-1 (Poseidon Mound, NE-top)	*51°27.49'N, 11°41.89'W, 680 m*
	**sediment colour:** 2.5Y 6/4 light yellowish brown **sediment:** coarse foraminiferan sand **live fauna:** violet octocoral, red gorgonian, *Cidaris cidaris*, crabs, polychaetes, dropstones colonised by actinians, verrucids, foraminiferans and bryozoans **components:** *Madrepora* and *Lophelia* rubble, large dropstones (up to 8 cm in diameter), otoliths, few barnacle plates, buccinid gastropod, *Cidaris* spines, pteropods, *Stenocyathus*, *Aphrocallistes*
GeoB 14535-2 (Poseidon Mound, SW-top)	*51°27.33'N, 11°42.18'W, 675 m*
	**sediment colour:** 2.5Y 5/4 light olive brown **sediment:** foraminiferan sand **live fauna:** *Munida*, gorgonian, *Cidaris*, blue sponge on coral fragment, violet-coloured octocoral (attached to coral rubble), tube worms, polychaetes, nereids, sponges **components:** coral rubble (mainly *Madrepora*, ~5% *Lophelia*, few solitary ones (amongst *Stenocyathus* and *Desmophyllum*), gastropods, barnacle plates, many large *Cidaris* spines, echinoids, bryozoans, few dropstones, pectinids, crustacean fragments, pteropods, *Asperarca*, *Astarte*, *Calliostoma*, serpulid tubes, bivalves

GeoB 14536-1 (Poseidon Mound, W-flank) *51°27.48'N, 11°42.08'W, 686 m*

sediment colour: few sediment
live fauna: one small *Lophelia* with eunicid tube, sponges, antipatharian, pink octocoral, hydrozoans and bryozoans on rubble, polychaetes, ophiuroids
components: *Madrepora* rubble, pteropods, pectinids, *Asperarca*, echinoid spines, *Aphrocallistes*, gastropods, bryozoans, otoliths, bivalves

GeoB 14540-1 (Poseidon Mound, SW-flank) *51°27.30'N, 11°42.30'W, 695 m*

sediment colour: 2.5Y 6/4 light yellowish brown
sediment: silty foraminiferan sand
live fauna: large *Cidaris*, polychaetes, diverse sponges, hydrozoans on rubble, ophiurids, red gorgonian, crinoid, amphipod tubes, violet octocoral
components: *Madrepora* rubble (few *Lophelia*), solitary corals (amongst *Stenocyathus*), pectinids, bryozoans, gastropods

GeoB 14541-1 (Poseidon Mound, W-flank) *51°27.64'N, 11°41.95'W, 715 m*

sediment colour: few sediment
live fauna: *Lophelia* (small polyps), numerous ophiurids, hydrozoans and bryozoans on rubble, red gorgonians, polychaetes, echinoids, crab, pectinids, young *Eunice* with tube, Sipunculidae, gastropod
components: *Madrepora* small-sized rubble (few *Lophelia*), solitary corals, echinoid spines, *Aphrocallistes*, otoliths
remarks: very few sediment

GeoB 14537-1 (Secchi Spur, W of Little Poseidon) *51°26.55'N, 11°42.86'W, 774 m*

sediment colour: 5Y 4/4 olive
sediment: quartz-foraminiferan sand (coarse to medium)
live fauna: octocoral, polychaetes
components: coral rubble (60% *Madrepora*, 40% *Lophelia*), many echinoid spines, *Desmophyllum*, small dropstones (~1 cm), barnacle plates, bivalves, gastropods, pteropods, scaphopods
remarks: a lot of sediment

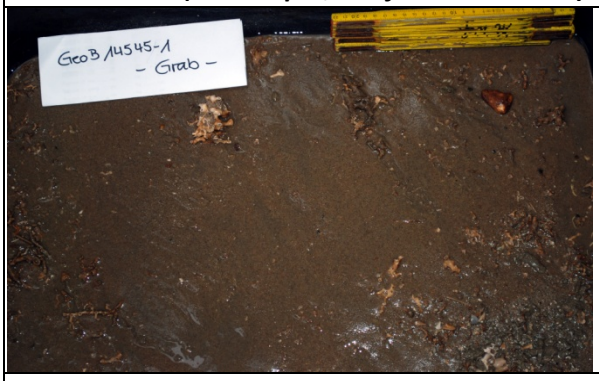
GeoB 14538-1 (Secchi Spur, W of Little Poseidon) *51°26.73'N, 11°42.39'W, 764 m*

sediment colour: 2.5Y 4/4 olive brown
sediment: medium to coarse quartz-foraminiferan sand
live fauna: amphipods, *Munida*, sponges, polychaetes, bryozoans on skeleton, small red gorgonian, ophiuroids
components: coral rubble (95% *Madrepora*), echinoid spines, *Stenocyathus*, gastropods, bryozoans
remarks: few material

GeoB 14539-1 (Little Poseidon Mound, top) *51°26.90'N, 11°42.98'W, 686 m*

sediment colour: 2.5Y 4/2 dark greyish brown
sediment: clayey foraminiferan sand
live fauna: red gorgonian, diverse sponges, polychaetes, hydrozoans, crustaceans, ascidian, tube worms, anemone, large white bryozoan, dropstones colonised by foraminifers, bryozoans, serpulids and "fluff"
components: coral rubble (mainly *Madrepora* 95%), bivalves (amongst *Lima marioni*), crustacean remains, gastropods, pteropods, otoliths, amphipods, echinoid spines, pectinids, large dropstones (~8 cm in diameter)

GeoB 14545-1 (Secchi Spur, W of Little Poseidon) *51°26.76'N, 11°42.47'W, 769 m*



sediment colour: 2.5Y 4/4 olive brown
sediment: medium quartz-foram sand
live fauna: octocoral, ophiuroids, polychaetes, amphipod tubes, *Munida*
components: *Madrepora* and *Lophelia* rubble, gastropods, pteropods, bivalves, cm-sized dropstone
remarks: test for current conditions

GeoB 14542-1 (unnamed mound, NW-flank) *51°26.09'N, 11°42.12'W, 670 m*

sediment colour: no sediment
live fauna: polychaetes, antipatharian on *Madrepora* rubble, ophiuroids, *Lima marioni*, *Stenocyathus* (pot. alive)
components: *Madrepora* rubble and recently dead material, echinoid spines, pteropods, gastropods, otoliths
remarks: very few material

4.3 CTD

For the measurement of sea water properties, a CTD system (Sea Bird Electronics) of the IFM-GEOMAR (Kiel, Germany) that is permanently installed on board RV POSEIDON was applied (Fig. 4.4). In addition to the classical CTD data (conductivity, temperature, depth), the available CTD system also provides oxygen and fluorescence data. The electronic hardware was mounted inside a frame. Twelve Niskin bottles that are normally mounted on the frame for water sampling were removed before deployment.

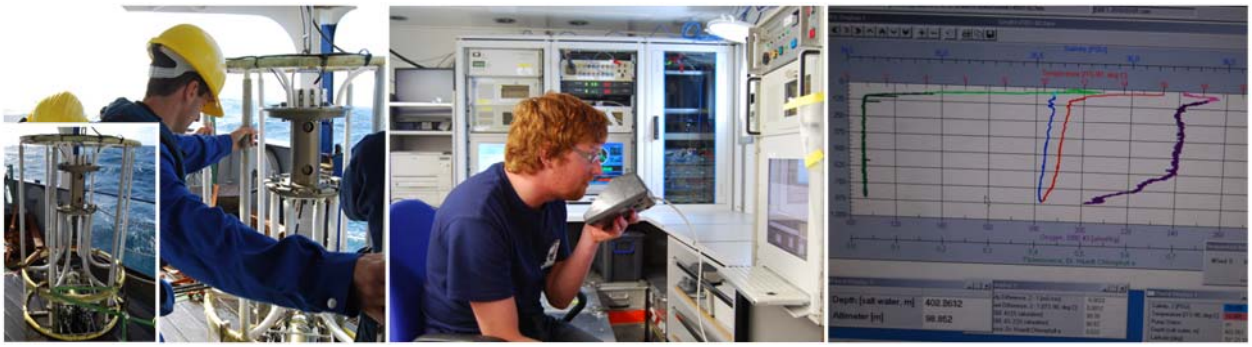


Figure 4.4. Deployment of CTD frame, CTD watch, screen showing fluorescence (green), salinity (blue), temperature (red), and oxygen (purple) data recorded during a CTD cast (from left to right; photos: J. Stone, MARUM).

During RV POSEIDON cruise POS400, the CTD was deployed at three stations (Area A: off-mound area, Area C: NW of Lion's Head Mound, Area D: Macnas Mounds) (Table 4.3). Each time the CTD was continuously lowered and raised over a period of 12 hours (so-called yoyo CTD) without leaving the water to trace tidal fluctuations.

