Cruise Report

RV Poseidon Cruise 292

Reykjavik – Galway

15th July — 4th August 2002

André Freiwald & Shipboard Party

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1. Scientific Objectives

The Poseidon Cruise 292 is dedicated to carry out tasks for two EU projects which sail under the 5th Framework Programme. These two projects are:

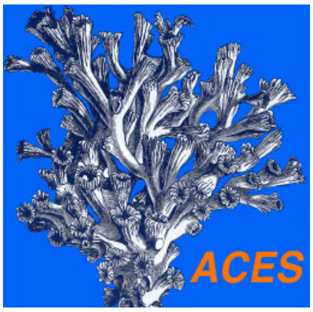
ACES
Atlantic Coral Ecosystem Study [Contract EVK3-CT-1999-00008]

ECOMOUND
Ecological Controls on Mound Formation along the European Continental Margin

[Contract EVK3-CT-1999-00013]

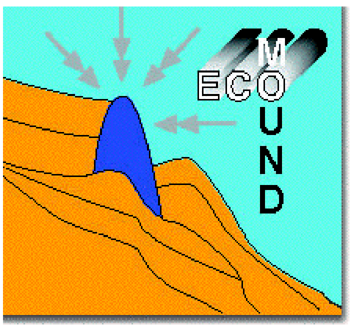
Both projects shared off shore working sites which calls for joint cruises to increase synergy through exchange of scientific expertise. In addition, both ACES and ECOMOUND joined the recently formed EU-Cluster related to continental margin research — OMARC (Ocean Margin deep-water Research Consortium).

1.1 The ACES Objectives



Coral reefs are something we usually associate with warm, tropical waters, but not with cold, deep and dark waters of the North Atlantic. It is now known that cold-water coral species also produce reefs, which rival their tropical counterparts in terms of their species richness and diversity. Increasing commercial operations in deep waters, and the use of advanced offshore technology have slowly revealed the true extent of Europe's hidden coral ecosystems. Our aim is a margin-wide environmental baseline assessment of the status of **Europe's deep-water coral margin** with recommendations for essential monitoring and methodology requirements for future sustainable development.

1.2 The ECOMOUND Objectives



Prominent carbonate mound reefs have been features of Earth's history ever since Cambrian times. These mounds frequently form giant host rocks for hydrocarbon accumulation. However, their formation and environmental controls are the subject of much discussion and disagreement. The discovery of spectacular **modern carbonate mounds** along the European continental margin provides an outstanding opportunity to study the processes that create carbonate mounds. Our present day knowledge of reef growth and reef formation is limited to the shallow water reef environments in tropical regions and to a few observations of „reefs„ from the cool water coral margin off Europe. Data and observations on modern carbonate mounds are still scarce.

1.3 Cruise Objectives

The Cruise 292 is a follow-up survey of the Poseidon Cruise 265 in 2000 (Freiwald et al., 2000) and thematically related OMARC cruises covering the area southern Rockall Trough and Porcupine Seabight.

The major scientific objectives of the Cruise 292 are devoted to the occurrence, sedimentary environment and biological zonation of deep-water coral ecosystems and coral-covered mound structures and the transition to the adjacent seabed environment in the following areas (fig. 1):

Northern Hatton Bank (reconnaissance survey)

Central western Rockall Bank (reconnaissance survey)

Pelagia Mounds at the southeastern Rockall Bank margin (major study site)

Transect from the Pelagia Mounds onto the top of the Rockall Bank (Empress of Britain Bank)

Propeller Mound (Hovland Mound Province) in the northern Porcupine Seabight (major study site)

Transect from Propeller Mound onto the top of Porcupine Bank

Poseidon and Therese Mound in the Belgica Mound Province (major study site)

The short reconnaissance surveys and transect seabed areas were sampled with an epibenthic dredge, a giant box corer and a SAPS (Stand-Alone-Pump-System), whereas in the major study sites a full-scale sampling and mapping survey was carried out. Aside the abovementioned gear, a ROV, Van Veen Grab and a gravity corer was used.

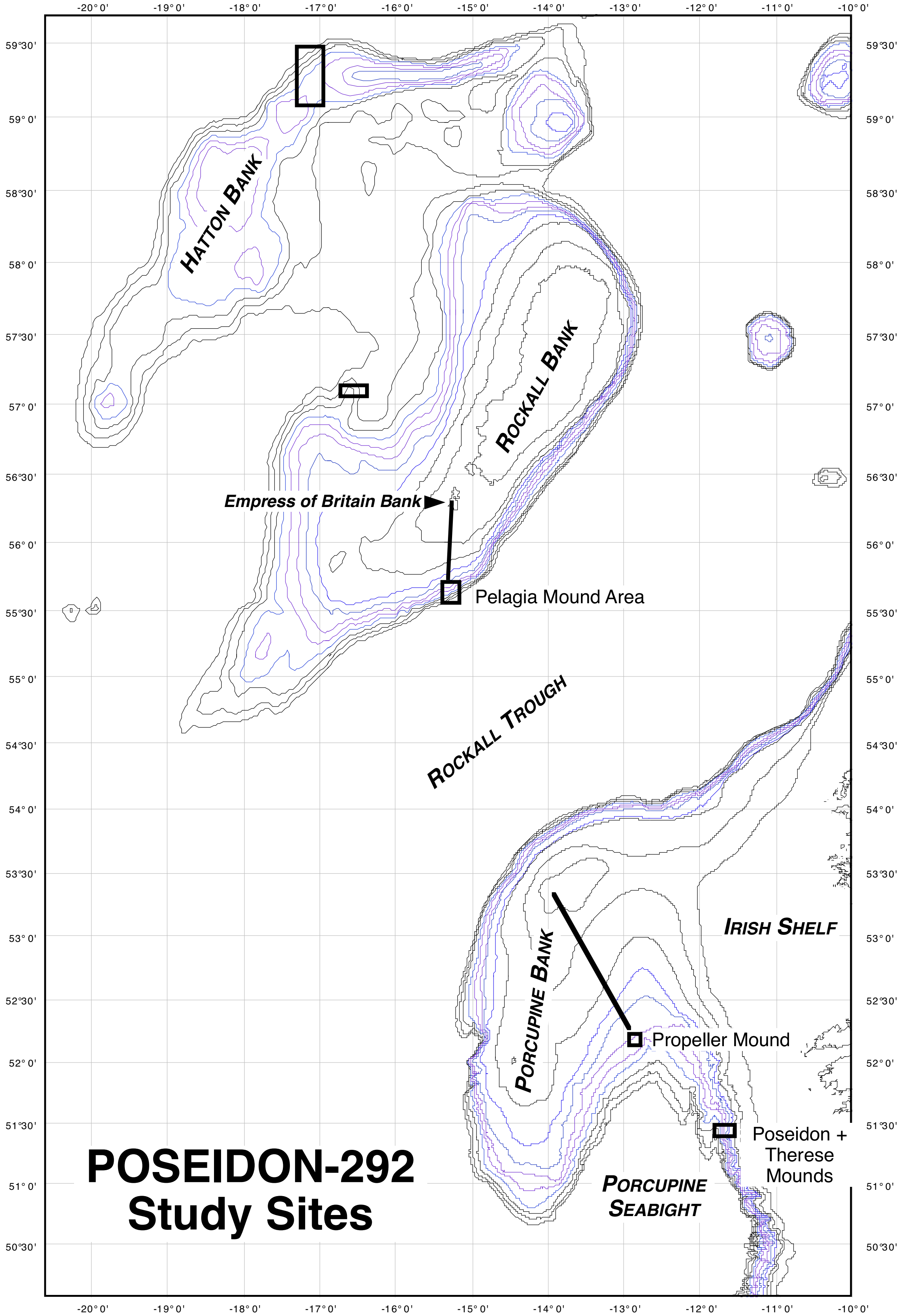


Fig. 1. Geographic overview showing all study sites of POS-292. The northernmost two boxes indicate the reconnaissance areas. The sedimentary sampling transects are marked with thick black lines. The major study sites (boxes) from three different mound provinces include the Pelagia Mounds, Propeller Mound and the Poseidon and Therese Mounds.

2. Narrative Report

Harbour day in Reykjavik (16th July)

The Poseidon was prepared to leave Reykjavik harbour on this day but due to an engine problem the start of the cruise had to be postponed for one day. This provides an extra day for the scientific crew to explore the surroundings of Reykjavik.

Transit to Hatton Bank (17th – 18th July)

At 08:00h we left Reykjavik under rainy weather conditions turned around the Reykjanes Peninsula off southwest Iceland and headed towards the first reconnaissance survey area with moderate sea conditions. These two transit days were welcomed by most of the scientists to adapt themselves to the life at sea…

Hatton Bank Survey (19th July)

We reached Hatton Bank at midnight and started immediately with two echosounder profiles crossing the northern flank of the bank in order to get information of suspicious seabed structures which indicate the presence of deep-water corals. A total of three epibenthic dredges proofed the wide occurrence of live and dead *Lophelia pertusa* and *Madrepora oculata* colonies and a diverse associated benthic community. One dredge contained numerous gorgonians. After the first SAPS-station we sailed towards the second reconnaissance area — the central western Rockall Bank margin.

Central western Rockall Bank (20th July)

Fig. 2. Detail of an antipatharian colony with an associated decapod (GeoB 8005-1/POS-528-1).

After a half day transit crossing the Hatton Bank – Rockall Bank Channel we reached a peculiar spur at the central western Rockall Bank margin where we conducted our second reconnaissance survey. The single echosounder line over the spur already shows the existence of a giant 140m-high mound structure. This mound was sampled with an epibenthic dredge, a box-corer station and SAPS. Again, deep-water corals and a huge antipatharian colony were collected (Fig. 2). During the day, the new Cheerokee-ROV was deployed for a functional test. After this test, we steamed over the Rockall Bank towards our first major study site — the Pelagia Mound area.

Pelagia Mound Province I (21st – 22nd July)

When we reached the study site at the southeastern Rockall Bank margin, the sea had picked up and it started to rain in heavy showers, What a Sunday.... Nevertheless, after the SAPS-station, the first real ROV survey was carried out in a distinct trough zone between two mound chains. As the ROV system was on its second real scientific mission, we all were excited to see how the ROV worked — and thanks to the ROV-team, it worked considerably well (Fig. 3). This operation lasted over the full daytime period. Starting in the evening, an intense Van Veen grab sampling survey over several mounds was launched until the next morning. Later on, we continued with the box corer and got very important seabed samples. In the afternoon, three short-barrel gravity corer station yielded moderate to good results. From earlier cruises we already knew that the Pelagia area is not a good coring area because of the great density of dropstone pavements. In the evening we began a 41nm-long echosoundier transect from the Pelagia Mounds to the shallow-water Empress of Britain Bank, a small satellite bank of the large oceanic Rockall Bank.

Fig. 3. Gerrit Meinecke and Nico Nowald during their demanding ROV-survey in the operation lab.

Rockall Bank Transect (23rd July)

The sea-state was still poor and a large swell did not make life easy on the working deck. Our shallowest station on the Empress of Britain Bank was at 236m water depth. From here, we went back along our tracked echosounder line towards the Pelagia Mound area and deployed the box corer each 100m depth interval, in order gain information about the sedimentary facies evolution from the shallow bank and the deep flanks with the coral mounds. In the evening, we reached the Pelagia Mound area and continued with the grab for the whole night with two SAPS-stations in between.

Pelagia Mound Province II (24th July)

The previous day and night was tough work for the coring team, so we continued in the morning with the box corer. In the meantime, the second ROV-dive was prepared. This time, the waypoints of the dive went right through the coral mounds with more than 100m of vertical relief. Now, the ROV-team had to provide their best support. We got some hours of superb video documentation of the different sedimentary environments and especially of the faunal distribution of the coral thickets and associated communities. After the successful recovery of the ROV-system, we decided to leave the area and steamed over night and half of the next day to the Propeller Mound.

Propeller Mound I (25th – 26th July)

This transit to our second major study site was necessary to wrap up initial results, sample storage and fixation of biological samples, to mend our coring equipment (Fig. 4) – and to allow a short rest for crew and scientists. We reached the Propeller Mound, northern Porcupine Seabight, in the early afternoon and started immediately with box coring and SAPS until sunset. After few more box corer stations, the third ROV-dive was prepared to explore the northeastern flank and summit region of Propeller Mound. Near the summit, a squid was sucked into the thrusters and blocked the

Fig. 4. On the way to Propeller Mound: Maintenance work on the heavily used box corer

system so that we had to stop this dive earlier than expected. This provided extra time for box corer stations in the southern part of Propeller Mound. In the evening, we started an 82nm-long echosounder transect onto the shallow Porcupine Bank.

Porcupine Bank (27th - 28th July)

The sea had considerably picked up when we reached the first SAPS and box corer station on the shallow (153m water depth) Porcupine Bank. We tried to box core our way back to Propeller Mound over the day, but after the second box corer station, we had to stop all deck work and steamed against the rising sea. The wind direction allowed a long echosounder transect to a peculiar canyon system at the western flank of the Porcupine Bank. At the upper canyon head huge mounds exist on the seabed. Over the night, sea conditions had slightly improved so that we could risk to continue our box corer transect from yesterday. We reached Propeller Mound in the evening after a total of 10 box corer stations from that transect. After a short dredge haul off the coral habitats we continued with grab stations through the night.

Propeller Mound II (29th – 30th July)

After the early morning SAPS-Station, we took three 6m-long gravity cores from the Propeller Mound and continued with box corer stations in the afternoon. This means that the sea had calmed down considerably. Over the night, a long-lasting echo-sounding grid was mapped over the whole Hovland Mound Province until the next morning. Today we experienced our first true sunny day but the wind speed continuously speeded up. So we speeded up too, in order to bring the ROV down for its fourth dive of the cruise. This time, the unexplored southern flank was the target area. Here, we sampled a hard-ground crust. After the ROV-recovery, we stopped our Propeller Mound programme to steam to the Belgica Mound province through the night. A dark wall of rainy clouds indicated bad weather conditions for the next day (Fig. 5).

Fig. 5. Poor weather coming…

Belgica Mound Province (31st July – 3rd August)

Indeed, the bad weather caught us so that we only stay in the area without seabed sampling. In the meantime, we mapped almost all mounds in the Belgica Mound Province and decided to concentrate the remaining shiptime on a mound due east of Therese Mound that we tentatively named "Poseidon Mound". The next day permitted box coring which we did for the rest of the daytime. Very densely packed dropstone pavements and *Madrepora*-rubble was sampled. The evening and night programme was dedicated by a dredge haul and several grab stations. The other day showed good weather again so that we carried out our last ROV-dive over the Poseidon Mound – with spectacular results. Over night, we started to pack our material and had only limited time left to take three box corer samples from the nearby Therese Mound. At noon we finished our scientific programme and steamed to Galway. It was perfect timing that we had two birthdays to celebrate just at the last night at sea….

Galway (4th August)

We entered Galway harbour in the early afternoon – relaxed (Fig. 6).

Fig. 6. Entering Galway harbour – end of the cruise.

3. Technical Report

3.1 Navigation and echosounding

Shipboard navigation based on a dGPS system. Bathymtetric data were obtained with a 30-kHz and an 18-kHz echosounder. On this cruise mapping played a minor role as detailed seabed maps of the major study sites (Pelagia Mound area, Propeller Mound and Belgica Mound Province) already existed through the joint efforts of the FP5-OMARC Projects.

3.2 SAPS (Stand-Alone-Pumping-System) K. Kiriakoulakis, A. Rüggeberg

During the Poseidon Cruise 292 large filter samples (GF/F, 292mm diameter) were used to sample suspended particulate material from the water column using a Stand – Alone – Pumping - System (SAPS, Challenger Oceanic, UK). This pump can be deployed at any given depth and pump large amounts of seawater. It is usually deployed for two hours and in this case it was deployed 18 times close to the bottom (20 - 30m above seabed). The filters were wrapped in foil and ashed (400°C; 3 - 4 hours) before deployment whilst after deployment they were immediately frozen (-20°C) for the rest of the cruise). A quarter slice of each filter was kept for microbiological analyses (Donal Eardly; University of Galway), whereas the rest of the filters will be analysed for lipids, chlorophylls and isotopes (C, N) in order to obtain information about the quality and quantity of Particulate Organic Matter (POM) that may be available to the corals and all associated fauna. The deployments spanned over a large area, taking samples from and around newly discovered mounds on the Hatton Bank, the western tip of the

Fig. 7. The SAPS in operation during POS-292.

Rockall Bank and the Porcupine Seabight (Poseidon Mound), as well as from established areas such as Pelagia Mound area (southeastern Rockall Bank), Propeller Mound (Porcupine Seabight) and Theresa Mound (Porcupine Seabight). Two samples were also taken from the top of Rockall and Porcupine Banks. Table 1 summarizes the SAPS deployments.

Table 1. SAPS sampling during the cruise

Date	Station	Location	Longitude	Latitude	Water Depth [m]	Volume (lt)
19 July	GeoB 8002-3	Hatton Bank,	59°18.19N	17°03.62W	790	1442
20 July	GeoB 8005-4	W Rockall Bank	57°07.88 - 08.13N	16°35.51-74W	680-723	1451
21 July	GeoB 8006-1	Pelagia Mounds	55°31.93N	15°38.84W	850-860	1604
22 July	GeoB 8014-1	Pelagia Mounds	55°33.05N	15°39.02W	820-837	1583
23 July	GeoB 8023-1	Rockall Bank	56°10.67N	15°14.05W	234	1783
23 July	GeoB 8029-1	Pelagia Mounds	55°32.24N	15°40.22W	700	1068
24 July	GeoB 8036-1	Pelagia Mounds	55°32.31N	15°40.01W	700-730	1127
25 July	GeoB 8042-1	Propeller Mound	52°08.95-99N	12°46.28-37W	710	1139
26 July	GeoB 8044-1	Propeller Mound	52°09.10-20N	12°46.61-48W	805	1153
26 July	GeoB 8048-1	Propeller Mound	52°09.17-38N	12°45.55W	875	1116
27 July	GeoB 8050-1	Porcupine Bank	53°20.02-23N	13°51.80-91W	153	1020
29 July	GeoB 8068-1	Propeller Mound	52°09.08-17N	12°46.30-75W	655-700	1140
29 July	GeoB 8076-1	Propeller Mound	52°07.99-08.33N	12°46.12-14W	850	1168
30 July	GeoB 8078-1	Propeller Mound	52°09.43-57N	12°47.86-48.13W	735-740	1157
31 July	GeoB 8081-1	Belgica Mound Area	51°26.01-5N	11°43.93-44.07W	916	1154
2 August	GeoB 8103-1	Poseidon Mound	51°27.49-56N	11°41.98-92W	680	1199
2 August	GeoB 8106-1	Poseidon Mound	51°27.60-43N	11°43.00-20W	880	1337
3 August	GeoB 8107-1	Therese mound	51°27.02N	11°45.14W	796	1011

In addition, 11 subcores from separate box-corer deployments were taken for organic chemical analyses at the University of Liverpool (7) and microbiogical analyses at the University of Galway (3). In detail, all cores but one (10) were frozen immediately (-20°C), then left to thaw temporarily, extruded, wrapped in ashed (400°C, 3 - 4 h) foil and refrozen at –20°C for the rest of the cruise. One core (GeoB 8051-1; top of Porcupine Bank) was lost during extruding. One core was sliced in 1 cm slices down to 12 cm, kept in sterilized plastic bags and stored at 4°C for the rest of the cruise. This core will be used for microbiological analyses (Donal Eardly; University of Galway). Table 2 summarizes box-core sampling.

Table. 2. Subcores from box-corer stations collected for microbiology and geochemistry.

Date	Station	Location	Longitude	Latitude	Water Depth (m)	Micro-biology	Geo-chemistry
23 July	GeoB 8023-2	Rockall Bank	56°10.54N	15°13.90W	236	0	1
23 July	GeoB 8025-1	Rockall Bank	55°51.55N	15°26.37W	348	0	1
23 July	GeoB 8027-1	Rockall Bank	55°41.35N	15°33.00W	498	0	1
25 July	GeoB 8039-1	Propeller Mound	52°08.19N	12°46.09W	850	1	0
25 July	GeoB 8040-1	Propeller Mound	52°08.52N	12°45.30W	809	0	1
26 July	GeoB 8045-1	Propeller Mound	52°09.17N	12°46.13W	682	0	1
26 July	GeoB 8047-1	Propeller Mound	52°09.34N	12°46.40W	795	0	1
27 July	GeoB 8051-1	Porcupine Bank	53°00.80N	13°34.04W	202	0	0
29 July	GeoB 8073-1	Propeller Mound	52°08.75N	12°47.11W	761	1	0
29 July	GeoB 8074-1	Propeller Mound	52°08.43N	12°45.88W	784	0	1
1 August	GeoB 8087-1	Poseidon Mound	51°27.70N	11°41.42W	767	1 (sliced)	0

3.3 Giant Box-Corer A. Jurkiw, K. Heindel, D. Hüttich, J. Langer, A. Grehan

The main tool for the recovery of surface sediment samples was the giant box-corer, with a sampling area of 50 * 50 cm, which is able to penetrate as deep as 50 cm into the sediment (Fig. 8). The giant box corer was used at 52 stations (Table 3) with highly variable recovery due to the specific types of sediment. Seabed covered either with coral colonies, dropstone pavements, or extremely inclined flanks of mounds are difficult to sample, therefore 14 box-corer trails showed no recovery.

In the sediment-dominated samples the sampling scheme included intense sampling of the sediment surface with two 200 cm^2 sub-samples for micropaleontological studies. One set of these sub-samples was stained with a solution of 1g of rose bengal in 1 l ethanol. The stained sub-samples are stored at the Bremen University while the non-stained sub-sample set remains in the Paleontological Institute, Erlangen, University. Temperature measurements of the sediment were taken immediately after recovery of the box-corer. The sediment column was logged and bulk samples were taken from each unit. In addition, two sets of archive-cores were taken (storage at Bremen and Erlangen Universities).

Fig. 8. Giant Box-Corer used during POS-292.

At some sites an additional tube for microbiological and geochemical investigations (see Table. 2). The remaining sediment column was sieved stratigraphically in 10cm-thick slices (or thinner in respect to the thickness of the sedimentary units) over a series of sieves with 2cm, 1cm and 0.5cm mesh-size. Occasionally, a sub-sample was washed with a 125µm-sive to obtain a coarse sand fraction sample for further component analysis. The various kinds of samples taken from the individual giant box corers are listed in Table 4.

Table 3. Giant Box-Corer stations during POS-292.

POS Coding	GeoB Coding	Geographic Region	Latitude	Longitude	Depth [m]
528-2	GeoB 8005-2	W Rockall Bank	57°07.86N	16°35.49W	715
539-1	GeoB 8015-1	Pelagia Mounds	55°32.52N	15°39.08W	748
539-2	GeoB 8016-2		55°32.43N	15°39.19W	839
540-1	GeoB 8017-1		55°32.59N	15°40.29W	690
541-1	GeoB 8018-1		55°32.21N	15°38.30W	885
541-2	GeoB 8018-2		55°32.17N	15°38.32W	889
541-3	GeoB 8018-3		55°32.18N	15°38.38W	889
546-2	GeoB 8023-2	Rockall Bank	56°10.54N	15°13.90W	236
547-1	GeoB 8024-1		56°07.53N	15°15.77W	249
547-2	GeoB 8024-2		56°07.58N	15°15.78W	253
548-1	GeoB 8025-1		55°51.55N	15°26.37W	348
549-1	GeoB 8026-1		55°44.63N	15°30°71W	447
550-1	GeoB 8027-1		55°41.35N	15°33.00W	498
551-1	GeoB-8028-1		55°39.32N	15°34.38W	575
560-1	GeoB 8037-1	Pelagia Mounds	55°32.44N	15°40.19W	704
560-2	GeoB 8037-2		55°32.42N	15°40.24W	674
562-1	GeoB 8039-1	Propeller Mound	52°08.19N	12°46.09W	850
563-1	GeoB 8040-1		52°08.52N	12°45.30W	809
564-1	GeoB 8041-1		52°09.05N	12°46.05W	736
568-1	GeoB 8045-1		52°09.17N	12°46.13W	682
570-1	GeoB 8047-1		52°09.34N	12°46.40W	795
573-2	GeoB 8050-2	Porcupine Bk	53°19.97N	13°51.92W	153
573-3	GeoB 8050-3		53°19.95N	13°51.86W	153
574-1	GeoB 8051-1		53°00.80N	13°34.04W	202
576-1	GeoB 8053-1		52°51.40N	13°25.39W	249
577-1	GeoB 8054-1		52°41.78N	13°16.43W	356
578-1	GeoB 8055-1	N-Porcupine SB	52°35.67N	13°10.74W	450
579-1	GeoB 8056-1		52°23.62N	13°01.56W	554
580-1	GeoB 8057-1		52°20.46N	12°56.72W	630
581-1	GeoB 8058-1		52°13.40N	12°50.24W	736
582-1	GeoB 8059-1	Propeller Mound	52°09.20N	12°46.88W	804
595-1	GeoB 8072-1		52°09.36N	12°46.79W	680
595-2	GeoB 8072-2		52°09.37N	12°46.80W	690
595-3	GeoB 8072-3		52°09.41N	12°46.87W	730
596-1	GeoB 8073-1		52°08.75N	12°47.11W	761
597-1	GeoB 8074-1		52°08.43N	12°45.88W	784
598-1	GeoB 8075-1		52°08.34N	12°46.41W	711
598-2	GeoB 8075-2		52°08.34N	12°46.53W	730
602-1	GeoB 8079-1		52°08.29N	12°46.38W	698
602-2	GeoB 8079-2		52°08.25N	12°46.39W	698
606-1	GeoB 8083-1	Poseidon Mound	51°27.61N	11°42.01W	670
607-1	GeoB 8084-1		51°27.41N	11°42.07W	691
608-1	GeoB 8085-1		51°27.32N	11°42.18W	679
608-2	GeoB 8085-2		51°27.37N	11°42°23W	670
609-1	GeoB 8086-1		51°27.46N	11°41.91W	680
610-1	GeoB 8087-1		51°27.70N	11°41.42W	767
611-1	GeoB 8088-1		51°27.03N	11°41.71W	740
612-1	GeoB 8089-1		51°27.58N	11°42.43W	834
631-1	GeoB 8108-1	Therese Mound	51°26.94N	11°45.20W	810
632-1	GeoB 8109-1		51°27.10N	11°45.20W	780
633-1	GeoB 8110-1		51°27.10N	11°44.98W	860
634-1	GeoB 8111-1		51°26.90N	11°44.88W	869

Table **4**. Sampling scheme for the giant box corer retrieved during cruise POS-292.

POS Coding	GeoB Coding	Water Depth [m]	Recovery [cm]	Temp. [°C]	Rose Bengal	Surface sample	Archive Cores	Sieving
528-2	GeoB 8005-2	715	7	8.1	-	2	-	x
539-1	GeoB 8015-1	748	-	-	-	-	-	-
539-2	GeoB 8016-2	839	13	8.2	x	x	-	x
540-1	GeoB 8017-1	690	13	8.5	x	x	-	x
541-1	GeoB 8018-1	885	-	-	-	-	-	-
541-2	GeoB 8018-2	889	-	-	-	-	-	-
541-3	GeoB 8018-3	889	15	7.3	x	-	x	x
546-2	GeoB 8023-2	236	16	9.5	x	x	x	x
547-1	GeoB 8024-1	249	-	-	-	-	-	-
547-2	GeoB 8024-2	253	18	9.4	x	x	x	x
548-1	GeoB 8025-1	348	18	9.5	x	x	x	x
549-1	GeoB 8026-1	447	15	9.4	x	x	x	x
550-1	GeoB 8027-1	498	10	9.6	x	x	x	x
551-1	GeoB-8028-1	575	12	9.2	x	x	x	x
560-1	GeoB 8037-1	704	-	-	-	-	-	-
560-2	GeoB 8037-2	674	Corals	-	-	-	-	-
562-1	GeoB 8039-1	850	24	9.5	x	x	x	x
563-1	GeoB 8040-1	809	22	9.4	x	x	x	x
564-1	GeoB 8041-1	736	-	-	-	-	-	-
568-1	GeoB 8045-1	682	30	9.8	x	x	x	x
570-1	GeoB 8047-1	795	23	9.7	x	x	x	x
573-2	GeoB 8050-2	153	-	-	-	-	-	-
573-3	GeoB 8050-3	153	poor	-	-	x	-	-
574-1	GeoB 8051-1	202	15	11.3	x	x	x	x
576-1	GeoB 8053-1	249	15	10.7	x	x	x	x
577-1	GeoB 8054-1	356	24	10.5	-	x	x	x
578-1	GeoB 8055-1	450	31	10.6	x	x	x	x
579-1	GeoB 8056-1	554	44	10.7	x	x	x	x
580-1	GeoB 8057-1	630	39	10.7	x	x	x	x
581-1	GeoB 8058-1	736	35	10.4	x	x	x	x
582-1	GeoB 8059-1	804	32	9.4	x	x	x	x
595-1	GeoB 8072-1	680	-	-	-	-	-	-
595-2	GeoB 8072-2	690	-	-	-	-	-	-
595-3	GeoB 8072-3	730	8	11.6	-	x	-	x
596-1	GeoB 8073-1	761	37	10.3	x	x	x	x
597-1	GeoB 8074-1	784	26	10.3	x	x	x	x
598-1	GeoB 8075-1	711	-	-	-	-	-	-
598-2	GeoB 8075-2	730	poor	-	-	x	-	-
602-1	GeoB 8079-1	698	-	-	-	-	-	-
602-2	GeoB 8079-2	698	-	-	-	-	-	-
606-1	GeoB 8083-1	670	poor	10.7	-	x	-	x
607-1	GeoB 8084-1	691	poor	10.4	-	x	-	x
608-1	GeoB 8085-1	679	-	-	-	-	-	-
608-2	GeoB 8085-2	670	-	-	-	-	-	-
609-1	GeoB 8086-1	680	poor	10.6	-	x	-	-
610-1	GeoB 8087-1	767	38	9.8	x	x	x	x
611-1	GeoB 8088-1	740	28	9.6	x	x	x	x
612-1	GeoB 8089-1	834	poor	11.7	-	x	-	-
631-1	GeoB 8108-1	810	10	12.5	-	x	x	x
632-1	GeoB 8109-1	780	corals	15.7 (!)	-	x	-	-
633-1	GeoB 8110-1	860	corals	-	-	x	-	-
634-1	GeoB 8111-1	869	15	-	-	x	-	x

3.4 Van Veen Grab A. Jurkiw, K. Heindel, D. Hüttich, J. Langer, A. Grehan

A 40kg-Van Veen Grab with a width of 40cm was used during night operations in the coral mound areas (Fig. 9). Although, high quality sediment surfaces can not be expected with this type of gear, the grab was quite effective in terms of rapid trials to collect fauna which is associated to the deep-water coral community. During the POS-292 cruise a total of 44 grab stations were carried out in the major study sites (Table 5). Due to the difficulty that is related to mis-releases of the shutter in the coral habitats, 11 trials showed no recovery.

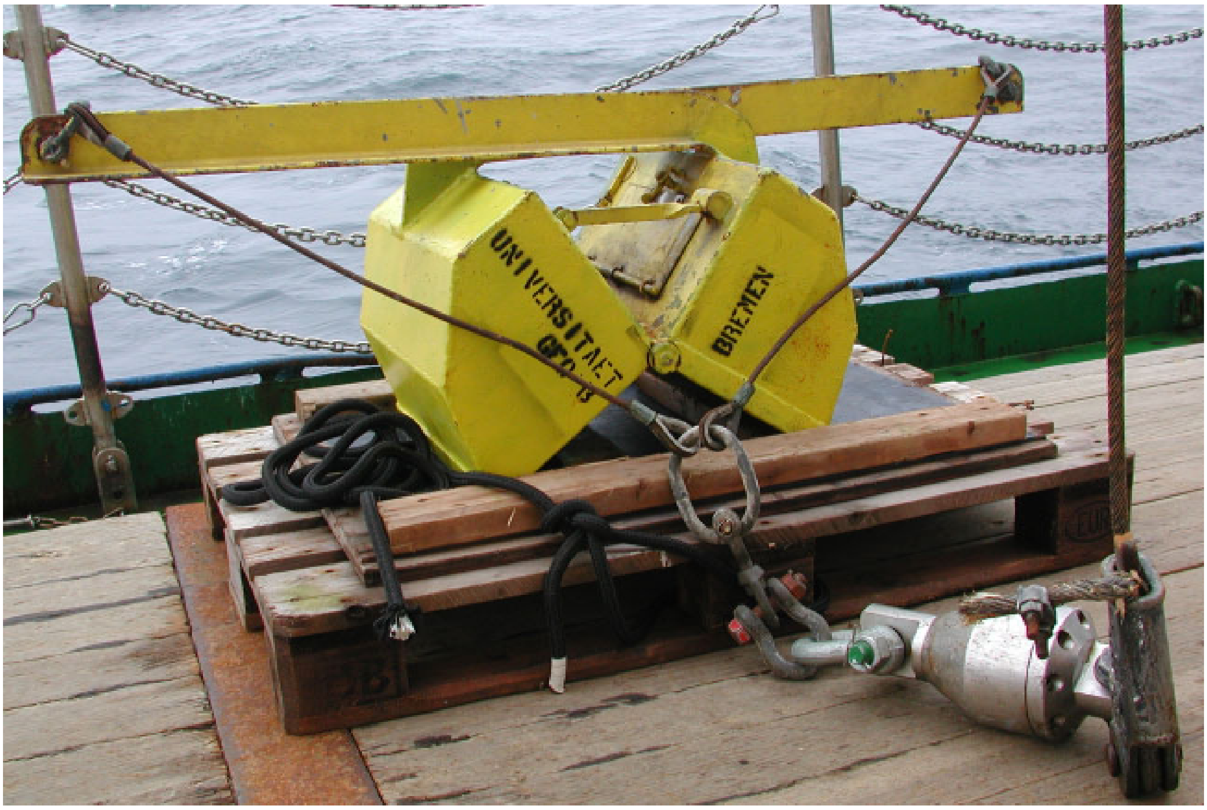


Fig. 9. The Van Veen Grab used during POS-292.

Table. 5. Van Veen Grab stations during POS-292.