Table 4.3. Metadata of CTD yoyo stations conducted during RV POSEIDON cruise POS400 (data are related to start and end time).

Cast	Station-No.		Date (dd.mm.yy)	Time (UTC)	Lat (N)	Lon (W)	WD sounder	No. of downcasts
Area C								
01	GeoB 14501-1	start	02.07.10	08:50	51°21.15	11°42.81	859m	23
		end	02.07.10	21:02	51°21.18	11°42.87	862m	
Area A								
02	GeoB 14508-1	start	04.07.10	06:29	51°29.02	11°47.99	990m	21
		end	04.07.10	18:38	51°29.19	11°47.92	986m	
Area D								
03	GeoB 14558-1	start	13.07.10	06:44	51°26.99	11°32.31	385m	44
		end	13.07.10	18:47	51°27.00	11°32.29	385m	

4.4 ROV Cherokee

During RV POSEIDON cruise POS 400, the midsize inspection class ROV Cherokee (manufactured by Sub-Atlantic, Aberdeen) was applied. It is operated by MARUM since 2001 and was adapted and enhanced for scientific purposes. The ROV Cherokee is 1000 m depth rated, but due to several "cut-offs" and terminations of the umbilical supply cable, only a diving depth of 850 m is guaranteed.

Vehicle – The vehicle dimensions are 120x80x100 cm (LxWxH) and weight in air is around 450 kg. It has a payload for scientific equipment of ~20 kg. It is electrically propelled by four axial thrusters and total power of the system is 12kW (Fig. 4.5).

Winch – The spooling winch is an MPD Aberdeen custom design winch, carrying ~1,000 m umbilical. Overall weight of the winch, incl. the umbilical, is 1.5 tons. The umbilical contains 20 electrical conductors providing electrical power and basic telemetry. In addition, four optical multimode fibres provide 4 video and 4xRS232 channels. Control over the system is given by three 19" racks, equipped with several display and recording devices (Fig. 4.5).

Surface Control Unit – The Surface Control Unit contains the remote control for the vehicle and the manipulator. It also contains the sonar PC and screen, two small 10" colour monitors for video camera display as well as an ampere. and voltmeter. The pilot rack's PC monitor shows navigational data from the ship and the ROV, such as heading, position, depth etc. A large analogue monitor inside the rack displays the live video of the Tritech colour zoom camera (Fig. 4.5). The video rack includes two DV recorders to record two cameras simultaneously. The rack also has a PC with software running to control the Konsberg still image camera, the IFREMER (Brest, France) framegrab utility Adelie and the USBL positioning system GAPS (IXSEA). The GAPS system consist of two components: an antenna with an acoustic array of four hydrophones, lowered on a ships pole below water surface and the corresponding transponder, mounted on the vehicle. The antenna interrogates the transponder, then calculating the relative distance from the vehicle to the ship in all three dimensions. Absolute position is achieved by a DGPS input, taking into account the relative distances, acquired by the acoustics. GAPS achieves an accuracy of 2 m. Navigational data (ship, ROV), video recordings, still images, Adelie frame grabs and sonar data are all time referenced for further scientific use.

Video recording – Four video cameras are mounted on the ROV for observation and navigational purposes: a colour zoom camera (720x576 lines), a modified Konsberg OE14 (5 Megapixels) with associated flash light and two mini video cameras for the overview of the front and back area of the vehicle. The video and still image cameras are mounted onto a pan & tilt unit, which enhances the observation capabilities of the vehicle. The pan & tilt unit also carries three lasers for object size measurements on the seafloor. Underwater light is provided by 3x230W DSPL dimmable spots. For long or close range obstacle detection and measurement, a Tritech Seaking dual frequency sonar is mounted on the port side of the vehicle. It displays an acoustical real time image on the topside sonar PC. The sonar operates at 325/675Hz with a maximum scanning range of 300 m. Navigational devices such as compass, altimeter and depth sensor are parts of the basic sensor package on board the ROV.

Sampling – For scientific sampling and experiments, a small hydraulical manipulator system is used (Fig. 4.5). The Hydro-Lek HLK-EH-5 is a non-proportional, five function manipulator powered and controlled by a combined pressure pump and six station valve pack. Operating pressure is 130bar and lifting capacity is 25kg. Part of the hydraulical system is the toolbox, which is used for storing samples and/or mounting sampling tools. It can be hydraulically opened and closed.

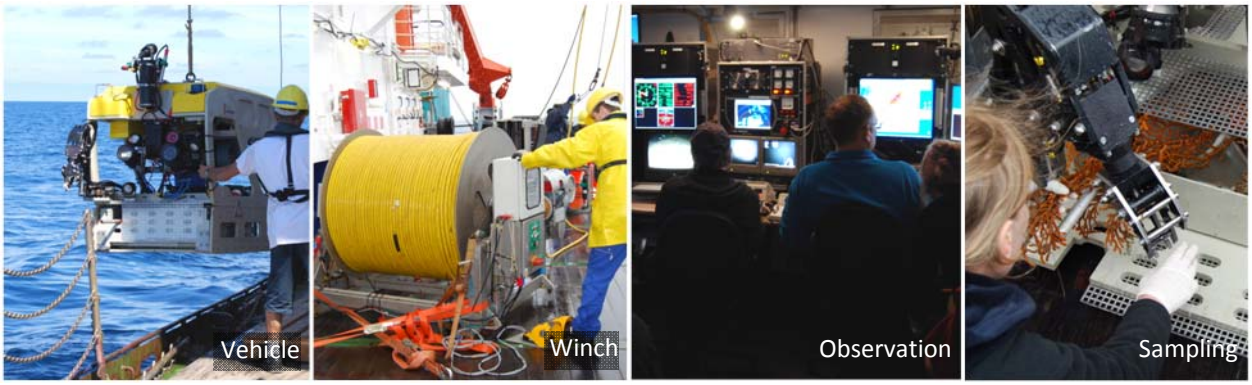


Figure 4.5. MARUM ROV Cherokee: deployment of the vehicle, the winch, laboratory for video observation, samples collected with the ROV manipulator (from left to right; photos: J. Stone, MARUM).

Seven dives were performed during cruise POS400 (Table 4.4), targets were (1) three coral mounds of the shallow mound chain in the Belgica Mound Province (Poseidon Mound, Little Poseidon Mound and Lion's Head Mound) and (2) the Macnas Mounds area which is situated ~18.5 km to the east of the Belgica Mound Province and comprises low-relief (height: 5-10 m) mound-like structures of unknown origin covered by coral rubble.

Table 4.4. Metadata of ROV Cherokee dives conducted during RV POSEIDON cruise POS400 (position is related to time of survey start and survey end).

Dive	Station-No.		Date (dd.mm.yy)	Time (UTC)	Lat (N)	Lon (W)	WD	Remarks, sample description	Still images	bottom time (diving time)
Area C: Lion's Head Mound (E-flank)										
01	GeoB 14520-1	start	05.07.10	17:11	51°20.40	11°41.33	814m	dive was aborted due to strong currents	22	1h 49min (3h 4min)
		end	05.07.10	19:00	-/-	-/-	-/-			
Area C: Lion's Head Mound (SW-flank to top)										
02	GeoB 14543-2	start	09.07.10	07:49	51°20.07	11°41.84	847m	-/-	277	3h 27 min (4h 55min)
		end	09.07.10	11:16	51°20.37	11°41.62	718m			
	sample #1		09.07.10	08:53	51°20.14	11°41.70	808m	live Lophelia, Madrepora		
	sample #2		09.07.10	10:51	51°20.37	11°41.62	723m	live Lophelia, gorgonian, antipatharian		
Area C: Lion's Head Mound (W- to E-flank)										
03	GeoB 14544-1	start	09.07.10	14:17	51°20.32	11°41.91	793m	-/-	137	1h 11 min (2h 54min)
		end	09.07.10	15:28	51°20.43	11°41.44	817m			
Area C: Little Poseidon Mound (SW-flank to top)										
04	GeoB 14545-2	start	10.07.10	07:10	51°26.70	11°42.42	781m	-/-	230	4h 55min (6h 3min)
		end	10.07.10	12:05	51°27.20	11°42.07	720m			
	sample #1		10.07.10	10:23	51°26.91	11°41.95	700m	dropstone with Pliobothrus		
	sample #2		10.07.10	11:27	51°27.09	11°41.93	741m	live Lophelia		
Area C: Poseidon Mound (SW- to NE-flank)										
05	GeoB 14548-1	start	11.07.10	07:05	51°27.34	11°42.43	795m	-/-	314	4h 46min (6h 20min)
		end	11.07.10	11:51	51°27.98	11°41.63	784m			
	sample #1		11.07.10	09:01	51°27.40	11°41.96	685m	dropstone with barnacles		
	sample #2		11.07.10	10:28	51°27.65	11°41.84	682m	lithified carbonate		
Area D: Macnas Mounds										
06	GeoB 14553-1	start	12.07.10	06:38	51°27.23	11°32.28	387m	-/-	117	1h 51min (2h 42min)
		end	12.07.10	08:29	51°27.65	11°31.81	371m			
Area D: Channel NW of Macnas Mounds										
07	GeoB 14554-1	start	12.07.10	09:58	51°27.53	11°34.19	465m	dive was interrupted and continued at the oppo-site flank of the channel	166	4h 55min (5h 45min)
		end	12.07.10	14:53	51°27.88	11°32.48	405m			

One ROV dive in the east of Lion's Head Mound had to be aborted right after bottom contact of the ROV due to very strong bottom currents. During the dives, a total of 23.5 hours of video footage was recorded and more than 1,250 still images were acquired with the photo camera (Table 4.4). Finally, several sonar images and six surface samples from the seafloor comprising cold-water corals (Fig. 4.5), dropstones and lithified carbonates were collected during the ROV dives.