Poseidon Coding	GeoB Coding	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
530-1	GeoB 8006-1	Pelagia Mound	55°32.05N	15°39.27W	862	No recovery
530-2	GeoB 8006-2		55°32.05N	15°39.27W	862	No recovery
530-3	GeoB 8006-3		55°32.05N	15°39.27W	862	*Lophelia*, *Aphrocallistes*
531-1	GeoB 8007-1		55°32.13N	15°38.25W	904	No recovery
531-2	GeoB 8007-2		55°32.16N	15°38.35W	890	No recovery
531-3	GeoB 8007-3		55°32.11N	15°38.36W	895	Dropstones, *Stylaster*
532-1	GeoB 8008-1		55°32.08N	15°38.30W	894	Dropstones, *Stylaster*
533-1	GeoB 8009-1		55°31.52N	15°37.92W	916	Failed
533-2	GeoB 8009-2		55°31.53N	15°37.94W	916	Corals, bryozoa
534-1	GeoB 8010-1		55°31.39N	15°38.13W	906	Corals and carbonate sand
535-1	GeoB 8011-1		55°31.48N	15°38.47W	842	Corals, *Aphrocallistes*
536-1	GeoB 8012-1		55°31.61N	15°38.92W	848	Dropstones
537-1	GeoB 8013-1		55°31.49N	15°39.26W	810	No recovery
552-2	GeoB 8029-2		55°32.19N	15°39.81W	830	Corals, porifera
553-1	GeoB 8030-1		55°32.12N	15°40.44W	835	*Madrepora*, sediment
554-1	GeoB 8031-1		55°32.42N	15°40.25W	660	*Lophelia, Madrepora*
555-1	GeoB 8032-1		55°32.26N	15°39.46W	825	*Madrepora, Aphrocallistes*
556-1	GeoB 8033-1		55°31.25N	15°38.46W	930	No recovery
556-2	GeoB 8033-2		55°31.22N	15°38.38W	943	*Madrepora, Aphrocallistes*
557-1	GeoB 8034-1		55°31.20N	15°39.23W	820	*Madrepora, Lophelia*
558-1	GeoB 8035-1		55°31.20N	15°39.14W	781	*Madrepora, Lophelia*
584-1	GeoB 8061-1	Propeller Mound	52°09.32N	12°46.70W	773	No recovery
584-2	GeoB 8061-2		52°09.45N	12°46.66W	764	Corals, Carbonate sediment
585-1	GeoB 8062-1		52°09.25N	12°45.97W	707	No recovery
585-2	GeoB 8062-2		52°09.28N	12°45.90W	780	Corals, sediment
586-1	GeoB 8063-1		52°08.57N	12°46.49W	745	Corals, sediment
587-1	GeoB 8064-1		52°08.79N	12°46.65W	800	Sediment
588-1	GeoB 8065-1		52°08.65N	12°46.01W	794	Sediment
589-1	GeoB 8066-1		52°08.82N	12°46.60W	801	No recovery
589-2	GeoB 8066-2		52°08.79N	12°46.62W	789	No recovery
590-1	GeoB 8067-1		52°08.95N	12°46.23W	780	Sediment
614-1	GeoB 8091-1	Poseidon Mound	51°27.91N	11°41.23W	770	Sandy mud, Dropstones
615-1	GeoB 8092-1		51°27.91N	11°41.40W	780	Dropstones
616-1	GeoB 8093-1		51°27.89N	11°41.67W	760	Dropstones, glacial clay
617-1	GeoB 8094-1		51°27.62N	11°42.07W	697	Dropstones, Corals
618-1	GeoB 8095-1		51°27.65N	11°42.03W	701	*Madrepora*
619-1	GeoB 8096-1		51°27.40N	11°41.97W	681	Dropstones, Barnacles
620-1	GeoB 8097-1		51°27.30N	11°42.30W	696	*Madrepora, Desmophyllum*
621-1	GeoB 8098-1		51°27.20N	11°41.89W	738	Dropstones
622-1	GeoB 8099-1		51°27.08N	11°42.18W	731	*Madrepora*
623-1	GeoB 8100-1		51°27.49N	11°42.59W	798	*Madrepora*
624-1	GeoB 8101-1		51°27.61N	11°42.16W	763	*Madrepora*
624-2	GeoB 8101-2		51°27.60N	11°42.20W	800	*Madrepora*
625-1	GeoB 8102-1		51°27.39N	11°42.42W	748	*Madrepora*

3.5 Gravity Corer

Daniel Hüttich, Jens Langer

Two gravity corer designs were used during this cruise. In penetretable sedimentary environments, the corer was equipped with a core barrel of 5.75m length and a weight of 1 ton on top to push it into the sediments (Fig. 10). In dropstone-rich areas, and in areas where during previous cruises ROV inspections have shown hardgrounds or boulder fields, a stabilised 2m core barrel was selected (Fig. 10).

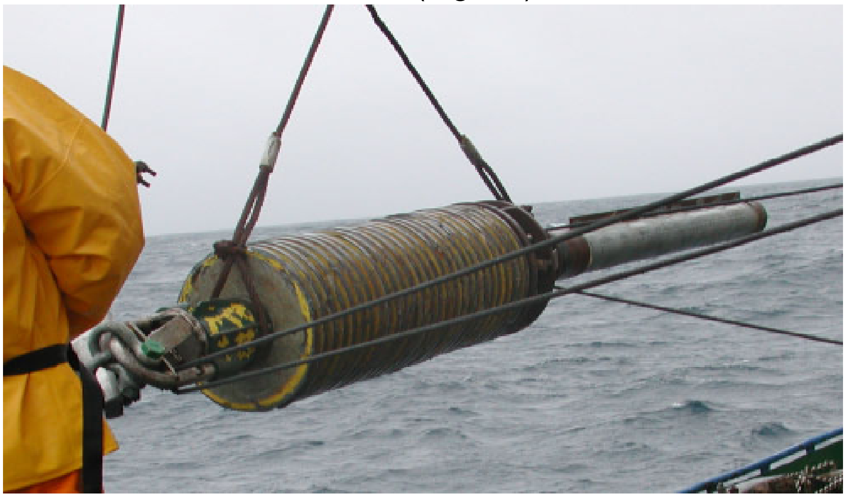


Fig. 10. The two gravity-corer versions used during POS-292: the 5.75m-long barrel for soft sediments (left) and the 2m-long and stabilised version for hard sediments, i.e. in boulder fields (right).

During the cruise a total of 6 gravity corer stations were carried out; 3 in the Pelagia Mound area (2m version) and 3 in the Propeller Mound area (5.75m version; Table. 6). Only one gravity corer trial was a failure. Individual core lengths range from 20 to 575cm. Gravity coring in the Pelagia Mound area proved to be quite difficult. Here only short cores have been retrieved, with 20cm and 151cm respectively. In contrast, the Propeller Mound is a much better coring area (except for the hardground regions). Here, total recovery range from 382cm to 575cm.

Table. 6. Gravity-Corer stations during POS-292.

Pos-Code	GeoB-Code	Length	Latitude	Longitude	Depth	Recovery
541-4	GeoB 8018-4	SL-2m	55°32.21N	15°38.44W	890m	No recovery
542-1	GeoB 8019-1	SL-2m	55°32.49N	15°39.16W	760m	20 cm
543-1	GeoB 8020-1	SL-2m	55°32.56N	15°40.35W	670m	151cm
592-1	GeoB 8069-1	SL-6m	52°09.40N	12°46.87W	777m	382 cm
593-1	GeoB 8070-1	SL-6m	52°08.79N	12°47.21W	760m	447 cm
594-1	GeoB 8071-1	SL-6m	52°08.48N	12°46.05W	761m	575 cm

3.6 Epibenthic Dredge

André Freiwald

An epibenthic dredge with a rectangular toothed frame and a chain-net with a knitted inlay net (Fig. 11) was used on eight stations: Hatton Bank (3), western Rockall Bank margin (1), Pelagia Mound area (1), Propeller Mound (1), Poseidon Mound (2). Except for the two reconnaissance areas, dredging through known coral habitats was absolutely avoided in order to minimize human impact to the benthic ecosystem. Relevant dredge haul data are listed in Tab. 7.

Fig. 11. The epibenthic dredge used during the cruise.

Table. 7. Dredge Hauls during POS-292.

Poseidon Coding	GeoB Coding	UTC	Latitude	Longitude	Depth [m]	Recovery/Remarks
525-1	GeoB 8002-1	Start: 08:02	59°18.71N	17°04.50W	839	1200m cable paid out
		End: 08:50	59°18.03N	17°03.50W	780	HDG: 140°, 1.8kn
525-2	GeoB 8002-2	Start: 09:16	59°18.26N	17°02.80W	810	1400m cable paid out
		End: 10:13	59°17.01N	17°00.34W	760	HDG: 135°, 1.5kn
526-1	GeoB 8003-1	Start: 15:16	59°11.06N	17°12.70W	513	1100m cable paid out
		End: 16:10	59°10.48N	17°11.21W	519	HDG: 130°, 1kn
528-1	GeoB 8005-1	Start: 08:17	57°08.06N	16°36.96W	745	1200m cable paid out
		End: 08:57	57°08.05N	16°34.15W	747	HDG: 90°, 1.5kn
544-1	GeoB 8021-1	Start: 18:00	55°31.37N	15°39.34W	835	1500m cable paid out
		End:19:15	55°31.09N	15°40.76W	858	HDG: 230°, 0.5kn
583-1	GeoB 8060-1	Start: 18:29	52°09.26N	12°45.88N	856	1200 m cable paid out
		End: 19:09	52°08.85N	12°46.16W	794	HDG: 180°, 1kn
613-1	GeoB 8090-1	Start: 16:08	51°27.22N	11°42.22W	681	1300m cable paid out
		End: 17:05	51°27.78N	11°41.79W	774	HDG: 51° , 0.5kn
627-1	GeoB 8104-1	Start: 08:34	51°27.30N	11°42.18W	683	1350m cable paid out
		End: 09:20	51°27.84N	11°41.44W	764	HDG: 51°. 0.5kn

3.7 ROV

G. Meinecke, N. Nowald, S. Klar, W. Schmidt

The Poseidon cruise 292 was the second scientific mission for the Cherokee ROV. In addition to the scientific tasks the ROV dives were also undertaken in order to run the vehicle to its limits for water depths, to proof the reliability of the system itself and to train the ROV crew to operate the complete system under field trip conditions. A brief technical overview will be given in the following section. For explanation the complete system is separated into two logical parts, the topside equipment (all components used on the ship) and downside equipment (underwater equipment, the ROV itself).

Topside

The topside equipment consists of three basic parts, the power distribution unit (PDU), the surface control unit (SCU) and the spooling winch (SW).

PDU

The PDU is a galvanic decoupled power transformer which can use input voltages from 380 V to 440 V, three phases. The output voltages of the PDU are 440 V AC and 220 V AC, both necessary the run the ROV. The complete power supply is in a range of 10 to 12 kVA. Due to peak current loads of 30 to 40 A it is necessary to run the PDU on a secure and stable power outlet otherwise the PDU will collapse during ROV diving missions. For this reason we have run all ROV operations with the PDU connected to the separate harbour engine and generator of RV Poseidon.

SCU

The SCU is the central controlling device for the ROV, installed in a 19” flight case rack. It consists of the central controlling PC, operation console, two 9” Panasonic colour screens, one PC with TFT display for the Sonar system, 1 Panasonic SVHS video recorder and an internal video overlay system (Fig. 12). The power supply from the PDU is interconnected with the ROV tether in order to provide the 440 V for the thrusters and the 220 V for the ROV electronics (switched separately). Both voltages are monitored in the SCU and in conjunction with an earth fault detection system one have the ability to perform emergency stops, if necessary. In addition to the power supply, 4 twisted pair copper lines and 4 mono fibres are interconnected from the SCU to the ROV tether. The downside installed sensors like vehicle compass, pressure sensor, altimeter data and also sonar data were transmitted via the copper lines to one of the screens as part of the video overlay system. These data are permanently visible ones the ROV is powered up and the sonar is switched on. The optic fibres of the tether are used to transmit up to 4 separate Video channels and also four RS 232 (full duplex) and two RS 485 (half duplex) signals between SCU and the ROV. All vehicle functions can be controlled via the operation console. In addition to the thrusters controls (forward, backward; lateral left, lateral right; axial left, axial right; up, down) one can limit the thrusters power consumption, dim the lights, control the pan and tilt unit, run the camera focus and zoom and control auto heading and auto depth. The console itself can be connected to the SCU either directly or via a 30 m remote cable, necessary during deploy and recovery operation of the ROV. If necessary for operations, the ROV manipulator can be controlled by a separate console attached to the main console.

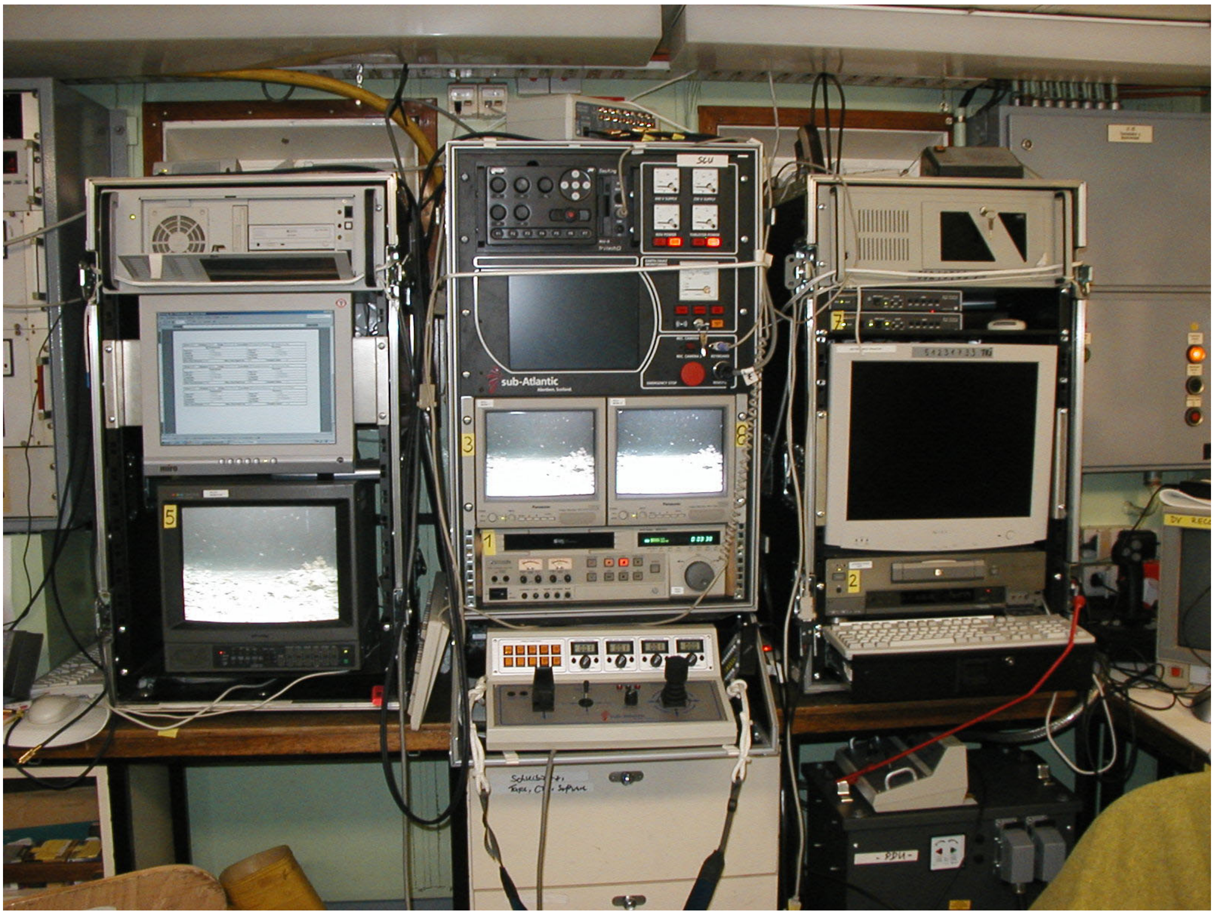


Fig. 12. Surface control unit (SCU, middle) with the additional pilot rack (PR, left) and the stereo rack (SR, right).

Beside this SCU rack, two additional 19” racks (pilot rack (PR), stereo cam rack (SR)) are connected to the SCU in order to provide better information for the pilot and for the scientific user of the ROV system. The PR consists of one PC with 15” TFT display with dual head VGA adapter and an attached overlay generator in order to pick up actual ship born data like ships time, ships heading, water depths, GPS data out of the NMEA data stream provided by RV Poseidon. These data were merged with the SCU overlay data like ROV heading on a separate 12” Sony Monitor, also installed in the PR rack. Now, the ROV pilot has the opportunity to see ships heading in relation to ROV heading on one screen (necessary to keep the ROV on the right side of the ship during deploy and recovery).

The SR rack basically consists of one PC with 18” TFT display, frame grabber card and attached overlay generator and has to perform two basic tasks. On one hand, the video signal transmitted in this rack is stored on the Sony DV recorder and can be picked up as a screen shot by the PC frame grabber card (still shots stored as bmp-file on the hard disc). On the other hand, this PC is the control unit for the attached stereo head mounted display (HMD) and the software utility to run the fast proportional stereo cam pan and tilt unit via a joystick interface. One line of this stereo camera system can be transferred to a separately attached 14” Panasonic monitor in order to provide additional video data to the scientific user.

All original video sources (1 pilot cam, 2 pencil cams, 1 spare) and the overlay sources (SCU, Pilot Rack, Stereo Rack) are interconnected via an 8 port Video Cross over Matrix to the video targets (12” Monitor, 14” Monitor, 2 x 9” Monitor, SVHS-Recorder and DV-Recorder, 1 spare). Nearly all combinations of distinct video signals on specific screens or recorders are possible.

<u>SW</u>

The ROV winch is designed as a simple spooling winch, built of stainless steal with a complete weight of 1.7 tons (winch and tether). It is electric driven by a 440 V AC Motor, controlled by a console box mounted on the winch frame. The winch carries 1000 m Kevlar-reinforced fibre-optical cable (9 copper lines power 440 V, 220 V, 2 times Neutral, 4 twisted pair lines and 4 mono fibres), which is designed as a buoyancy adjusted tether and not as an armoured Umbilical (Fig. 13). The ROV itself can’t be lifted with the tether. In the actual configuration a *electric* slip ring (48 connectors) is attached to the winch, means all electric cables passes through the winch axis and are active throughout all operations of the winch. Unfortunately, the fibres need to be connected/disconnected while the winch need to be spooled, means no video data are available from the ROV throughout these operations. The outlet from the slip ring and the 4 optical fibres are interconnected via 30 m of deck cable with the SCU.

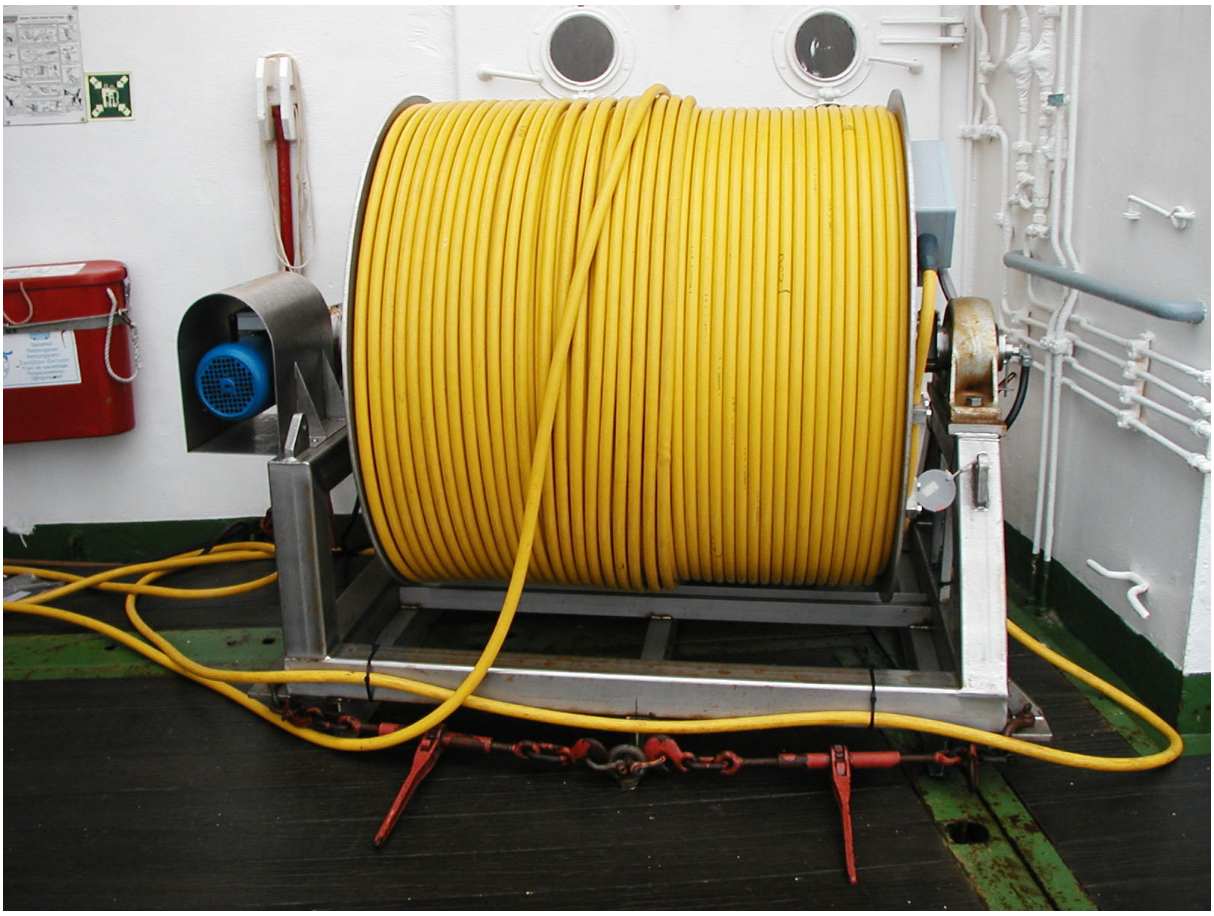


Fig. 13. Spooling winch (SW) with 1000 m of yellow fibre-optic ROV tether.

Downside

On this cruise the downside equipment consist only of the ROV itself, because no scientific payload needs to be installed of the ROV.

<u>Cherokee ROV</u>

The Cherokee ROV in the actual configuration is designed as an open frame ROV with the dimensions of 0.8 x 0.9 x 1.5 m (H x W x L) and a weight of roughly 300 kg. The net payload capacity is in a range of 50 kg. During the actual cruise, the ROV was ballasted with 12 kg of lead. The frame is completely build of polypropylene, a very robust, slightly elastic plastic material which is slightly positive buoyant in seawater (Fig. 14).

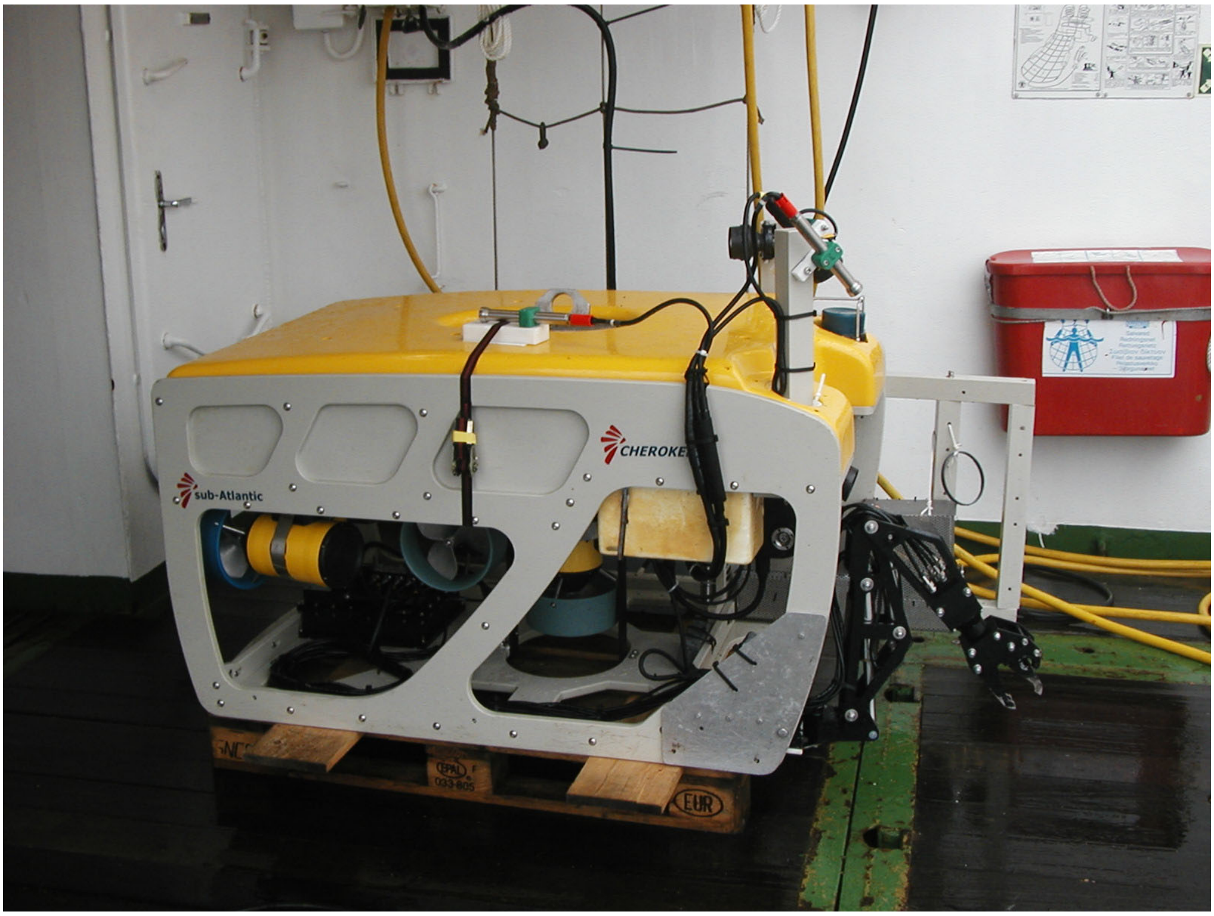


Fig. 14. Side view of the Cherokee ROV with attached 5-function manipulator (right), one forward looking JAI pencil cam (upright bar at the right side of yellow buoyancy package) and one backward looking JAI pencil cam (flat mounted on top of buoyancy package).

The buoyancy package is build of syntactic foam pressure tested to 2000 m water depth. All central electronic boards and casings are also adjusted to 2000 m water depth in order to have the chance to upgrade the system to greater depth (a power conversion system needs to be installed). In the actual configuration the system is limited to 1000 m operational depth. The ROV is equipped with 4 reliable AC thrusters, two single head thrusters for forward/backward and axial turns, 1 double head thruster for lateral and one double head thruster for up/down movements. All thrusters are pressure compensated. The central electronics are placed in 2 pressure resistant aluminium housings. In the front of the ROV the pan and tilt unit (fixed speed) for the pilot camera is installed and the lights (3 x 250 W) also. A TRITECH TYHOON colour CCD camera with more than 470 TV-lines resolution (795 x 596 pixels) and 22 times zoom is attached to the pan and tilt as the mayor pilot cam. At the top of the buoyancy block, two additional pencil cameras are mounted to the proportional SCHILLING pan and tilt unit. The ø 17 mm wide angle pencil cameras are build of JAI colour CCD DSP controlled cameras with a resolution of 450 TV lines (752 x 582 pixels), installed in titanium housings. Due to a broken O-ring sealing during the first dive, the SCHILLING pan and tilt unit was dismounted from the ROV. Instead this unit, the JAI pencil cams were placed with fixed orientation on the ROV - JAI cam #1 top view, slightly forward looking and JAI cam #2 backward looking in order to see the floating tether. In addition to the video cameras, a TRITECH dual frequency scanning sonar head (325/675 Hz) is fitted into the buoyancy package, a TRITECH altimeter is located in the bottom part of the frame and the pressure sensor and TCM2 compass is located in one of the electronic pods. At the right side of the ROV a 5 function HYDROLEK manipulator (wrist up/down; arm up/down; arm left, right; jaw rotate lift/right; jaw open/close) is mounted to the frame (Fig. 15). The manipulator is controlled by a 6 port valve pack (one spare function) installed at the back of the ROV. To complete the ROV, a small sample box build of stainless steal plates was fitted on the left side in front of the ROV.

Fig. 15. Front view of the Cherokee ROV. Visible the TRITECH pilot cam (middle), HYDROLEK manipulator (left), JAI cam #1 with add. light (left), scanning sonar head (blue cap right) and the sample box (right).

Deploy and Recovery Operations

The Cherokee ROV is capable to run as free flying ROV. The tether is buoyantly adjusted but nevertheless it is negative buoyant in seawater. One of the potential risks during deploys and recovery is the free floating tether and the problem of getting the tether into the propeller of the support vessel or to dive the ROV under the ship to the wrong side. Due to the lack of an ultra short base line navigation system, necessary to locate the ROV position in relation to the ships positions, another simple way of ROV control was used. Before deployment, roughly 100 m of tether were placed on deck of the RV Poseidon (Fig. 16). Afterwards, the ROV was placed in the ocean at the sea surface and nearly 40 m of tether was spooled out guided by two ø 60 cm sheaves, one was placed on deck and the other one was mounted in the A-frame on portside (Fig. 17). Theses sheaves are necessary to protect the tether for bending below the minimum radius of the fibre-optic cable.

Fig. 16. Preparation for ROV deployment. The first 100 m of tether were placed on deck the RV Poseidon.

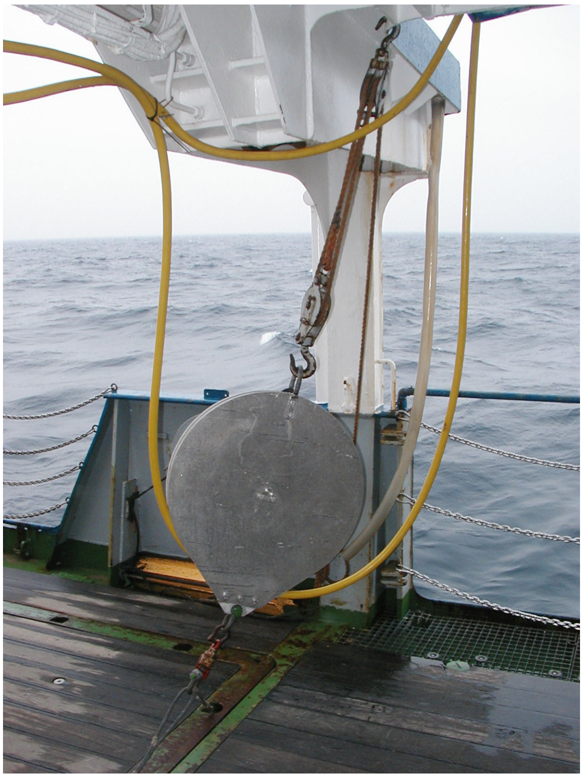


Fig. 17. Guiding sheave to protect the tether for bending below minimum radius.

The 40 m of tether were buoyantly positive balanced due to 4 floatation balls (each with 2.5 kg uplift), clamped equally spaced to the tether. The ROV was driven away in right angle direction from the portside of the RV Poseidon (Fig. 18). Afterwards, a ships wire with a depressor weight was lowered down from the A-frame, 8 m below the ship and than the tether was clamped to the ships wire. Now, in parallel, the ROV and the ships wire both were lowered down farther on and the ROV starts it's descend to the seafloor. The degree of freedom for the ROV was limited to the length of the free floating tether, in this case roughly 40 m around the ships wire. During the ROV operations at the seafloor, the wire length was adjusted permanently to actual water depth or 10 m less, depending on drag and currents. For the recovery of the ROV, the pilot has to take care that the ROV ascend in right angle direction to the portside, roughly 40 m away from of the RV Poseidon. At the sea surface, first the depressor weight was recovered while the ROV had to keep the right angle position at portside. Afterwards the 40 m of tether, the floatation balls and the ROV itself were recovered. These deploy and recovery procedures were operational up to sea states 5 - 6.

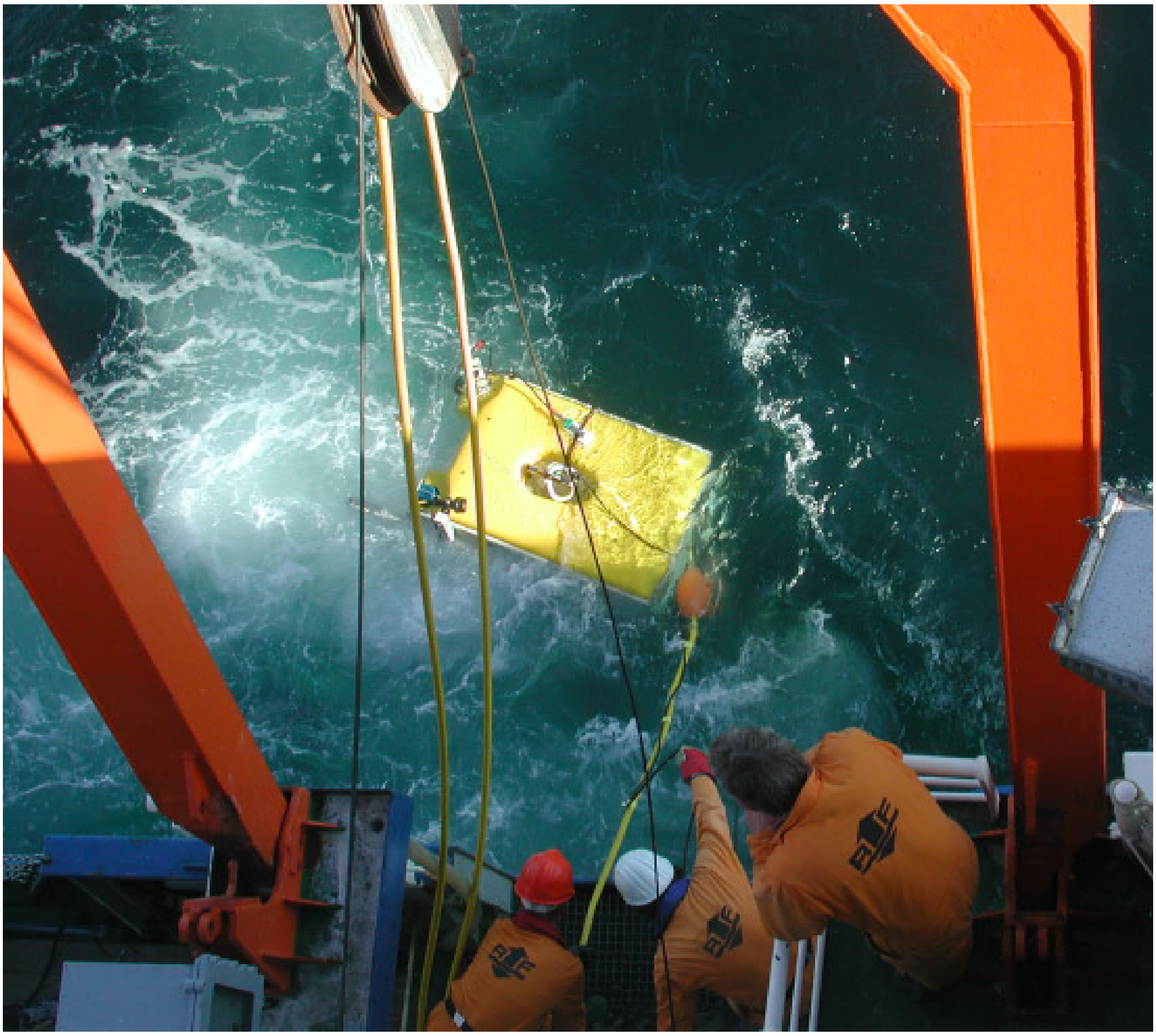


Fig. 18. Cherokee ROV on portside of the RV Poseidon during deploy operations.