4.4.1 Video analysis – Area C: Lion's Head Mound

E-flank (GeoB 14520-1; Dive 1)

An E-W transect was conducted starting at the eastern base of the mound at 51°20.40'N and 11°41.33'W in 814 m water depth (Fig. 4.6). A depth range of 815-807 m was surveyed until the dive had to be aborted due to prevailing strong bottom currents. The area studied was dominated mainly by winnowed gravel, pebble and cobble sized dropstone fields laying on soft sediment (Fig. 4.7). The soft sediment partly showed lebenspuren and was colonised by cerianthids. Individual boulders - often having comet tails - and larger sized drop-stones were mainly colonised by *Psolus*, frequently by *Pliobothrus symmetricus* and rarely by actinians or stolonial octocorals. Seldom gobiid fish were observed as well as grazing *Cidaris cidaris* and *Echnius* cf. *acutus*.

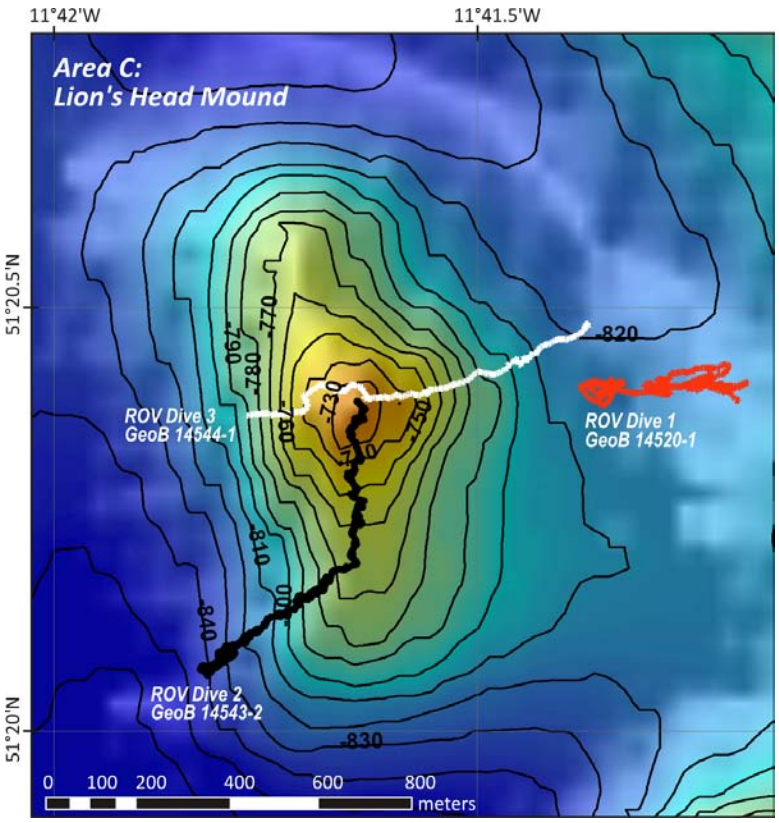


Figure 4.6. Lion's Head Mound, ROV dive tracks are indicated.

SW-flank to top (GeoB 14543-2; Dive 2)

The dive started at the SW flank (51°20.07'N and 11°41.84'W) in 847 m water depth heading NE and turned north when reaching the crest of the southern spur of the mound to continue uphill and ending at the top of the Lion's Head Mound (51°20.37'N, 11°41.62'W) in 718 m water depth (Fig. 4.6). Until 815 m water depth vast coral rubble fields exist intermixed with some semi-buried dropstones and small soft sediment fields, which are partly rippled or depict traces

of mobile organisms. The presence of current ripples and exposed dropstones point to rather strong bottom currents at the lower southwestern flank of Lion's Head Mound. Isolated live *Madrepora oculata* and *Lophelia pertusa* colonies appear in a scattered way, measuring up to 30 cm in length of which up to 25 cm can be still alive. Live and dead portions are observed to be colonised by hydroids, pectinids, sabellids and often also eunicids. The coral rubble and in situ dead framework portions serve as substrate for organisms, such as various octocorals and sponges, *Anthomastus grandiflorus*, tube-dwelling amphipods, ascidians and actinians. Boulders harbour associations of *Pliobothrus symmetricus*, live *Madrepora oculata* and tube-dwelling amphipods. The soft sediment contains two cerianthid types distinguished by their tentacle crown colour, which is either entirely dark-red coloured or their outer tentacles appear violet and the inner whitish. The area is dominated by various predators, as are *Neptunea antiqua*, *Cidaris cidaris*, *Echinus* cf. *acutus,* muniids, *Bathynectes maravigna* and pagurids of various sizes within *Neptunea antiqua* shells and Trochidae shells*. Paromola cuvieri* was observed to carry species potions, which are either absent during dive, like *Aphrocallistes beatrix,* or rare ones, like live *Acanthogorgia armata. A. armata* has exclusively been observed in one occasion growing isolated on coral rubble. Two fish species were documented in rare abundance (*Phycis blennoides* and a gobiid).

In 815 m the fauna starts to get more diverse and sessile species, like orange antipatharian (colonised by shrimps), whip-shaped corals, branching bryozoans, *Aphrocallistes beatrix*, actinians, live solitary corals, octocorals, amongst stolonial of various colour, hydrozoans, various sponges (e.g, *Hexadella* sp.), amphipod burrows, zooanthids, various ascidians and *Acanthogorgia armata* appear, partly also associated with live framework-building scleractinians. Predating and grazing species diversity increases with presence of unident. decapods, pillow stars (*Ceramaster*) and hermit crabs in symbiosis with *Epizoanthus.*

On top of the mound large megabars or dunes were developed, which had an approximate N-S orientation. The crests of these dunes were densely covered by dead coral framework colonised by numerous live *Lophelia* and *Madrepora* colonies, antipatharians and octocorals (Fig. 4.7). The troughs of the dunes were dominated by anemones (e.g., cerianthids).

W-flank to E-flank (GeoB 14544-1; Dive 3)

The dive started at the western base of the mound (51°20.32’N, 11°41.91’W) in 793 m water depth crossing the mound’s top and ended at its eastern flank (51°20.43’N, 11°41.44’W) in 817 m water depth (Fig. 4.6). Like on the top also on the western flank of Lion's Head Mound, large N-S oriented dunes were developed covered by large coral framework. The framework was colonised by a highly diverse and abundant associated fauna, such as *Aphrocallistes beatrix*, large octocorals, reddish antipatharians, actinians, solitary corals, crinoids and sponges (e.g., *Hexadella*), by predators (*Munida*, *Bathynectes maravigna*) and grazers, like *Cidaris cidaris*, *Calliostoma* cf. *mauricoli* and *Porania.*

Towards the top (~720 m), live *Lophelia* and *Madrepora* colonies became more abundant and also the size of the coral framework increased. The dive continued from the top towards the eastern flank. Down to a water depth of 770 m, the eastern flank was again covered by large coral framework colonised by abundant isolated *Lophelia* and *Madrepora* colonies. Between 770 and 820 m water depth, a conspicuous change towards a dropstone dominated facies was observed (Fig. 4.7). The dropstones had varies sizes and were of colonised by barnacles, the calcified hydrozoan *Pliobothrus symmetricus* and octocorals. Amongst the fish fauna, few individuals of the macrourid fish *Coelorinchus* cf. *caelorhincus*, *Phycis blennoides* and *Helicolenus dactylopterus* were documented.

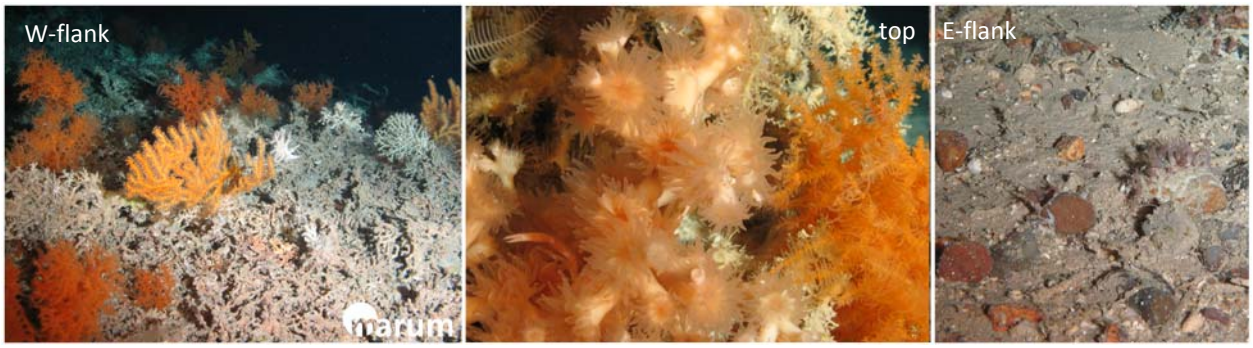


Figure 4.7. Lion's Head Mound. The western flank is dominated by large coral framework colonised by abundant octocorals and antipatharians, live small-sized Lophelia *and* Madrepora *colonies. On top grow large* Lophelia *colonies. The lower eastern flank is dominated by a dropstone-barnacle facies (from left to right; ROV images ©MARUM).*

4.4.2 Video analysis – Area C: Poseidon area

SW-flank-top-N-flank of Little Poseidon Mound (GeoB 14545-2; Dive 4)

The dive started at the south-western base of the mound at 51°26.70'N and 11°42.42'W in 781 m water depth, crossed its top and continued north to the depression between Little Poseidon and Poseidon Mound (Fig. 4.8). At the western base between 781 and 760 m, large dunes or megabars were developed as already found for Lion's Head Mound. The large dunes were superimposed by current ripples and covered by abundant dropstones (Fig. 4.9), large gastropods (*Neptunea antiqua*), abundant *Cidaris cidaris* and small-sized coral rubble.

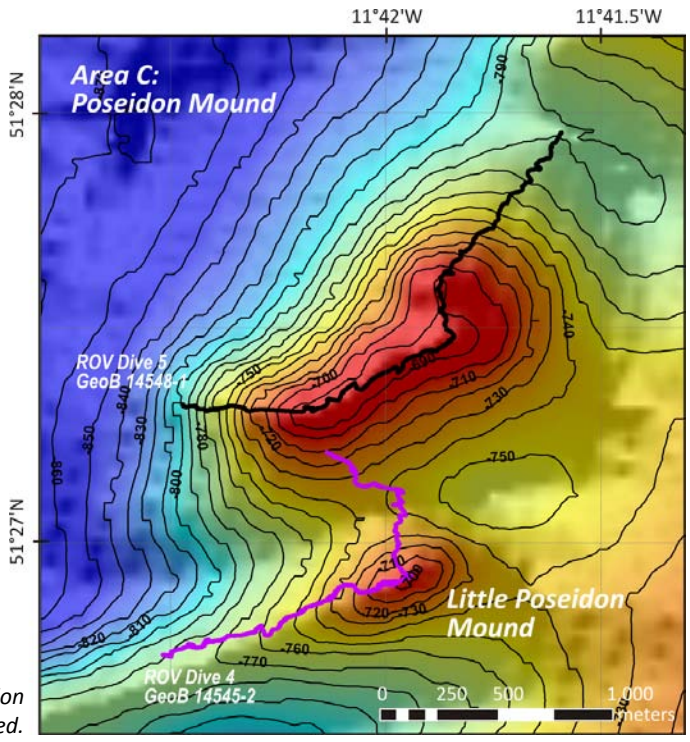


Figure 4.8. Little Poseidon Mound and Poseidon Mound, ROV dive tracks are indicated.

One striking observation was *Paromola cuvieri* swimming (!) in front of our cameras. Going further uphill, the current ripples disappeared, coral rubble became more abundant, and the amount and size of dropstones decreased. Overall, less live associated fauna as on Lion's Head Mound was observed. At 720 m water depth, first live but small-sized *Lophelia* and *Madrepora* colonies growing on large dead coral framework occurred. However, to the surprise of all scientists the top of Little Poseidon Mound at water depths between 710 and 695 m was dominated by large dropstone boulders, which reached sizes of up to 3 m in diameter and which where densely colonised by barnacles (*Bathylasma*) and the calcified hydrozoan *Pliobothrus symmetricus* (Fig. 4.9). Such a facies is more characteristic for troughs/channels than for the top of a coral mound, and points to very strong bottom currents.

Figure 4.9. Little Poseidon Mound. The lower western flank is dominated by current ripples, dropstones, and small-sized coral rubble. The top of the mound is covered by large dropstone boulders that are densely colonised by barnacles and the calcified hydrozoan Pliobothrus *(ROV images ©MARUM).*

Along the entire northern flank of Little Poseidon Mound as well as within the deep and narrow depression between Little Poseidon and Poseidon Mound, again large dunes or megabars were developed. As on Lion's Head Mound, these dunes have a N-S orientation. Their crests were covered by massive dead coral framework colonised by partly abundant live *Lophelia* and *Madrepora* colonies (Fig. 4.10), it was conspicuous that the scleractinian colonies had all the same size with a diameter of 10-20 cm. In contrast, the dune troughs were dominated by sandy sediments, current ripples, few small-sized coral rubble and abundant anemones (Fig. 4.10).

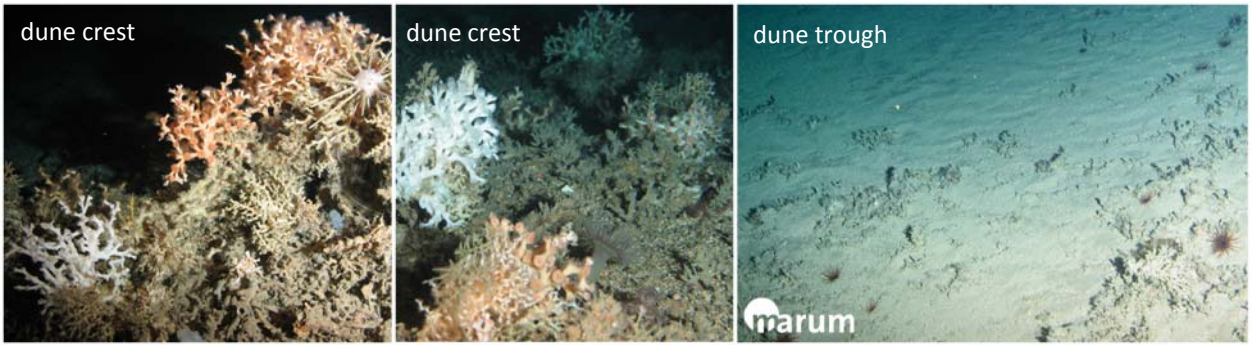


Figure 4.10. Large dunes developed on the northern flank of Little Poseidon Mound and in the depression between Little Poseidon and Poseidon Mound. The dune crests are covered by large coral framework colonised by abundant large live Lophelia *and* Madrepora *colonies. The dune troughs are dominated by coarse sediments, current ripples, anemones and few coral rubble (ROV images ©MARUM).*

The bottom currents were remarkably strong revealing the channelling effect between the two coral mound. The dive had to be aborted in 720 m water depth due problems with the break of the winch at 51°27.20'N and 11°42.07'W.

W-flank-top-NE-flank of Poseidon Mound (GeoB 14548-1; Dive 5)

Starting at the western flank of the mound in 795 m water depth (51°27.34'N and 11°42.34'W) the ROV went upwards to the top, followed the crest to the northern spur and ended at its northeastern flank in 784 m water depth at 51°27.98'N ad 11°41.63'W (Fig. 4.8). On the western flank between 800 and 740 m water depth, again large dunes were developed. The dune crests were again covered by massive dead coral framework which was colonised by few rather small live *Lophelia* and *Madrepora* colonies, abundant reddish antipatharians, octocorals, crinoids, echinoids and sponges. A large number of the spider crab *Paromola cuvieri* was observed. The dune crests were dominated by dropstones and small-sized coral rubble. From 740 m water depth towards the top, small-sized coral rubble became more abundant and no more live scleractinian colonies were observed (Fig. 4.11). The southwestern top of Poseidon Mound at a water depth of 690-680 m was covered by large dropstone boulder (2-3 m in diameter!) as already observed for the top of Little Poseidon Mound. Again these boulders were densely colonised by barnacles, *Pliobothrus symmetricus* and even very few juvenile *Lophelia* were observed (Fig. 4.11). The sediment in between the dropstones boulders was composed of small-sized coral rubble, abundant barnacle plates and small dropstones.