ROV dives

During the POS 292 cruise the Cherokee ROV was used for 1 test dive and 5 scientific missions (Tabs. 8 and 9). The complete overall dive time was nearly 37 hours. During these dives a maximum water depth of 905 m was reached by the ROV without any problem. The ROV took approximately 50 - 60 minutes to descend to a water depth of

850 m and more or less the same time to ascend to sea surface. During all dives the very sensible balance between ships speed, currents and wire length of the depressor weight was clearly visible, due to the lack of a dynamic positioning system on RV Poseidon. If one of these three factors was in the wrong setting, it was impossible to reach or to stay at the sea bottom. During the dives the camera signals were stored on the SVHS (with ROV overlay, GPS and ship born data) and in parallel on the DV tape (without any overlay). As standard the pilot camera was recorded and only sometimes switched over to the JAI #1. All these tapes will be archived and available at the *Research Center Ocean Margins*, Bremen University (*RCOM*).

Despite the normal maintenance of pre- and post dive checks, two parts of the ROV had to be replaced due to malfunction. During the first dive the SCHILLING pan and tilt unit was blocked due to sharp fragments of corals. Obviously, this was the reason for a broken O-ring sealing on the unit and the complete oil consumption of one of the pressure compensator. The unit itself was well functioned but leaking oil and therefore the pan and tilt unit was dismounted. The other part was the starboard axial thrusters which failed sometimes in responding to control commands. For security reasons the thruster was replaced by a spare thruster. Sometimes, it was assumed that the horizontal thrusters have some power problems but more likely this was a problem of the above stated balance between ships speed and cable length. At the end of one dive, the horizontal thruster was blocked due to a squid which fixed the wings of the propeller. During ascend of the ROV the squid was cut and the thruster became free and functioned well without any damage. In complete, the Cherokee ROV during the cruises was easy to maintain and successful during all scientific missions.

Table 8: Dive logs from Dive 1, 2, 3.

Dive #	1	**Station:**	528-3	**Date**	20.07.02	**Location**	Test Dive over W Rockkal Bank
Deployment				**Recovery**			
Time UTC	10:38			**Time UTC**	11:25		
Latitude	57°07,97N			**Latitude**	57°08,12N		
Longitude	16°35,57W			**Longitude**	16°35,59W		
Sea State	3			**Sea State**	3		
Dive Time (hh:mm)	1:30	**Max. Dive Depth (m)**	20	**Samples taken**	0		

Dive #	2	**Station:**	529-2	**Date**	21.07.02	**Location**	Pelagia Mound area
Deployment				**Recovery**			
Time UTC	9:20			**Time UTC**	17:20		
Latitude	55°32,05N			**Latitude**	55°31,76N		
Longitude	15°38,99W			**Longitude**	15°38,64W		
Sea State	5			**Sea State**	3		
Dive Time (hh:mm)	8:00	**Max. Dive Depth (m)**	872	**Samples taken**	5		

Dive #	3	**Station:**	561-1	**Date**	24.07.02	**Location**	Pelagia Mound area
Deployment				**Recovery**			
Time UTC	9:41			**Time UTC**	16:00		
Latitude	55°33,08N			**Latitude**	55°32,22N		
Longitude	15°38,96W			**Longitude**	15°39,45W		
Sea State	3-4			**Sea State**	3		
Dive Time (hh:mm)	6:20	**Max. Dive Depth (m)**	850	**Samples taken**	0		

Table 9. Dive logs from DIVE 4, 5, 6.

Dive #	4	Station:	569-1	Date	26.07.02	Location	Propeller Mound: NE Flank to Top
Deployment				Recovery			
Time UTC	9:50			Time UTC	16:45		
Latitude	52°09,55N			Latitude	52°08,99N		
Longitude	12°45,21W			Longitude	12°46,37W		
Sea State	3-4			Sea State	3		
Dive Time (hh:mm)	6:55	Max. Dive Depth (m)	905	Samples taken	0		

Dive #	5	Station:	603-1	Date	30.07.02	Location	Propeller Mound: SE Flank to Top
Deployment				Recovery			
Time UTC	9:53			Time UTC	17:40		
Latitude	52°07,84N			Latitude	52°09,05N		
Longitude	12°45,89W			Longitude	12°46,33W		
Sea State	4			Sea State	3		
Dive Time (hh:mm)	7:50	Max. Dive Depth (m)	880	Samples taken	3		

Dive #	6	Station:	628-1	Date	02.08.02	Location	Poseidon Mound: SE Flank to NW Flank
Deployment				Recovery			
Time UTC	10:10			Time UTC	15:55		
Latitude	51°27,31N			Latitude	51°28,21N		
Longitude	11°41,50W			Longitude	11°43,04W		
Sea State	3			Sea State	3		
Dive Time (hh:mm)	5:45	Max. Dive Depth (m)	877	Samples taken	0		

4. Preliminary Results **André Freiwald**

This chapter presents preliminary results obtained during the POS-292 cruise.

4.1 Hatton Bank reconnaissance survey

In terms of benthic biology, the deep flanks of the oceanic Hatton Bank are poorly known and occurrences of deep-water coral communities are scarce (see station compilation in Rogers, 1999: 378) but live and dead corals have been sampled in the Hatton Bank area within the depth range of 457m to 1064m (Frederiksen et al., 1992; Wilson, 1979). During the POS-292 survey two echosounder lines — #8001-1 with a distance of 20nm and #8001-2 with a distance of 10nm — were selected to map a relatively small area facing the northern slope of the Hatton Bank (Fig. 19). Based upon these two lines, suspicious seabed features have been selected for short-distance dredge hauls and one SAPS station. The line #8001-1 covered the Hatton Bank slope between 920m and 520m water depth (Fig. 20A). The gently upsloping flank is accentuated by seabed steps, escarpments or even small mounds of unknown origin at 850m, 800m, 760m 700m, 570m and 540m water depth. The same arrangement of seabed elevations was detected on line #8001-2 (Fig. 21A). Here, the elevations appear much more prominent, however, this results

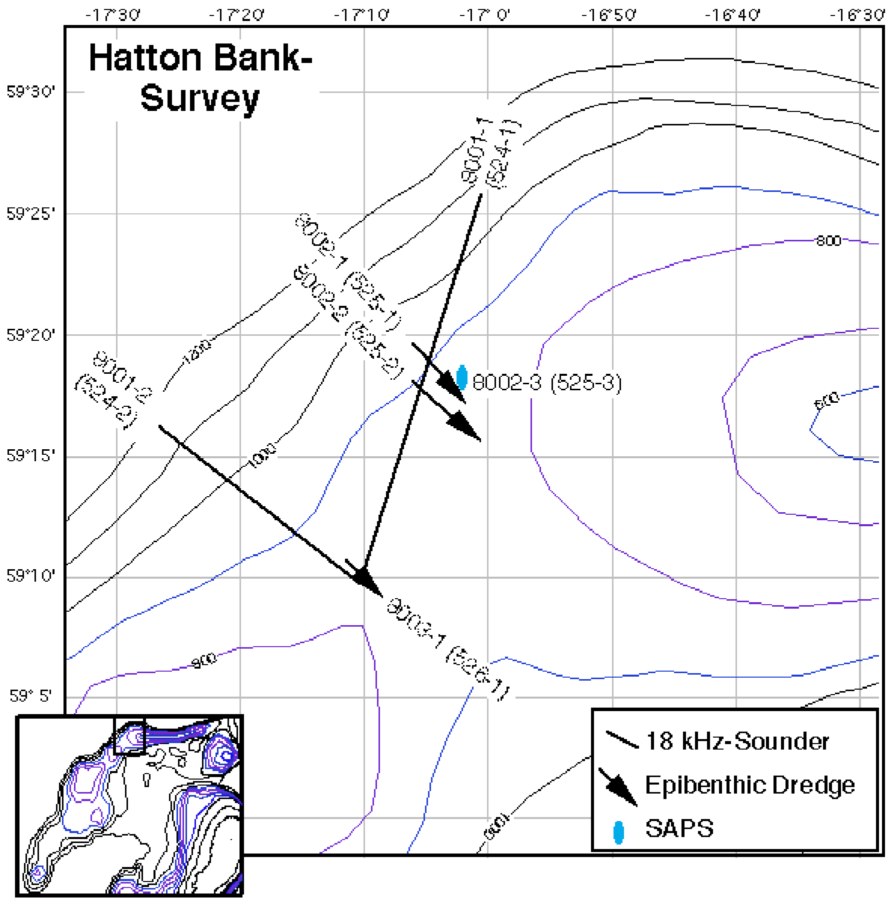


Fig. 19. Station plot and GEBCO-bathymetry of the area studied on the northern Hatton Bank. The inserted map marks the position (box) of the study area in respect to the overall structure.

from the fact that the heading was crossing the slope perpendicular to the slope inclination and not obliquely as in line #8001-1. On line #8001-2, the most remarkable difference to the first line is the set of mound-like elevations in the 500m to 550m depth interval. The available shiptime allowed for three short-distance dredge hauls in order to gain information about existing deep-water coral communities.

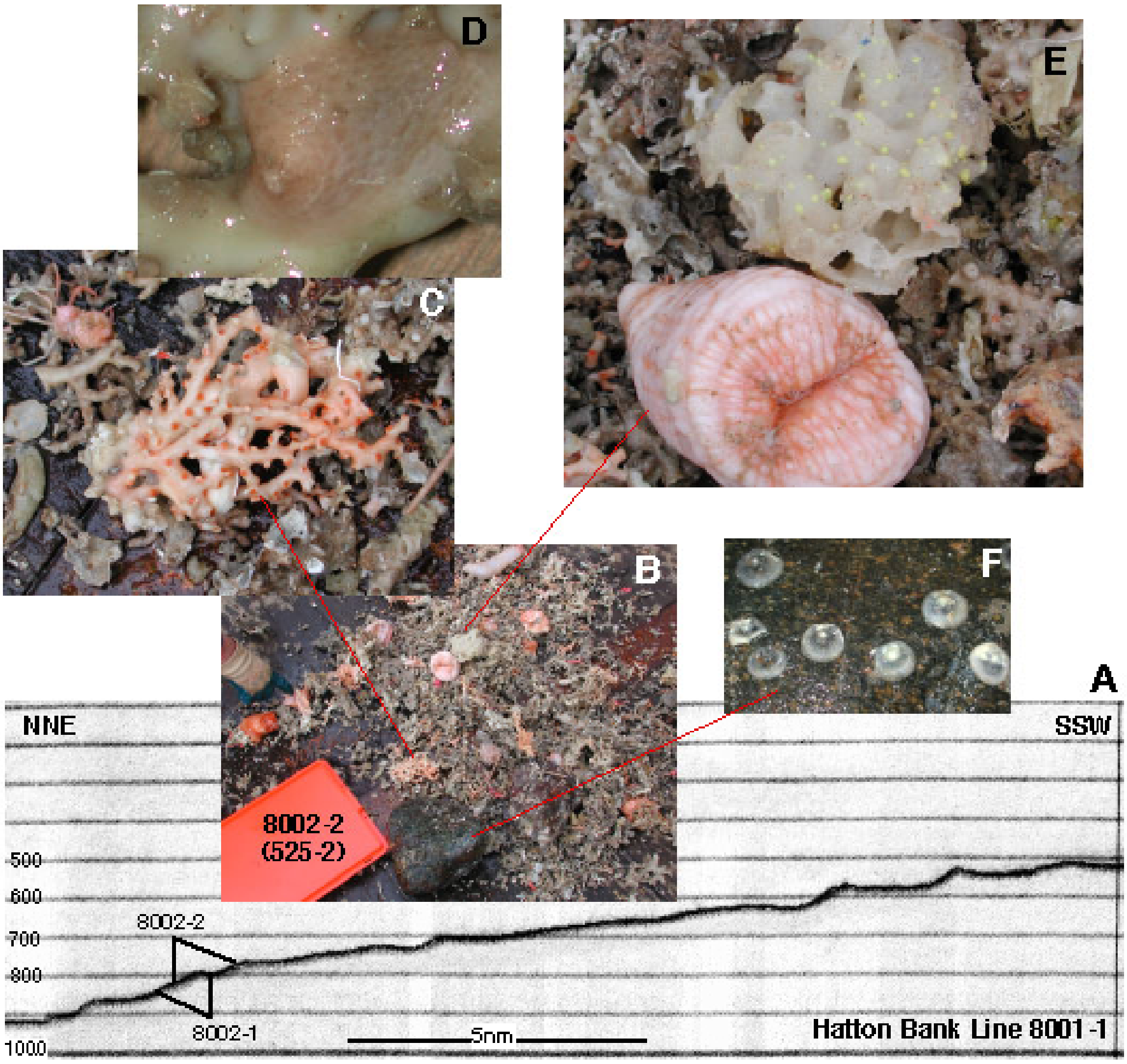


Fig. 20. Results of the Hatton Bank survey I: **A)** The seabed topography of line #8001-1 with the positions of the dredges #8002-1 and #8002-2. **B)** The content of dredge #8002-2 with dead and live corals. **C)** Close-up of a living *Madrepora oculata* colony. **D)** Very often the holothurian *Psolus* cf. *squamatus* was found within the coral colonies. **E)** Close-up of a hexactinellid sponge and an actinian *(Actinauge* sp.). **F)** IRD-boulders often a colonised by brachiopods *(Crania anomala).*

Dredge haul #8002-1 came up empty except a small piece of a live *Madrepora oculata.* Therefore, haul #8002-2 was repeated nearly at the same location but slightly shallower. This dredge came up with plenty of dead coral colonies consisting predominantly of *Madrepora oculata* and much lesser *Lophelia pertusa* (Fig. 20B).

Both species were also found alive and formed a symbiosis with *Eunice norvegicus* (Fig. 20C). Other scleractinians are *Desmophyllum cristagalli* and *Caryophyllia* sp.. Other cnidaria belong to the group of antipatharians and whip-corals (gorgonians) as well as actinians *(Actinauge* sp.; Fig. 20E). During the sorting process, large quantities of platy holothurians *(Psolus* cf. *squamatus*; Fig. 20D) were found associated to the coral skeletons and one *Stichopus* sp. specimen was recorded. The dredge hauls also contained two metamorphic and well-rounded IRD boulders which were intensely colonised by sponges, brachiopods *(Terebratulina retusa, Crania anomala;* Fig. 20F), bryozoans and occasionally, hexactinellid sponges (Fig. 20E).