Figure 4.11. Poseidon Mound. The western flank is covered by dead coral framework colonised by live Lophelia *and* Madrepora*, antipatharians, octocorals and crinoids. The carrier crab* Paromola *was abundant. The southwestern top is covered by large dropstone boulders colonised by abundant barnacles (ROV images ©MARUM).*

When the ROV reached the northern edge of the top (680 m water depth), suddenly large area with several metre-sized seabed structures occurred (Fig. 4.12). The structures had a rough surface and were colonised by abundant hydrozoans and even small-sized *Lophelia* colonies (Fig. 4.12). As it was impossible to identify these structures (sponges, cold seeps, rocks etc.), we collected a sample with the ROV. Back on board the sample was preliminary defined as a medium lithified carbonate containing coral fragments and other shells, further analyses in the home laboratories will give more detailed information about the origin of these carbonates.

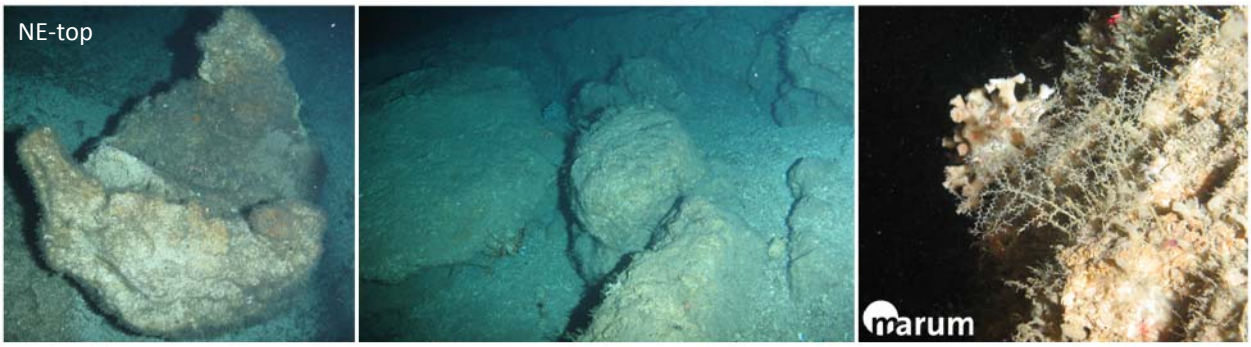


Figure 4.12. Northeastern top of Poseidon Mound. Metre-sized seabed structures of unknown origin colonised by abundant hydrozoans and live Lophelia *colonies (ROV images ©MARUM).*

The dive was continued downhill the northeastern flank of Poseidon Mound. Down to a water depth of 750 m, again large dunes were observed with their crests being covered by dead coral framework and very small live colonies of *Lophelia*, *Madrepora* and octocorals, whereas the troughs were covered by small-sized coral rubble and anemones. Further downhill between 750 and 784 m water depth, the dunes disappeared and the amount of dropstones increased. The dropstones are often colonised by *Pliobothrus symmetricus*.

4.4.3 Video analysis – Area D: Macnas Mounds

Macnas Mounds (GeoB 14553-1; Dive 6)

The dive crossed five small mounds in the Macnas area, starting at 51°27.23'N and 11°32.28'W in 387 m water depth and ending at 51°27.65'N and 11°31.81'W in 371 m water depth (Fig. 2.2). Between the mounds, the facies comprised soft sediments with current ripples and bioturbated sediments, partly covered by small dropstones (Fig. 4.13). The top of the mounds were covered with abundant but small-sized coral rubble (mainly *Lophelia*; Fig. 4.13). Anemones, crustaceans, gastropods, echinoid, holothurians, ophiurids and asteroids were abundant. Live *Lophelia* and/or *Madrepora* were not observed. Trawling marks and lost fishing gears were abundant (Fig. 4.13).

Figure 4.13. Macnas Mounds. The area between the mounds was characterised by soft sediment with current ripples and bioturbation. The tops of the mounds were covered by coral rubble and lost fishing gears were abundant (ROV images ©MARUM).

Channel NW of Macnas Mounds (GeoB 14554-1; Dive 7)

The dive started at 51°27.53'N and 11°34.19'W in 465 m water depth going uphill the NW flank of the canyon, interrupted and continued at the southwestern flank uphill until 51°27.88'N and 11°32.48'W in 405 m water depth (Fig. 2.2). We observed large dunes superimposed by current ripples (Fig. 4.14). Again, bioturbated soft sediments covered by small dropstones was the dominant facies. Anemones, maily cerianthids (often arranged as groups), crustaceans (e.g., *Munida*, *Paromola*, hermit crabs), gastropods, asteroids, echinoids and fish are abundant. Numerous large trawling marks were observed (Fig. 4.14).

Figure 4.14. North-western slope of the channel situated NW of the Macnas Mounds. Soft sediment with current ripples, gastropods, crabs, asteroids and anemones are abundant. Numerous large trawling marks were observed (ROV images ©MARUM).

Unfortunately, also the south-eastern slope of the canyon was dominated by soft sediments with current ripples, bioturbation and small dropstones. The live fauna comprised abundant anemones, crustaceans, echinoids, holothurians, gastropods, crinoids and fish (Fig. 4.15). After 2 hours without finding any evidence for the existence of cold-water corals, the dive was aborted at a water depth of 400 m.

Figure 4.15. South-eastern slope of the channel situated NW of the Macnas Mounds. Soft sediments dominate. Anemones, echinoids and fish were abundant, and even an octopus was observed (ROV images ©MARUM).

5 Weather diary

Date	Position	Area	Temperature	Pressure	Wind	Swell	Remarks
29.06.2010	44°16'N, 09°51'W	Transit	18.6°C	1023 hPa	2 Bft.	1 m	cloudless sky
30.06.2010	47°16'N, 10°51'W	Transit	19.4°C	↓ 1021-1018 hPa	6 Bft.	1 m	overcast
01.07.2010	50°46'N, 11°35'W	Transit	16.5°C	1006 hPa	5-7 Bft.	2.5-3 m	overcast
02.07.2010	51°21'N, 11°43'W (CTD)	C: Lion's Head	15.2°C	↑ 1007-1015 hPa	5-7 Bft.	3-4.5 m	overcast, showers
03.07.2010	51°30'N, 11°41'W	A: off-mound	15.8°C	1018 hPa	6-8 Bft.	3-3.5 m	overcast
04.07.2010	51°29'N, 11°48'W (CTD)	A: off-mound	14.8°C	↑ 1016-1024 hPa	5-6 Bft.	3 m	overcast
05.07.2010	51°20'N, 11°41'W (ROV)	C: Lion's Head	15.4°C	1029 hPa	3-4 Bft.	2 m	sunny
06.07.2010	51°25'N, 11°46'W	B: Pollux	16.3°C	↓ 1023-1018 hPa	6-7 Bft.	2-2.5 m	overcast, showers
07.07.2010	51°25'N, 11°46'W 51°28'N, 11°42'W	B: Pollux C: Poseidon	15.3°C	1017 hPa	5-7 Bft.	2.5-3 m	overcast
08.07.2010	51°28'N, 11°42'W	C: Poseidon	14.8°C	↓ 1016-1011 hPa	3-4 Bft.	2.5 m	overcast, rain
09.07.2010	51°20'N, 11°42'W (ROV)	C: Lion's Head	14.7°C	↑ 1011-1014 hPa	5 Bft.	2 m	rain
10.07.2010	51°27'N, 11°42'W (ROV)	C: Poseidon	14.4°C	↑ 1010-1016 hPa	5 Bft.	1.5-2 m	sunny
11.07.2010	51°27'N, 11°42'W (ROV)	C: Poseidon	15.1°C	1015 hPa	3-4 Bft.	1-1.5 m	overcast
12.07.2010	51°27'N, 11°32'W (ROV)	D: Macnas	14.4°C	1013 hPa	3-4 Bft.	2 m	overcast
13.07.2010	51°27'N, 11°32'W (CTD)	D: Macnas	15.0°C	↓ 1004-993 hPa	4-5 Bft.	1.5-2 m	rain, gale warning!
14.07.2010	51°54'N, 08°27'W	Transit	15.3°C			2.5 m	sunshine & rain