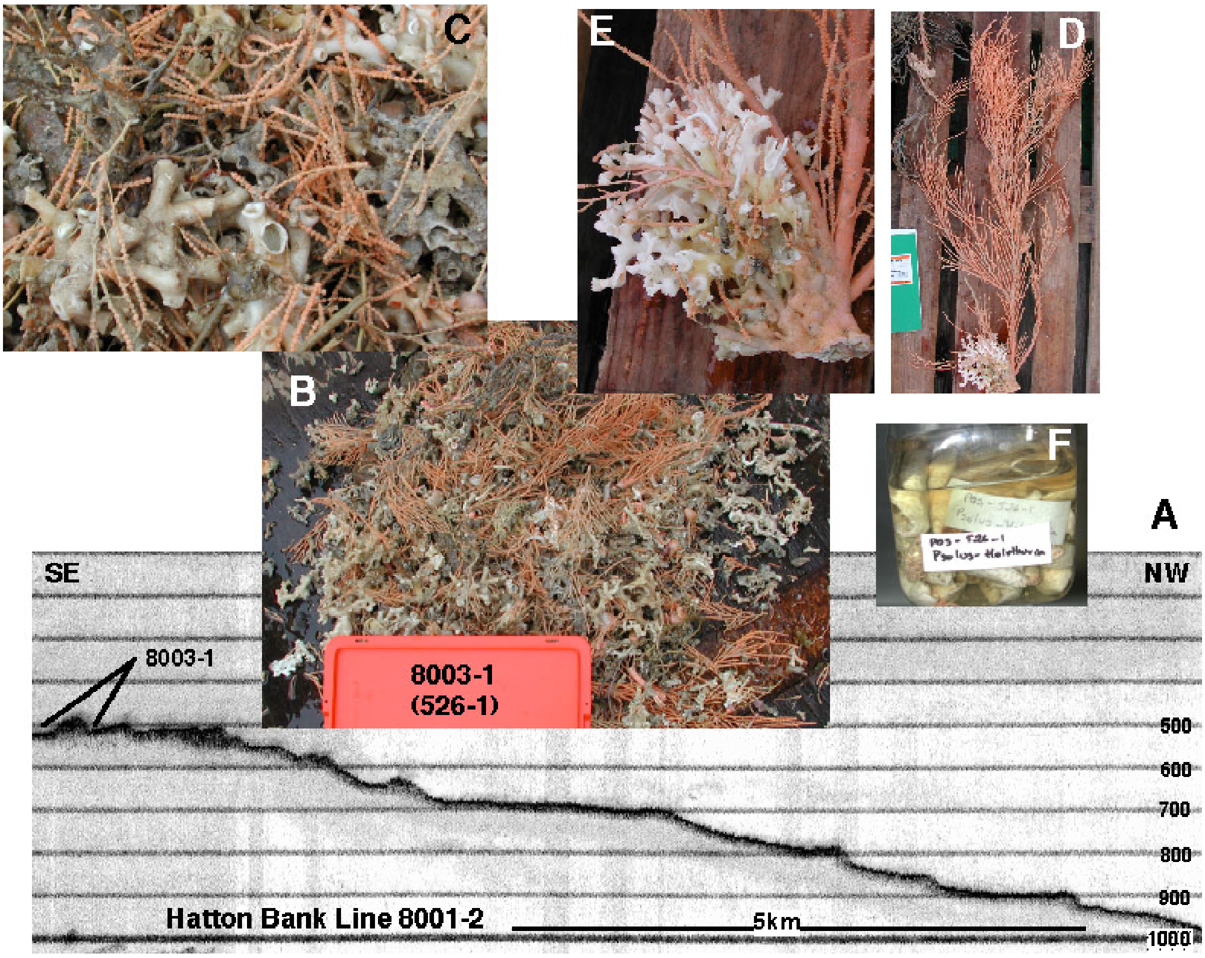


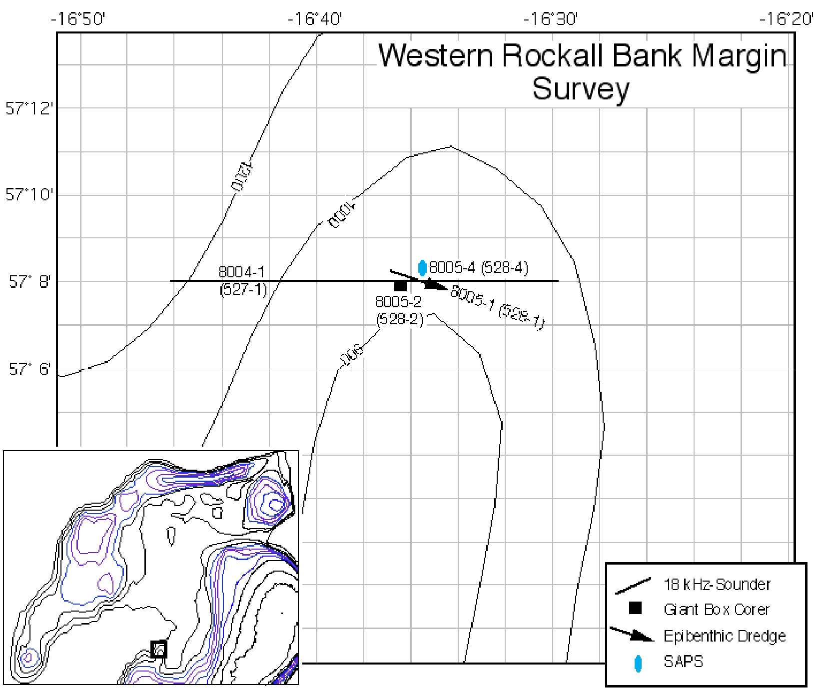
Fig. 21. Results of the Hatton Bank survey II: **A)** The seabed topography of line #8001-2 with the position of the dredge #8003-1. **B)** The content of the dredge #8003-1 with large quantities of live and dead scleractinian and gorginian corals. **C)** Close-up of the general sample impression. **D)** *Primnoa resaedeformis* colony fused with a live *Lophelia pertusa*. **E)** Close-up of the *Primnoa*-holdfast. **F)** Fixed *Psolus* cf. *squamatus* specimen.

The last dredge #8003-1 was dragged over the shallowest part of the Hatton Bank mapped during this survey, were a clustering of mound-like elevations were recorded on line #8001-2 (Fig. 21A). Again, large quantities of dead and live *Lophelia pertusa* and *Madrepora oculata* have been found (Fig. 21B-C). The most striking differences, however, were the rich amounts of *Primnoa resaedeformis* colonies (Fig. 21B-E) and holothurians *(Psolus* cf. *squamatus;* Fig. 21F).

Despite the fact that only a minute portion of the Hatton Bank was surveyed for the existence of deep-water corals, the bank must be regarded as a coral-rich area. Future visual seabed inspections should unravel the geometry and dimension of the coral ecosystem and their interaction with the positive seabed elevations found on the two echosounder lines.

4.2 Western Rockall Bank reconnaissance survey

The second reconnaissance survey was devoted to a peculiar "nose" situated at the western Rockall Bank margin. The nearly N-S-oriented spur is assumed to generate a complex hydrographic current regime that, in turn stimulates rich benthic life in this area. According to the coral-bearing station compilation of the entire Rockall Bank by Rogers (1999), no occurrences are indicated. During the survey one E-W-directed, 19nm-long echosounder line (#8004-1) was carried out over the northernmost sector of the spur (Fig. 22), followed by a dredge haul (#8005-1), a giant box-corer (#8005-2) and a SAPS station (#8005-4).



Fig, 22. Station plot and GEBCO-bathymetry of the area studied on the western Rockall Bank margin. The inserted map marks the position (box) of the study area in respect to the overall structure.

The line #8004-1 has hit a fascinating seabed target — an at least 175m high and 2km-wide mound structure at the distal eastern edge of the spur (Fig. 23A). All sampling was concentrated on that structure in order to find deep-water corals.

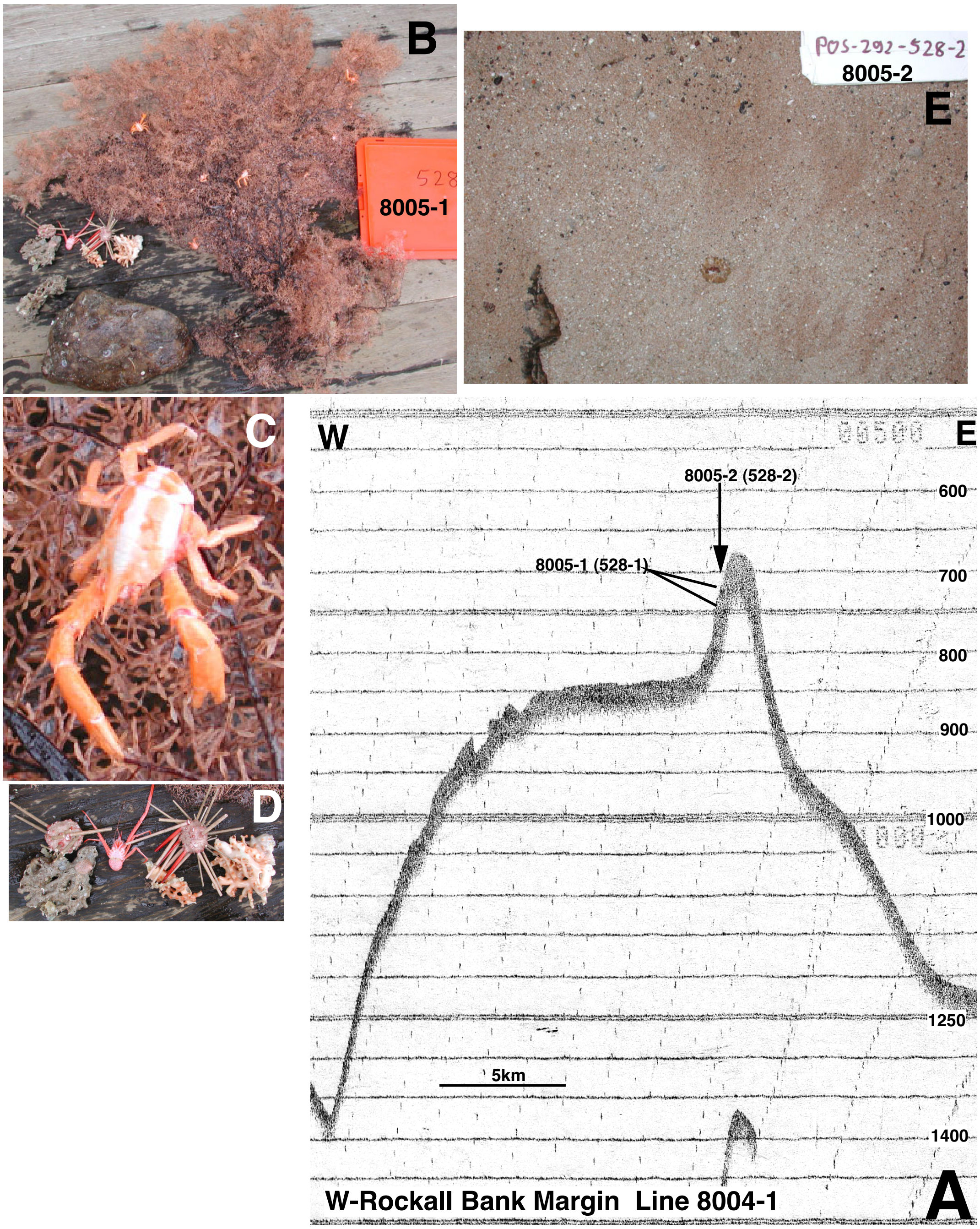


Fig. 23. Results of the western Rockall Bank margin survey: **A)** The seabed topography of line #8004-1 with the position of the dredge #8005-1 and the box-corer #8005-2 near the summit of the mound. **B)** The content of the dredge #8005-1 with IRD boulders serving as a substrate for *Antipatharia* sp.. **C)** Close-up of a muniid crustacean typically found as an associate to *Antipatharia* sp.. **D)** Other by-catch: *Lophelia pertusa, Cidaris* sp. and *Munida* sp.. **E)** Sediment surface of box-corer #8005-2.

On line #8004-1 the spur shows an asymmetric cross-section with a base at 1370m at the western flank and 1230m at the eastern flank (Fig. 23A). The mound structure started between 900m (eastern flank) and 870m (western flank) and it rests on the eastern part of the shoulder of the spur. The shallowest mound area recorded was at 675m water depth. The dredge haul #8005-1 yielded a large well-rounded IRD boulder that serves as a substrate for a huge antipatharian colony (Fig. 23B). Several striped muniid crustaceans were found clinging within the antipatharian colony (Fig. 23C). The few other dredged organisms are live and dead *Lophelia pertusa, Munida* sp. and cidaroid sea-urchins (Fig. 23D). The box corer #8005-2 shows surprisingly enough no colonial corals (except one *Flabellum*-type solitary coral; Fig. 23E). The surface sediment consists of medium to coarse sands rich in *Cibicides* foraminifers, which indicates a hydrodynamic active environment. In addition, polymict IRD-pebbles are dispersely distributed. The sand is inhabited by polychaetes with agglutinated and chitinous tubes.

This target must be regarded as a new mound and is recommended for a detailed swathe bathymetry mapping with subsequent visual inspection.

4.3 Pelagia Mound Area

The Pelagia Mound area belongs to the key flagship study sites of ACES and ECOMOUND and is located at the southeastern Rockall Bank Margin between 1000m and 500m water depth. The area of interest measures 2nm by 1.5nm in dimension and consists of two mound clusters which a separated by a central trough (Fig. 24). The inner mound cluster (proximal to Rockall Bank) shows a complex seabed topography with a lateral succession of different seabed types towards the shallower slope section. As can be exemplified from line #8022-1 — Pelagia Mound area to the Empress of Britain Bank — the gently downsloping Rockall Bank seabed abruptly turned into a rugged zone that is characteristic for sand-wave signatures on an echosounder. The assumed sand wave area is approximately 1.5nm width and is located within the 450m to 530m depth interval (Fig. 24). From 550m downward, the

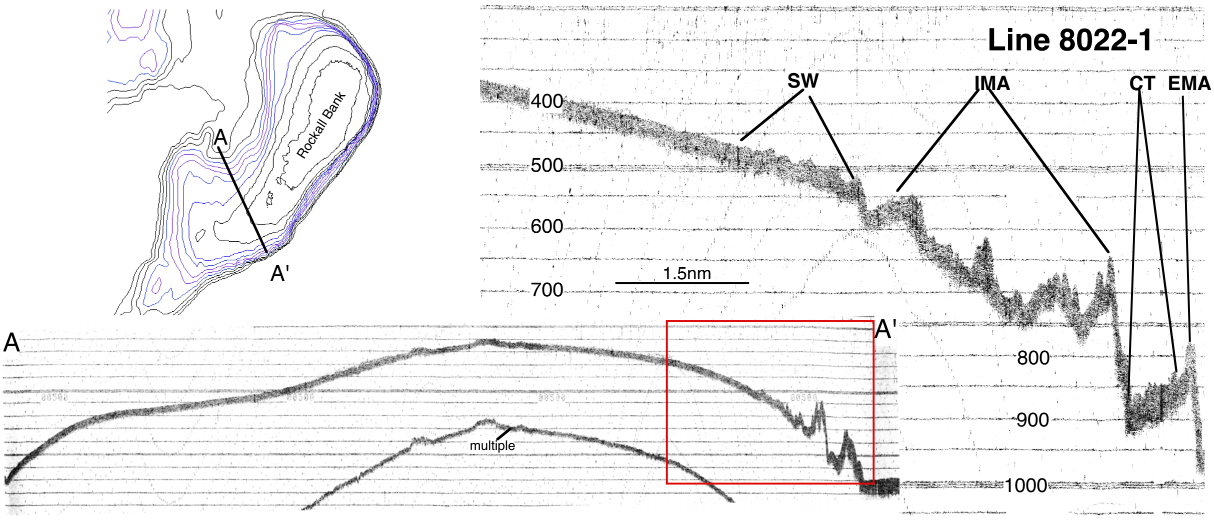


Fig. 24. The Pelagia Mound area at the southeastern Rockall Bank margin. The sounder line (bottom) shows the large-scale topography of the Rockall Bank in relation to the position of the Pleagia Mound area. The position of this line is indicated in the bathymetric map (upper left). Detail of the Pelagia Mound area (upper right) and adjacent seabed from Line #8022-1 with a Sand Wave zone (SW), the Inner Mound Area (IMA), the Central Trough (CT) and the External Mound Area (EMA).

wavelengths gradually became much more enlarged and changed to individual mounds covered with coral frameworks. This gradual change of the seabed pattern indicates the beginning of the inner mound cluster at around 570m water depth. Individual and more isolated mounds can obtain up to 75m thickness. In the central part of the inner mound cluster, the individual mound heights increase to up to 120m of thickness. The downslope end of the inner mound cluster is formed by a very steep front that merges in to the central trough starting at 850m water depth (Fig. 24). The central trough forms a 0.5nm broad plain before the seabed gradually shallows from 850 to 800m depth which is the transition to the outer mound cluster. The outer mound cluster was only sounded cursory with individual mound thicknesses of up to 170m.

During the Pelagia Mound survey, 4 box-corer, 2 successful gravity corer, 14 grabs, 1 dregde haul, 4 SAPS and two ROV-dives were carried out (Fig. 25).

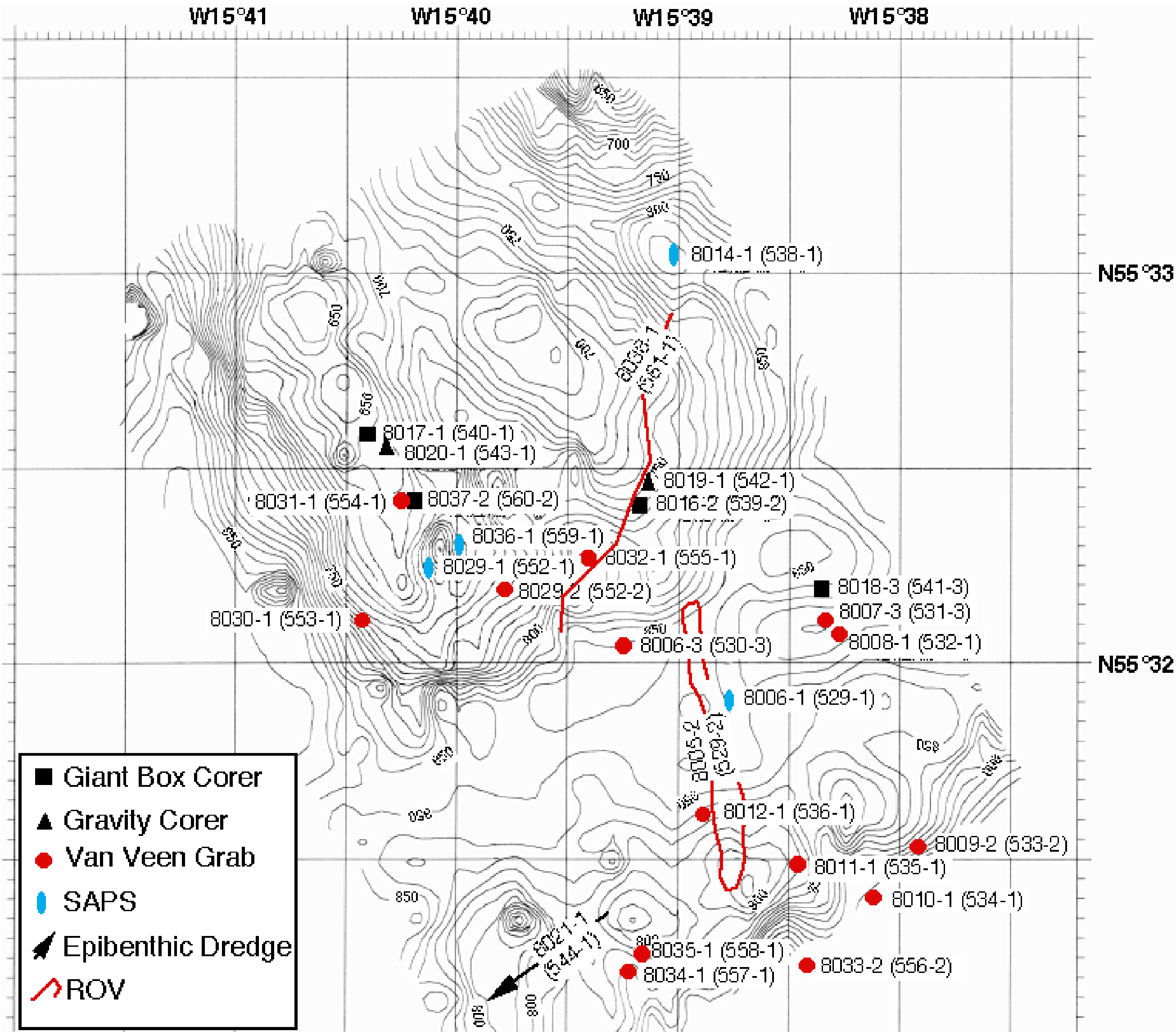


Fig. 25. Station plot in the Pelagia Mound area. The detailed bathymetry was produced with RV Pelagia and kindly provided by NIOZ.