6 Participants

6.1 Scientific shipboard party

Dr. Claudia Wienberg	Chief Scientist	MARUM - Bremen
Markus Eisele	Marine Geologist	MARUM - Bremen
Marco Klann	Technician	MARUM - Bremen
Jana Stone	Video & Photo Documentation	MARUM - Bremen
Götz Ruhland	ROV Pilot/technician	MARUM - Bremen
Werner Dimmler	ROV Pilot/Technician	FIELAX - Bremerhaven
Prof. André Freiwald	Marine Geologist	SaM - Wilhelmshaven
Dr. Lydia Beuck	Marine Biologist	SaM - Wilhelmshaven
Mark Coughlan	Irish Observer	UCC – Cork

Claudia (Chief Scientist)

Götz (ROV)

Werner (ROV)

Lydia

André

Marco

Markus

Mark (Observer)

Jana (Video documentation)

6.2 RV POSEIDON crew

Oliver Secchi	Master
Theo Griese	Chief Officer
Alexander Hänsel	2nd Officer
Kurre Klaas Kröger	Chief Engineer
Heiko Hepping	2nd Engineer
Dietmar Klare	Electrician
Rüdiger 'Arthur' Engel	Motorman
Joachim Mischker	Bosun
Ralf Peters	SM Deckhand
Bernd Rauh	SM Deckhand
Gent Wichmann	Deckhand
Pedro M. Barosa	Deckhand
Horst Habecker	Cook
Ulrich Mack	Steward

Oliver (Master) *Theo* *Alex*



Kurre (Chief) *Dietmar* *Heiko* *Arthur*




Achim (Bosun) *Pedro* *Gent* *Ralf* *Bennie* *Ulli (Steward)* *Horst (Cook)*






6.3 Participating institutions

MARUM - Zentrum für Marine Umweltwissenschaften, Universität Bremen
Leobener Straße, 28359 Bremen, Germany

SaM - Forschungsinstitut Senckenberg am Meer, Abt. für Meeresforschung
Südstrand 40, 26382 Wilhelmshaven, Germany

Fielax GmbH, Barkhausenstr. 4
27568 Bremerhaven, Germany

UCC - University College Cork
College Road, Cork, Ireland

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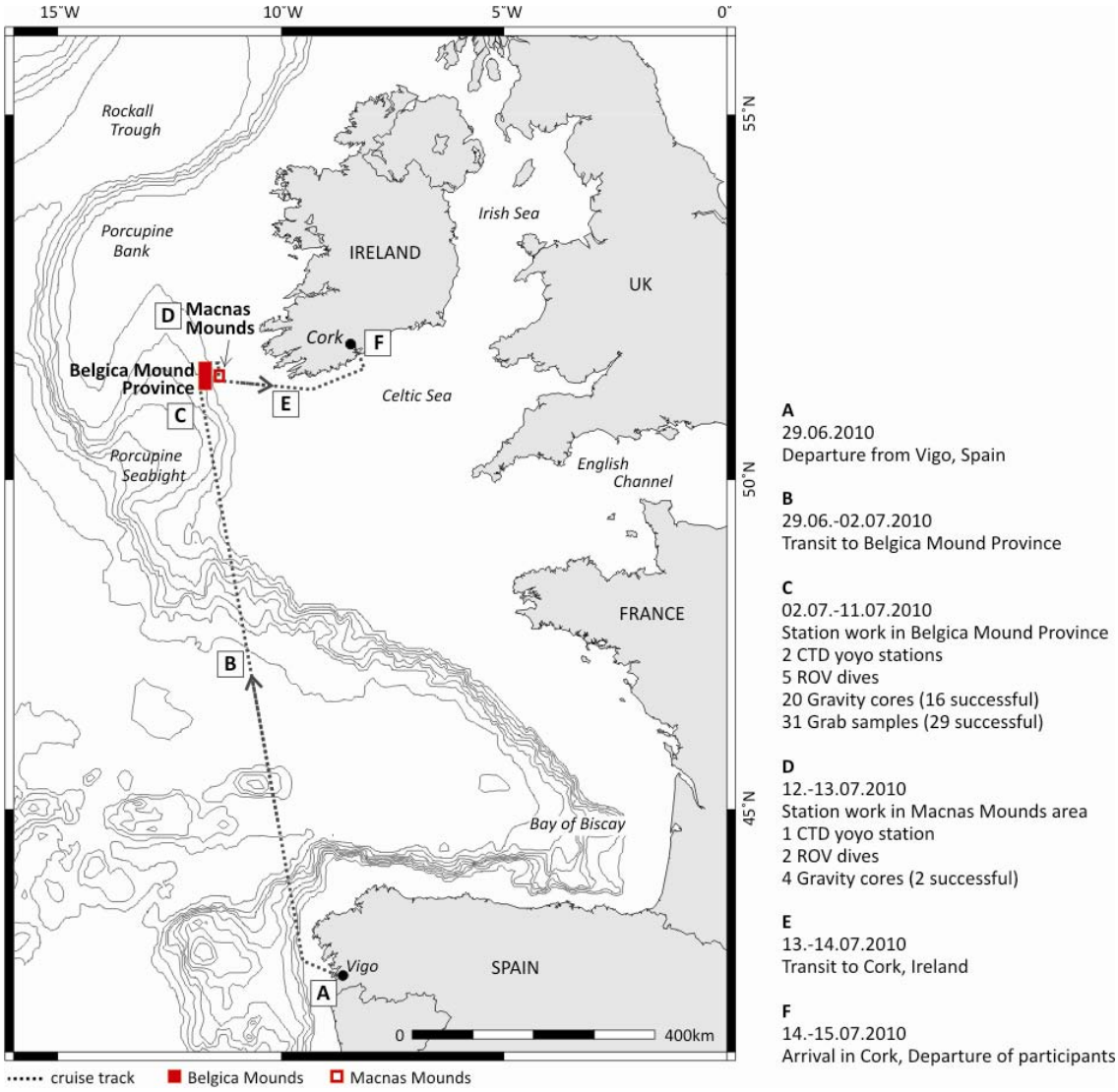
Appendix A

Cruise track of RV POSEIDON cruise POS400



A
29.06.2010
Departure from Vigo, Spain

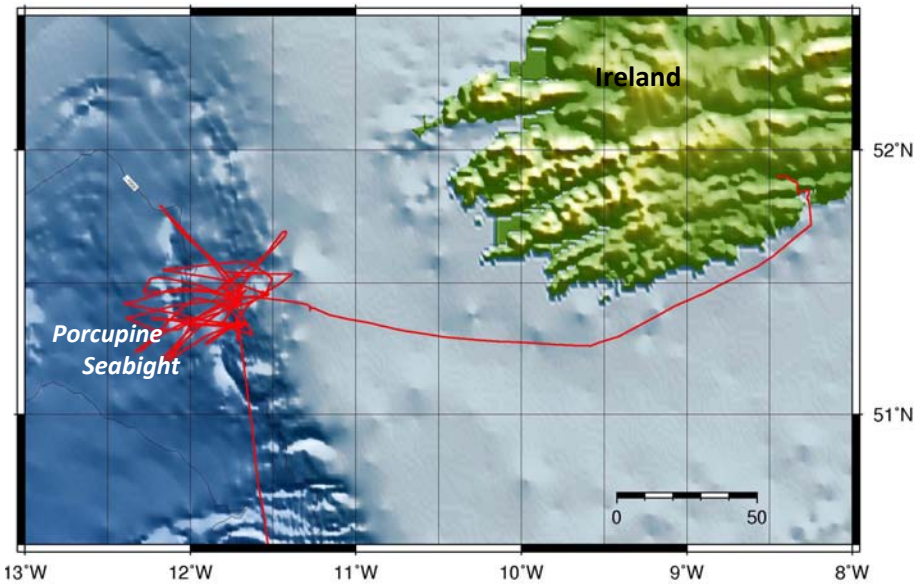
B
29.06.-02.07.2010
Transit to Belgica Mound Province

C
02.07.-11.07.2010
Station work in Belgica Mound Province
2 CTD yoyo stations
5 ROV dives
20 Gravity cores (16 successful)
31 Grab samples (29 successful)

D
12.-13.07.2010
Station work in Macnas Mounds area
1 CTD yoyo station
2 ROV dives
4 Gravity cores (2 successful)

E
13.-14.07.2010
Transit to Cork, Ireland

F
14.-15.07.2010
Arrival in Cork, Departure of participants



Appendix B

Station list of RV POSEIDON cruise POS400

Gears

GC	Gravity Corer
GR	Grab Sampler)
CTD	Conductivity-Temperature-Depth
ROV	Remotely Operated Vehicle ('CHEROKEE', MARUM

Abbreviations

Lat	Latitude
Lon	Longitude
REC	Recovery
WD	Water depth

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14501-1	CTD	1	02.07.10	08:50	51°21.15	11°42.81	859m		02.07.10	21:02	51°21.18	11°42.87	862m		yoyo station for 12 hours, 23 casts	Area C (shallow) Lion's Head Mound
14502-1	GC	1	03.07.10	07:15	51°32.07	11°36.65	526m	552m						335	6m pipe; clayey sediment	Area A off-mound
14503-1	GC	2	03.07.10	08:25	51°31.84	11°38.99	635m	666m						-/-	6m pipe; empty, coarse sand on pipe	Area A off-mound
14503-2	GC	3	03.07.10	08:55	51°31.81	11°38.98	635m	666m						-/-	6m pipe; empty	Area A off-mound
14504-1	GC	4	03.07.10	10:08	51°31.54	11°41.96	739m	775m						499	6m pipe; clayey sediment	Area A off-mound
14505-1	GC	5	03.07.10	11:05	51°31.03	11°43.85	832m	882m						540	6m pipe; 2x pulled! dropstones on top	Area A off-mound
14506-1	GC	6	03.07.10	12:02	51°30.27	11°45.89	911m	963m						550	6m pipe	Area A off-mound
14507-1	GC	7	03.07.10	13:00	51°28.53	11°47.02	987m	1044m						476	6m pipe; dropstones on top	Area A off-mound
14508-1	CTD	2	04.07.10	06:29	51°29.02	11°47.99	990m	-	04.07.10	18:38	51°29.19	11°47.92	986m		yoyo station for 12 hours, 21 casts	Area A off-mound
14509-1	GR	1	05.07.10	06:10	51°20.20	11°41.64	758m	778m						bulk	***Madrepora* rubble** (<10% *Lophelia*), dropstones, olive foram-quartz sand	Area C (shallow chain) Lion's Head Mound (S-flank)
14510-1	GR	2	05.07.10	07:07	51°20.32	11°41.67	720m	755m						bulk	***Lophelia-Madrepora* rubble**, very few olive foram sand	Area C (shallow chain) Lion's Head Mound (S-flank)
14511-1	GR	3	05.07.10	07:51	51°20.39	11°41.64	707m	730m						bulk	**dead *Madrepora* framework**	Area C (shallow chain) Lion's Head Mound (top)
14512-1	GR	4	05.07.10	08:43	51°20.47	11°41.68	739m	750m						bulk	**dead *Madrepora* framework**, olive foram sand	Area C (shallow chain) Lion's Head Mound (N-flank)
14513-1	GR	5	05.07.10	09:15	51°20.57	11°41.72	750m	758m						bulk	**dead Madrepora framework**, no sediment	Area C (shallow chain) Lion's Head Mound (N-flank)
14514-1	GR	6	05.07.10	10:21	51°20.39	11°41.56	718m	728m						bulk	**dead Madrepora framework/rubble** (5% large Lophelia), no sediment	Area C (shallow chain) Lion's Head Mound (E-flank)
14515-1	GR	7	05.07.10	11:00	51°20.33	11°41.75	783m	800m						bulk	**Madrepora rubble**, no sediment	Area C (shallow chain) Lion's Head Mound (W-flank)
14516-1	GR	8	05.07.10	11:42	51°20.50	11°41.60	764m	760m						bulk	**Madrepora rubble** , olive foram sand	Area C (shallow chain) Lion's Head Mound (E-flank)

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14517-1	GC	8	05.07.10	12:35	51°20.39	11°41.56	725m	787m						443	6m pipe; coral-bearing core *Madrepora* coral rubble on top; see GR GeoB 14514-1	Area C (shallow chain) Lion's Head (E-flank)
14518-1	GC	9	05.07.10	13:25	51°20.38	11°41.64	707m	750m						587	6m pipe; coral-bearing core, slightly over-penetrated, but top is saved, *Madrepora* rubble on top; see GR GeoB 14511-1	Area C (shallow chain) Lion's Head Mound (top)
14519-1	GC	10	05.07.10	14:17	51°20.33	11°41.76	794m	836m						397	6m pipe; coral-bearing core; see GR GeoB 14515-1	Area C (shallow chain) Lion's Head Mound (W-flank)
14520-1	ROV	1	05.07.10	17:11	51°20.40	11°41.33	814m	-	05.07.10	~19:00	-/-	-/-	-/-		E-W transect; the dive had to be aborted due to strong bottom currents (tidal current effect?)	Area C (shallow chain) Lion's Head Mound
14521-1	GR	9	06.07.10	07:37	51°24.75	11°45.85	975m	982m						bulk	**dead coral framework** (*Madrepora* & *Lophelia* 50/50), no sediment	Area B (deep chain) Pollux Mound (SW-flank)
14522-1	GR	10	06.07.10	08:30	51°24.82	11°45.80	949m	952m						bulk	**dead and live Lophelia framework,** no sediment	Area B (deep chain) Pollux Mound (SW-flank)
14523-1	GR	11	06.07.10	09:18	51°24.90	11°45.83	943m	947m						-/-	**not released**	Area B (deep chain) Pollux Mound (W-flank)
14523-2	GR	12	06.07.10	10:33	51°24.89	11°45.84	958m	956m						bulk	**dead & live *Lophelia* framework** (20% *Madrepora*), no sediment	Area B (deep chain) Pollux Mound (W-flank)
14524-1	GR	13	06.07.10	11:16	51°24.89	11°45.79	899m	914m						bulk	**live *Lophelia* framework** (10% dead), no sediment	Area B (deep chain) Pollux Mound (top)
14525-1	GR	14	06.07.10	12:00	51°24.89	11°45.62	928m	955m						bulk	**dead *Lophelia-Madrepora* framework** (growing in each other), olive foram sand	Area B (deep chain) Pollux Mound (E-flank)
14526-1	GR	15	06.07.10	12:49	51°24.94	11°45.74	884m	905m						bulk	**dead & live *Lophelia* framework** (10% live, 1-2% *Madrepora*)	Area B (deep chain) Pollux Mound (top)
14527-1	GR	16	06.07.10	13:20	51°24.96	11°45.72	888m	910m						bulk	**dead *Lophelia* framework** (5% live, 10% *Madrepora*)	Area B (deep chain) Pollux Mound (top)

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14528-1	GR	17	06.07.10	13:52	51°25.02	11°45.68	921m	929m						bulk	**dead Madrepora framework** (20% Lophelia), olive foram sand	Area B (deep chain) Pollux Mound (N-flank)
14529-1	GR	18	06.07.10	14:23	51°25.08	11°45.65	932m	947m						bulk	**dead Lophelia framework** (5% live)	Area B (deep chain) Pollux Mound (N-flank)
14530-1	GC	11	07.07.10	06:36	51°24.89	11°45.82	950m	988m						508	6m pipe; coral-bearing core, large coral fragments on top; see GR GeoB 14523-2	Area B (deep chain) Pollux Mound (W-flank)
14531-1	GC	12	07.07.10	07:40	51°24.89	11°45.77	904m	950m						449	6m pipe; coral-bearing core, large coral fragments on top; see GR GeoB 14524-1	Area B (deep chain) Pollux Mound (top)
14532-1	GC	13	07.07.10	08:41	51°24.87	11°45.62	933m	980m						-/-	just a few corals & sponges in core catcher (*Madrepora*, *Aphrocallistes*)	Area B (deep chain) Pollux Mound (E-flank)
14532-2	GC	14	07.07.10	09:32	51°24.88	11°45.62	926m	980m						103	corals in sandy sediment matrix; pipe might be toppled over, top disturbed; see GR GeoB 14525-1	Area B (deep chain) Pollux Mound (E-flank)
14533-1	GR	19	07.07.10	11:26	51°27.49	11°41.67	687m	698m						bulk	**barnacle plates**, few coral rubble (mainly *Madrepora*), olive coarse foram sand	Area C (shallow chain) Poseidon Mound (E-flank)
14534-1	GR	20	07.07.10	11:58	51°27.49	11°41.89	680m	693m						bulk	***Madrepora* rubble**, light yellowish brown coarse foram sand	Area C (shallow chain) Poseidon Mound (NE-top)
14535-1	GR	21	07.07.10	12:43	51°27.33	11°42.17	676m	680m						-/-	not released	Area C (shallow chain) Poseidon Mound (SW-top)
14535-2	GR	22	07.07.10	13:08	51°27.33	11°42.18	675m	694m						bulk	***Madrepora* rubble**	Area C (shallow chain) Poseidon Mound (SW-top)
14536-1	GR	23	07.07.10	14:06	51°27.48	11°42.08	686m	720m						bulk	***Madrepora* rubble**, one small live *Lophelia*	Area C (shallow chain) Poseidon Mound (W-flank)
14537-1	GR	24	08.07.10	06:19	51°26.55	11°42.86	774m	790m						bulk	**coral rubble** (60% *Madrepora*, 40% *Lophelia*), small dropstones, olive medium to coarse quartz-foram sand	Area C (shallow chain) Secchi Spur