Due to the steepness and hardiness of the coral mounds, box-coring was very difficult for obtaining valuable samples. Therefore, only 50% of the box-corer stations yielded good results (Fig. 26).

Description of box-corer stations:

#8016-2 (539-2; —839m) (Fig. 26A):

0-2cm: Coral rubble made up by *Lophelia pertusa* and *Madrepora oculata* clogged by fine-grained foraminifera sand, cidaroid spines, bryozoa, mollusc shells and pteropods. Colour Code: 10YR 6/2.

2-13cm: Same type of sediment as above but colour changed to 10YR 7/2.

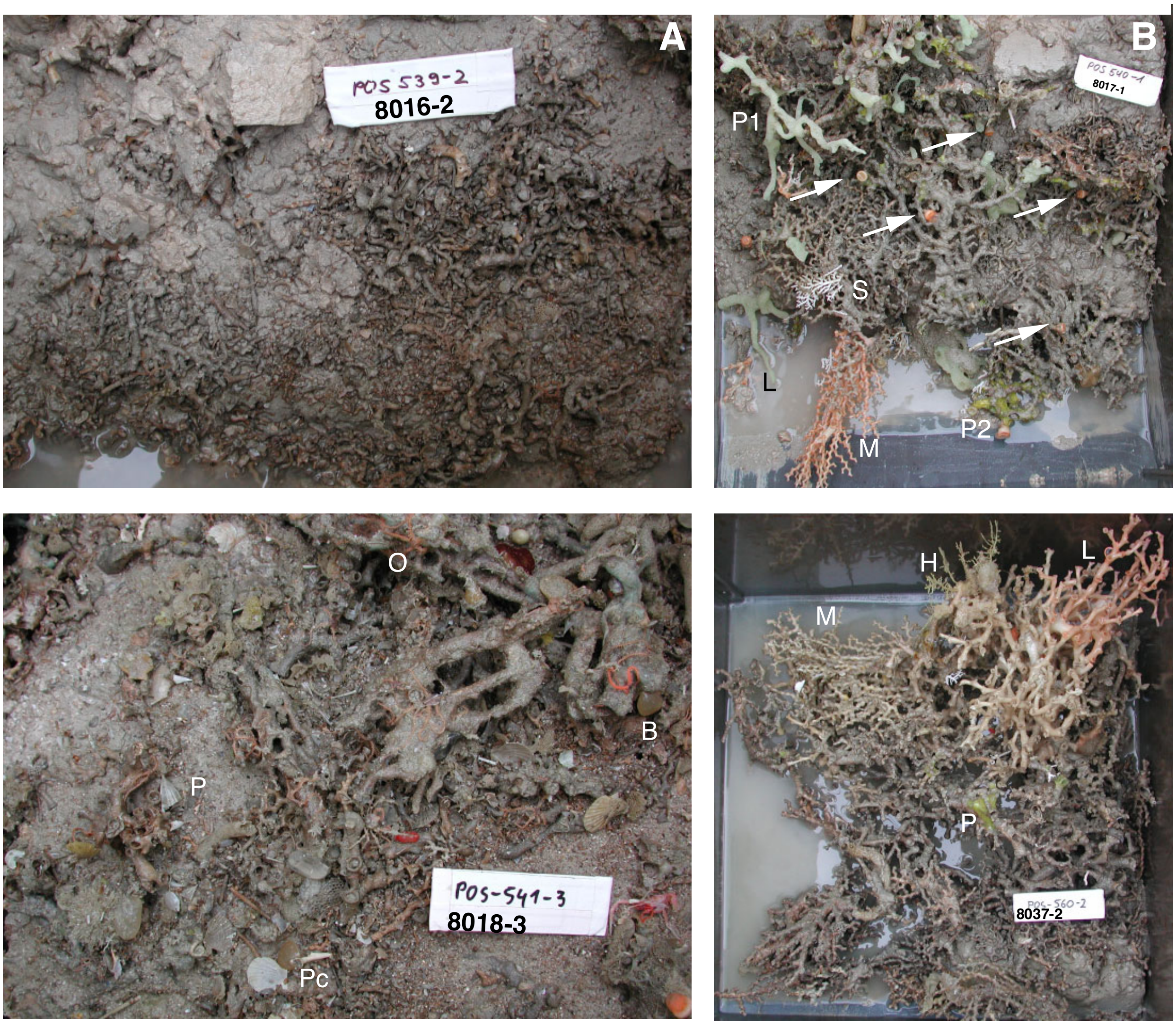


Fig. 26. Pelagia Mound area box-corer sediment surfaces: **A)** #8016-2 with sediment-clogged coral rubble facies. **B)** #8017-1 with sediment-exposed coral framework with epibenthic colonisation of solitary scleractinians (arrows), *Lophelia pertusa* (L), *Madrepora oculata* (M), porifera (P1, P2) and *Stylaster* sp.. **C)** #8018-3 sediment-clogged coral framework with large ophiuroid (O) abundances, brachiopods (B), pectinids (Pc) and pteropod shells (P). **D)** #8037-2 with coral framework and live *Lophelia pertusa* (L), porifera (P), hydroids (H) and recently dead *Madrepora oculata* (M).

#8017-1 (540-1; —690m) (Fig. 26B):

25cm-thick sediment-exposed coral framework of live and dead *Lophelia pertusa* and *Madrepora oculata.* The framework is intensely colonised by porifera, molluscs, ophiuroids, asteroids, tunicates, bryozoa, hydroids, polychaetes, brachiopods, serpulids, octocorals, stylasterids and solitary corals.

0 – 3cm: fine-grained foraminifer sand with dispersed coral rubble. Colour code: 10YR 6/1.

3 – 13cm: Same type of sediment as above but with lighter colouration towards the base (10YR 7/2) and bioclasts have a ferric stain.

#8018-3 (541-3, —889m) (Fig. 26C):

5cm-thick sediment-exposed coral framework made by *Lophelia pertusa, Madrepora* oculata and *Aphrocallistes beatrix*. Exposed parts are densely colonised by ophiuroids and serve as hard substrate for *Aphrocallistes beatrix* (Hexactinellidae) and other demosponges, stylasterids, erect bryozoan colonies, solitary scleractinians, tunicates, brachiopods and octocorals.

0-7cm: Clogged coral framework by a foraminifer-rich sand littered with pteropod shells, gastropods and bivalves — especially pectinidae. This reliefed habitat is rich in spider crabs and other crustaceans, ophiuroids and few pycnogonids. Colour code: 10YR 6/2)

7-13cm: Same as above but with colour gradation to 10YR 7/2.

#8037-2 (560-2; —674m) (Fig. 26D):

30cm-thick coral framework consisting of *Lophelia pertusa* and *Madrepora oculata*. The framework served as a hardsubstrate for bryozoans, sponges, anemones, hydroids (including stylasterids), ophiuroids, asteroids and polychaetes.

<u>Description of grab stations:</u>

A total of 21 grab stations were performed of which 14 retrieved valuable seabed samples (see Tab. 5). These samples added considerably to the biodiversity aspect as the grab was much less time consuming compared to box-corer. Major aspects of samples are described. For sample locations see Fig. 25.

Fig. 27. **#8006-3** (530-3), —862m : Predominantly dead *Lophelia* rubble, partly Fe-Mn-stained, *Aphrocallistes beatrix,* ophiuroids, serpulids and bryozoa.

Fig. 28. **#8007-3** (531-3), —895m: Dropstone pebbles with siliciclastic sand. Dropstones are colonised by bryozoans, sponges and stylasterids (see inserted figure).

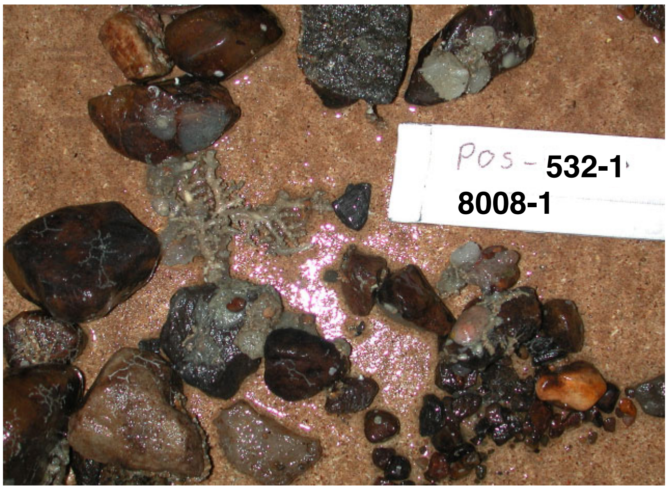


Fig. 29. #8008-1 (532-1), —894m: Partly Fe-Mn-stained polymict drop-stones colonised by stylasterids and bryozoans.

Fig. 30. **#8009-2** (533-2), —916m: *Madrepora* and *Lophelia* rubble with fenestrate bryozoan *colony and a live Stenocyathus* vermiformis coral.

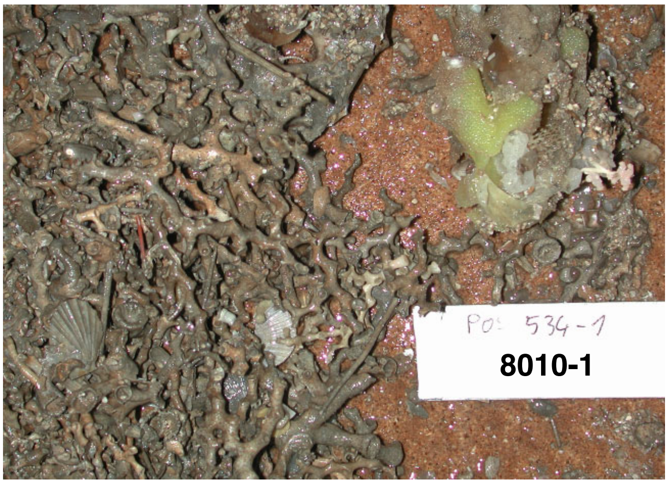


Fig. 31. **#8010-1** (534-1), —906m: *Madrepora* rubble with *Lophelia* and pectinid bivalves. Living *Aphro-callistes beatrix* and octocorals.

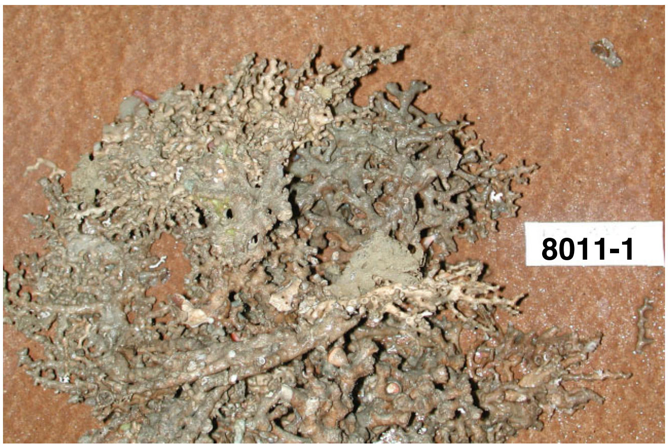


Fig. 32. **#8011-1** (535-1), —842m: *Madrepora* rubble with *Lophelia* and *Aphrocallistes* with small living styl-asterids.

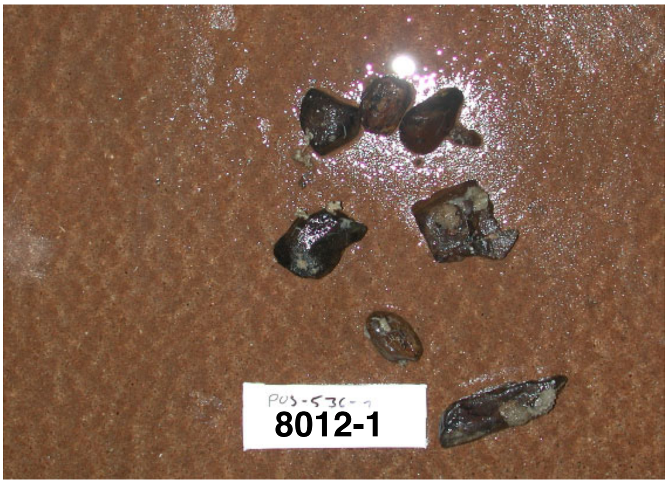


Fig. 33. **#8012-1** (536-1), —848m: Polymict dropstones with bryozoan and sponge encrustations.

Fig. 34. **#8029-2** (552-2), —830m. *Lophelia* rubble with few live *Lophelia* and *Eunice norvegicus*. Coral rubble is encrusted by a yellow sponge. Few asteroids were found.

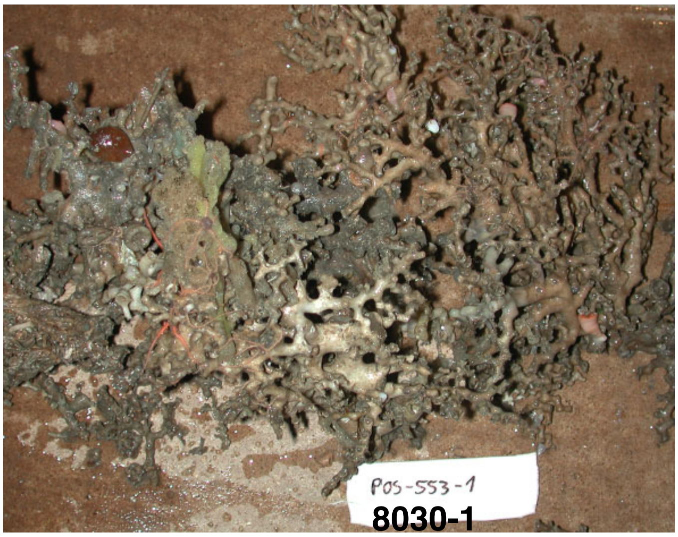


Fig. 35. **#8030-1** (553-1), —835m, Life and dead *Lophelia* framework with *Madrepora oculata* and *Aphrocallistes beatrix,* brachiopods and ophiuroids.

Fig. 36. **#8031-1** (554-1), —660m: Coral framework with life and dead *Lophelia pertusa* and *Madrepora oculata.* Dead framework is encrusted by a yellow sponge and stylasterids and *Acesta marioni*.

Fig. 37. **#8032-1** (555-1), —825m: *Madrepora – Lophelia – Aphrocallistes* – rubble.

Fig. 38. **#8033-2** (556-2), —943m: Coral framework and rubble with fenestrate bryozoan skeleton, life *Aphrocallsites beatrix* and a crinoid.

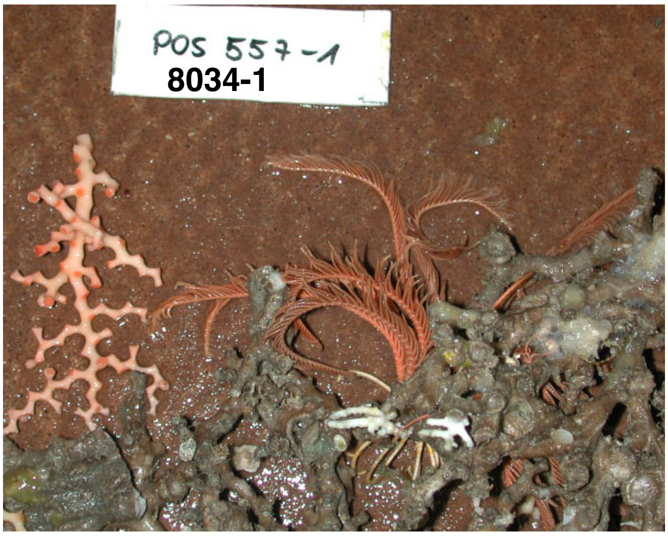


Fig. 39. **#8034-1** (557-1), —820m: *Lophelia* rubble with life *Madrepora oculata,* stylasterids, ophiuroids and crinoids.

Fig. 40. **#8035-1** (558-1), —781m: *Lophelia* rubble with solitary corals, zoantharids, tunicates and crinoids.

<u>ROV-Dives</u>

Two ROV-dives were performed in the Pelagia Mound area: #8005-2 (529-2) with 8h of operational time and #8038-1 (561-1) with 6:20 h of operational time. Dive #8005-2 was dedicated to explore the central trough between the inner and outer mound cluster while dive #8038-1 was carried out to document the on-mound facies (see Fig. 25). The mounds are almost entirely covered by a thicket of life and dead corals (Fig. 41A) consisting of *Madrepora oculata* and *Lophelia pertusa*. Occasionally clusters of *Desmophyllum cristagalli*-pseudocolonies and other solitary corals contribute to the framework. Indications of sexual reproduction through recolonisation of single coral colonies were rather abundantly observed during the visual insections. The lower and mid-slopes of the mounds show peculiar ridge systems which are oriented along the isolines, or current parallel (Fig. 41B). These ridges measure up to 1m in thickness are intensely colonised by the same sort of coral thicket. The troughs between the ridges are covered either by coral rubble or dropstone pavements.