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14538-1	GR	25	08.07.10	07:11	51°26.73	11°42.39	764m	767m						bulk	***Madrepora* rubble**, olive brown medium to coarse quartz-foram sand	Area C (shallow chain) Secchi Spur
14539-1	GR	26	08.07.10	07:56	51°26.90	11°41.98	686m	714m						bulk	***Madrepora* rubble**, dark greyish brown clayey sand	Area C (shallow chain) Little Poseidon (top)
14540-1	GR	27	08.07.10	08:42	51°27.30	11°42.30	695m	731m						bulk	***Madrepora* rubble**, light yellowish brown silty foram sand	Area C (shallow chain) Poseidon Mound (SW-flank)
14541-1	GR	28	08.07.10	09:29	51°27.64	11°41.95	715m	733m						bulk	***Madrepora* rubble**, live *Lophelia*, very few sediment	Area C (shallow chain) Poseidon Mound (NW-flank)
14542-1	GR	29	08.07.10	11:54	51°26.09	11°42.12	670m	736m						bulk	***Madrepora* rubble**; very few material	Area C (shallow chain) unnamed mound (NW-flank)
14543-1	GR	30	09.07.10	06:25	51°20.06	11°41.81	832m	848m						bulk	- to test current conditions - **coral rubble** (*Madrepora* 60%, *Lophelia* 40%), live *Lophelia*, mm-sized drop-stones, light olive grey medium sand	Area C (shallow chain) Lion's Head Mound (NW-flank)
14543-2	ROV	2	09.07.10	07:49	51°20.07	11°41.84	847m	-	09.07.10	11:16	51°20.37	11°41.62	718m		SW-NE-N track	Area C (shallow chain) Lion's Head Mound
				08:53	*51°20.14*	*11°41.70*	*808m*								*sample 1: live Madrepora & Lophelia*	
				09:18	*51°20.16*	*11°41.65*	*794m*								*trawling mark*	
				10:06	*51°20.26*	*11°41.63*	*761m*								*fishing lines & net*	
				10:15	*51°20.29*	*11°41.63*	*755m*								*fishing line*	
				10:51	*51°20.37*	*11°41.62*	*723m*								*sample 2: live Lophelia with gastropod, gorgonia & antipatharia on coral framework*	
14544-1	ROV	3	09.07.10	14:17	51°20.32	11°41.91	793m	-	09.07.10	15:28	51°20.43	11°41.44	817m		W-E track; at the eastern flank problems with strong bottom currents!	Area C (shallow chain) Lion's Head Mound
				15:17	*51°20.37*	*11°41.49*	*799m*								*fishing line*	
				15:24	*51°20.39*	*11°41.41*	*818m*								*trawling mark*	
14545-1	GR	31	10.07.10	06:19	51°26.76	11°42.47	769m	783m						bulk	-to test current conditions - **few coral rubble**, live brown medium sand	Area C (shallow chain) Secchi Spur SW of Little Poseidon

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14545-2	ROV	4	10.07.10	07:10	51°26.70	11°42.42	781m	-	10.07.10	12:05	51°27.20	11°42.07	720m		SW-NE-N track; the dive had to be aborted due to problems with the break of the winch	Area C (shallow chain) Little Poseidon Mound
				08:43	*51°26.85*	*11°42.20*	*751m*								*fishing net*	
				10:23	*51°26.91*	*11°41.95*	*700m*								*sample 1: Pliobothrus on dropstone*	*top Little Poseidon*
				10:53	*51°26.99*	*11°41.93*	*733m*								*bottle slightly overgrown*	
				11:27	*51°27.09*	*11°41.93*	*741m*								*sample 2: white and pink living Lophelia*	*megabars*
14546-1	GC	15	10.07.10	14:33	51°27.64	11°41.95	699m	755m						170	6m pipe; coral-bearing core with large coral fragments on top; see GR GeoB 14541-1	Area C (shallow chain) Poseidon Mound (NW flank)
14547-1	GC	16	10.07.10	15:14	51°27.48	11°41.88	681m	715m						428	6m pipe; just a few coral fragments, dropstones and barnacles plates on top; see GR GeoB 14534-1	Area C (shallow chain) Poseidon Mound (NE top)
14548-1	ROV	5	11.07.10	07:05	51°27.34	11°42.43	795m	-	11.07.10	11:51	51°27.98	11°41.63	784m		SW-NE track: dive started at the western base of the mound, crossed its top and ended at its eastern flank	Area C (shallow chain) Poseidon Mound
				07:22	*51°27.31*	*11°42.37*	*769m*								*fishing line*	
				09:01	*51°27.40*	*11°41.96*	*685m*								*sample 1: large dropstone, barnacles*	
				09:23	*51°27.45*	*11°41.88*	*688m*								*trawl mark*	
				10:08	*51°27.59*	*11°41.86*	*682m*								*large old fishing net*	
				10:28	*51°27.65*	*11°41.84*	*682m*								*sample 2: lithified carbonate*	
14549-1	GC	17	11.07.10	13:17	51°27.30	11°42.38	748m	785m						-/-	core pipe bended (“banana”)	Area C (shallow chain) Poseidon Mound (W-flank)
14550-1	GC	18	11.07.10	14:13	51°27.33	11°42.18	676m	715m						558	6m pipe; sandy sediment, dropstones & coral fragments on top (probably very few corals downcore); see GR GeoB 14535-2	Area C (shallow chain) Poseidon Mound (SW top)
14551-1	GC	19	11.07.10	15:00	51°27.10	11°41.90	744m	780m						226	6m pipe; dropstones & barnacles on top, no corals to see	Area C (shallow chain) megabars between Little Poseidon & Poseidon

			Gear at bottom / Start of survey						End of survey							
Station [GeoB]	**Gear**	**Cast** [No.]	**Date** [dd.mm.yy]	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**WD** [winch]	**Date** [dd.mm.yy	**Time** [UTC]	**Latitude** [N]	**Longitude** [W]	**WD** [sounder]	**REC** [cm]	**Remarks**	**Area**
14552-1	GC	20	11.07.10	15:39	51°26.91	11°41.99	692m	733m						583	6m pipe; coral-bearing core, slightly overpenetrated; see GR GeoB 14539-1	Area C (shallow chain) Little Poseidon Mound (top)
14553-1	ROV	6	12.07.10	06:38	51°27.23	11°32.28	387m	-	12.07.10	08:29	51°27.65	11°31.81	371m		dive crossed 5 small mounds of the Macnas area; abundant trawl marks!	Area D Macnas Mounds
				06:50	*51°27.30*	*11°32.12*	*380m*								*fishing net*	
				06:59	*51°27.32*	*11°32.12*	*380m*								*trawl mark*	
				07:19	*51°27.39*	*11°32.05*	*381m*								*glass bottle*	
				07:24	*51°27.41*	*11°31.99*	*378m*								*fishing net*	
				07:32	*51°27.46*	*11°32.00*	*382m*								*fishing net*	
14554-1	ROV	7	12.07.10	09:58	51°27.53	11°34.19	465m		12.07.10	14:53	51°27.88	11°32.48	405m		dive going uphill the NW flank of a channel, interrupted an continued at the SW flank going uphill; abundant trawl marks	Area D Channel NW of Macnas
				10:01	*51°27.55*	*11°34.23*	*467m*								*fishing line*	
				10:15	*51°27.61*	*11°34.26*	*466m*								*trawl mark*	
				10:18	*51°27.63*	*11°34.28*	*465m*								*fishing line*	
				11:28	51°28.12	11°34.26	455m								dive along the NW flank of the channel was stopped, ROV was heaved 100m above seafloor, then steaming to the SE flank	
				12:32	51°27.82	11°33.40	448m								continue dive at the SE flank	
				13:16	*51°27.81*	*11°33.18*	*430m*								*fishing line*	
14555-1	GC	21	13.07.10	04:11	51°27.41	11°31.99	374m	392m						-/-	6m pipe; a few larger coral fragments and dropstones in the core catcher	Area D Macnas Mounds
14555-2	GC	22	13.07,10	04:32	51°27.41	11°31.99	375m	392m						-/-	6m pipe; very few coral fragments in the core catcher	Area D Macnas Mounds
14556-1	GC	23	13.07.10	05:00	51°27.63	11°31.91	375m	397m						529	6m pipe; sediment, no corals	Area D Macnas Mounds
14557-1	GC	24	13.07.10	06:09	51°27.44	11°31.72	369m	388m						413	6m pipe; sandy sediment, no corals	Area D Macnas Mounds
14558-1	CTD	3	13.07.10	06:44	51°26.99	11°32.31	385m	-	13.07.10	18:47	51°27.00	11°32.29	385m		yoyo station for 12 hours, 44 downcasts	Area D, Macnas Mounds

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