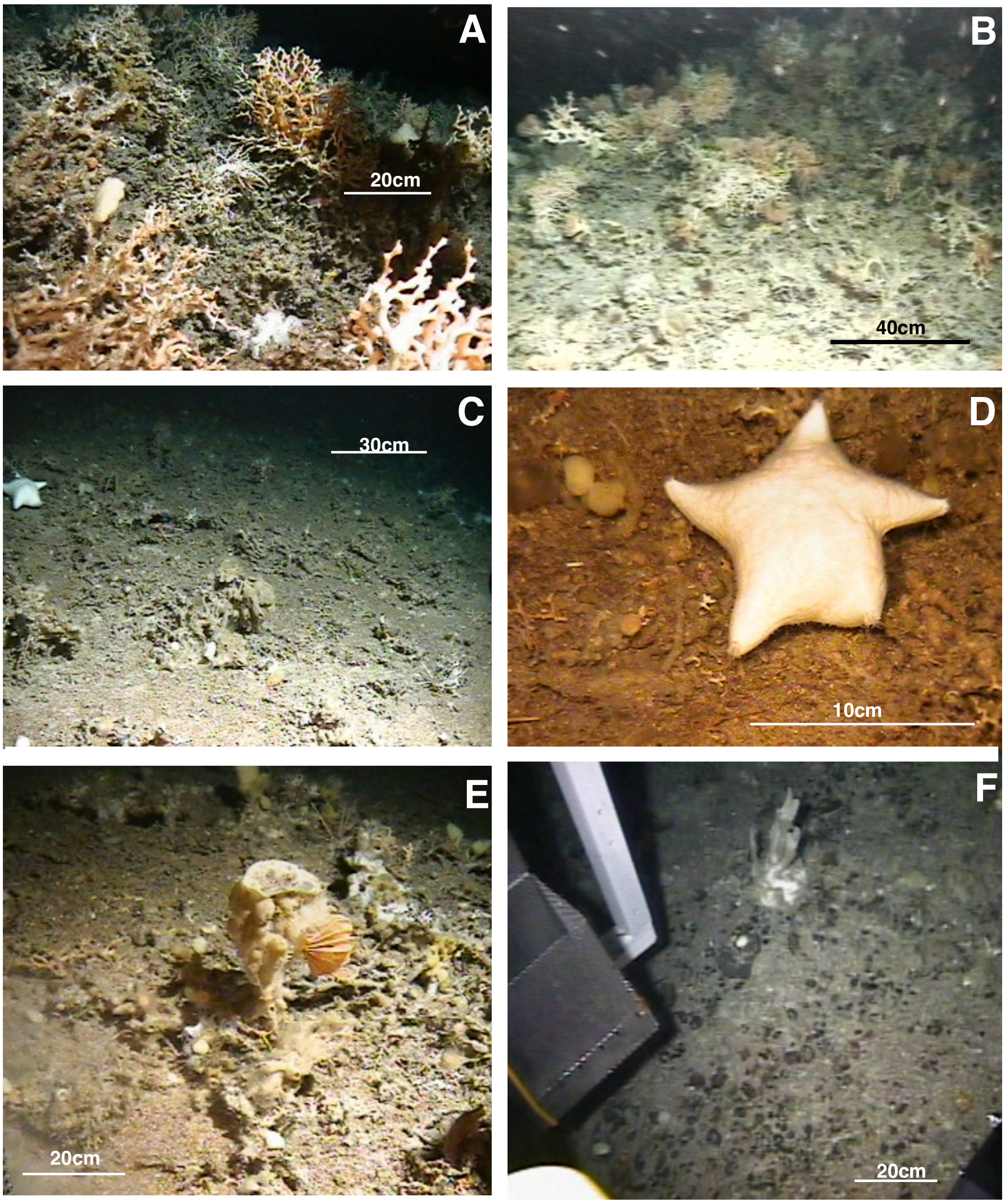


Fig. 41. Examples from the ROV-dives 529-2 and 561-1 in the Pelagia Mound area: **A)** Coral thicket from the mound tops. **B)** Ridge, accentuated by a coral thicket. **C)** Coral rubble facies at the bases of a mound. D) Asteroid on coral rubble facies (see C for overview). **E)** *Aphrocallistes beatrix* mit a crinoid in the coral rubble facies. **F)** Dropstone pavement with *Oceanapia robusta* from the central trough.

The mound facies fades out with a coral rubble facies consisting of bioeroded and intensely colonised coral framework (Fig. 41 C – E). The central trough between the inner and outer mounds is a dropstone plain (Fig. 41F).

4.4 Rockall Bank Transect

For the understanding of how the coral mounds grade into the shallow-water Rockall Bank sedimentary environment, a 41nm-long echosounder line (#8022-1 (545-1; see Fig. 24)) was undertaken. The shallowest station was at the outer Empress of Britain Bank, a satellite bank on the southern portion of the Rockall Bank (Fig. 42). After the sounding, six box-corer stations including one SAPS station (#8023-1) were selected on the basis of the line #8022-1. The most prominent changes in seabed topography are explained in the previous chapter 4.3. There were no distinct seabed features discernible in depths shallower than 480m. Therefore, the stations roughly were selected from every 100m depth interval — from 236m, 253m, 348m, 447m, 498m and 575m, respectively.

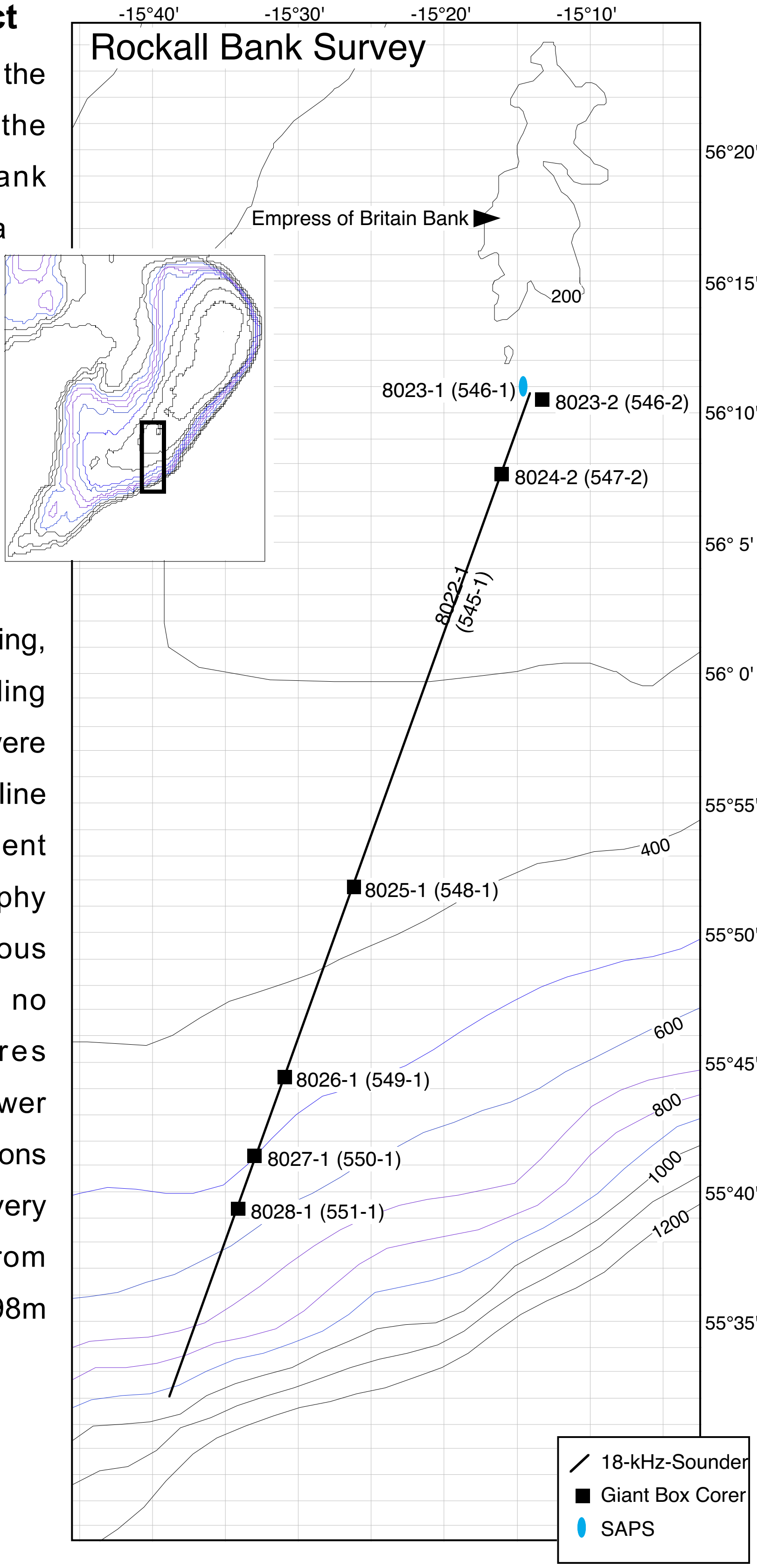


Fig. 42. Station plot and GEBCO-bathymetry of the sounded portion of the Rockall Bank.

Description of box-corer stations

#8023-2 (546-2; —236m) (Fig. 43A):

0 – 16cm: Agglutinated *Epizoanthus* sp.. Fine-grained calcareous-siliciclastic sand with fossil solitary corals *(Caryophyllia* sp.), very abundant *Ditrupa*-tubes (partly Fe-stained), gastropods. The sand becomes gradually IRD-enriched at the base. Rich in echinoid coronas near the top. Colour Code: 2.5Y 5/2 (surface) to 5Y 5/4 (remaining sediment column).

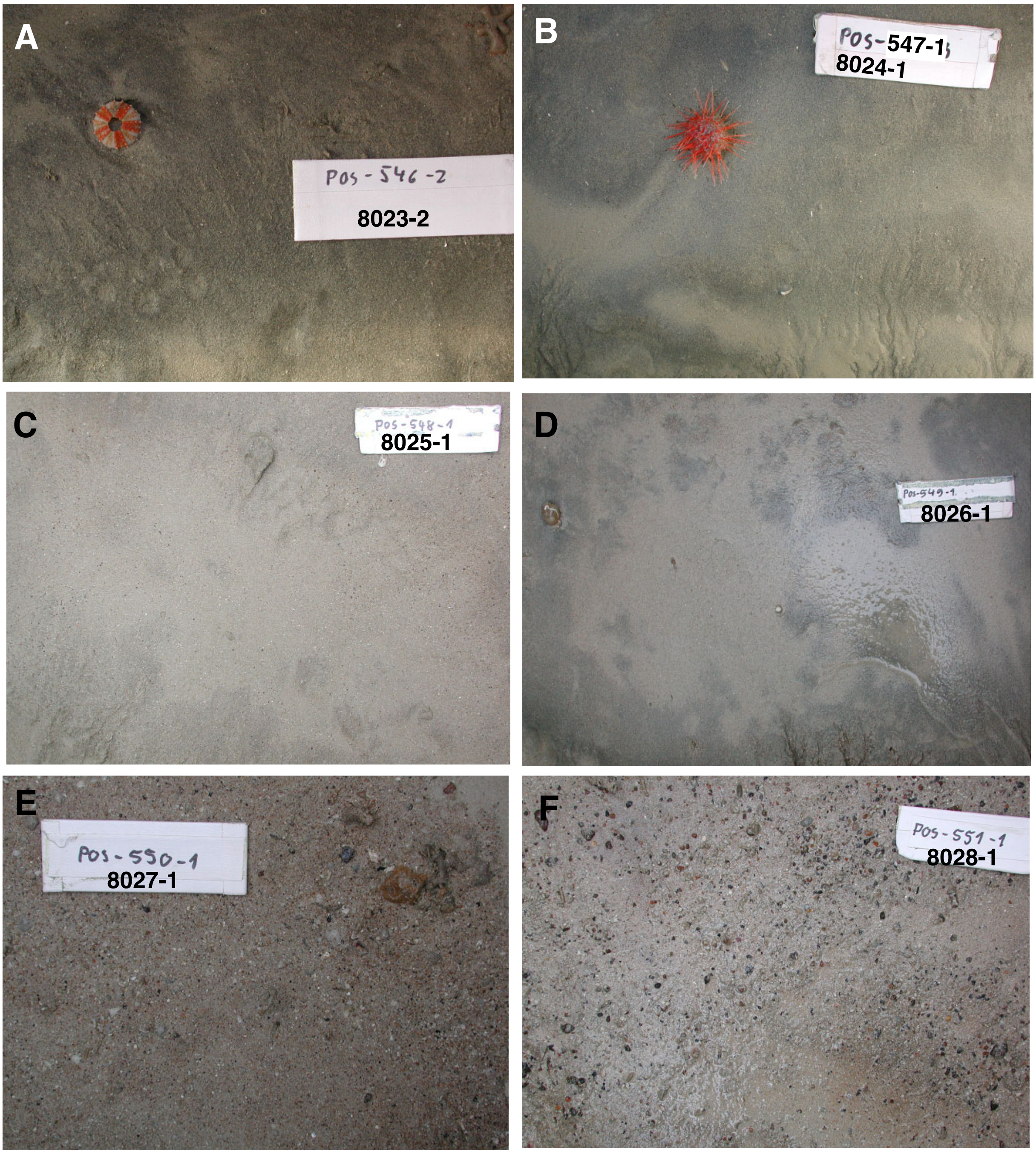


Fig. 43. Box-Corer sediment surfaces from the Rockall Bank transect: **A)** #8023-2. **B)** #8024-2. **C)** #8025-1. **D)** #8026-1. **E)** #8027-1. **F)** #8028-1.

#8024-2 (547-2; —253m) (Fig. 43B):

0 – 16cm: Mixed calcareous – siliciclastic fine sand with dispersed dropstone pebbles. Sand contains fossil solitary corals *(Caryophyllia* sp., same monospecific assemblage as in #8023-2), *Ditrupa arietina*-tubes and mollusc shells. Strong H_2S smell at the base. Living fauna: polychaetes with chitinous tubes, regular echinoids, hermit crab in gastropod shell. Code: 5Y 5/4 – 5Y 4/3

16 – 18cm: Firm coarse sand mit >2mm-sized mollusc fragments, serpulid tubes and abundant polymict dropstones. Code: 5Y 5/4 – 5Y 4/3

#8025-1 (548-1; —348m) (Fig. 43C):

0 – 7cm: Living fauna: tunicates, polychaetes with chitinous tubes. Silty fine sand, rich in foraminifers and mollusc shells, bioturbated. Code: 5Y 5/2

7 – 18cm: Grades into 5Y 4/2 with bioturbation through the end of core with 5Y 5/2 coloration. Sand becoming richer in solitary corals *(Caryophyllia* sp., same monospecific assemblage as in #8023-2 and #8024-2), pectinid bivalves, gastropods, *Ditrupa*-tubes and echinoid plates and spines. Dispersed angular and subrounded dropstones (1 – 2mm). At the base, pockets with coarse sand and gravel.

#8026-1 (549-1; —447m) (Fig. 43D):

0 – 0.2cm: Living fauna consists of terebratulid brachiopods, hermit crabs. Planktic foraminifer sand. Code 2.5Y 6/2.

0.2 – 2cm: Fine-gravelly calcareous sand of planktic foraminifers, dropstone pebbles and shell fragments. Code: 5Y 5/2.

2 – 15cm: Poorly-sorted medium to coarse calcareous sand, planktonic foraminifers, dropstones, solitary corals, bivalve shells and few serpulid tubes. Code 2.5Y 5/2. At the base, a pocket of dropstone gravel (up to 7cm), few shell fragments. Code 2.5Y 5/1.

#8027-1 (550-1; —498m) (Fig. 43E):

0 – 10cm: Living fauna: irregular echinoid, ophiuroids, polychaetes. Silty fine to medium sand composed predominantly of foraminifers and fragmented molluscs, dropstones (already abundant at the surface), barnacle plates.

Fragment of *Madrepora oculata* at the surface. Dropstones encrusted by bryozoans and serpulids. Code 5Y 6/2.

#8028-1 (551-1; —575m) (Fig. 43F):

0 – 1cm: Living fauna: ophiuroids, phoronids. Silty to fine mixed calcareous-siliciclastic sand rich in planktic foraminifers (10YR 6/1). Dropstones already at the sediment surface and downcore, partly bryozoan encrusted, molluscs fragments and calcareous (?) sponge remains (2.5Y 6/2).

4.5 Propeller Mound

The Propeller Mound initially was surveyed during POS-265 cruise in 2000 for detailed bathymetry, gravity- and box-coring, dredging, CTD-casts and mooring deployments (Freiwald & Shipboard Party, 2000). The Propeller Mound is located in the Northern Porcupine Seabight near the transition between the Porcupine Bank and Slyne Trough (see Fig. 1) and belongs to the Hovland Mound Province (De Mol et al., 2002). The summit of the mound lies at 52°09.80N and 12°46.40W in 653m water depth. The Propeller Mound forms a freely exposed 140m high structure emerging from the lower slope of the Porcupine Bank (Fig. 44). Therefore, the base of the mound is at 800m along its western flank and 890m at its eastern flank. The shape of the mound is very peculiar due to three merged spurs which resembles a three-bladed propeller. The three spurs point to NE, NW and S directions. The overall extension is 2000m in N-S direction. At the northern part Propeller Mound is about 600m width but narrows to about 250m at the southern tip. The slope inclination calculated over the long-axis of the three spurs varies between 8° and 10° while the

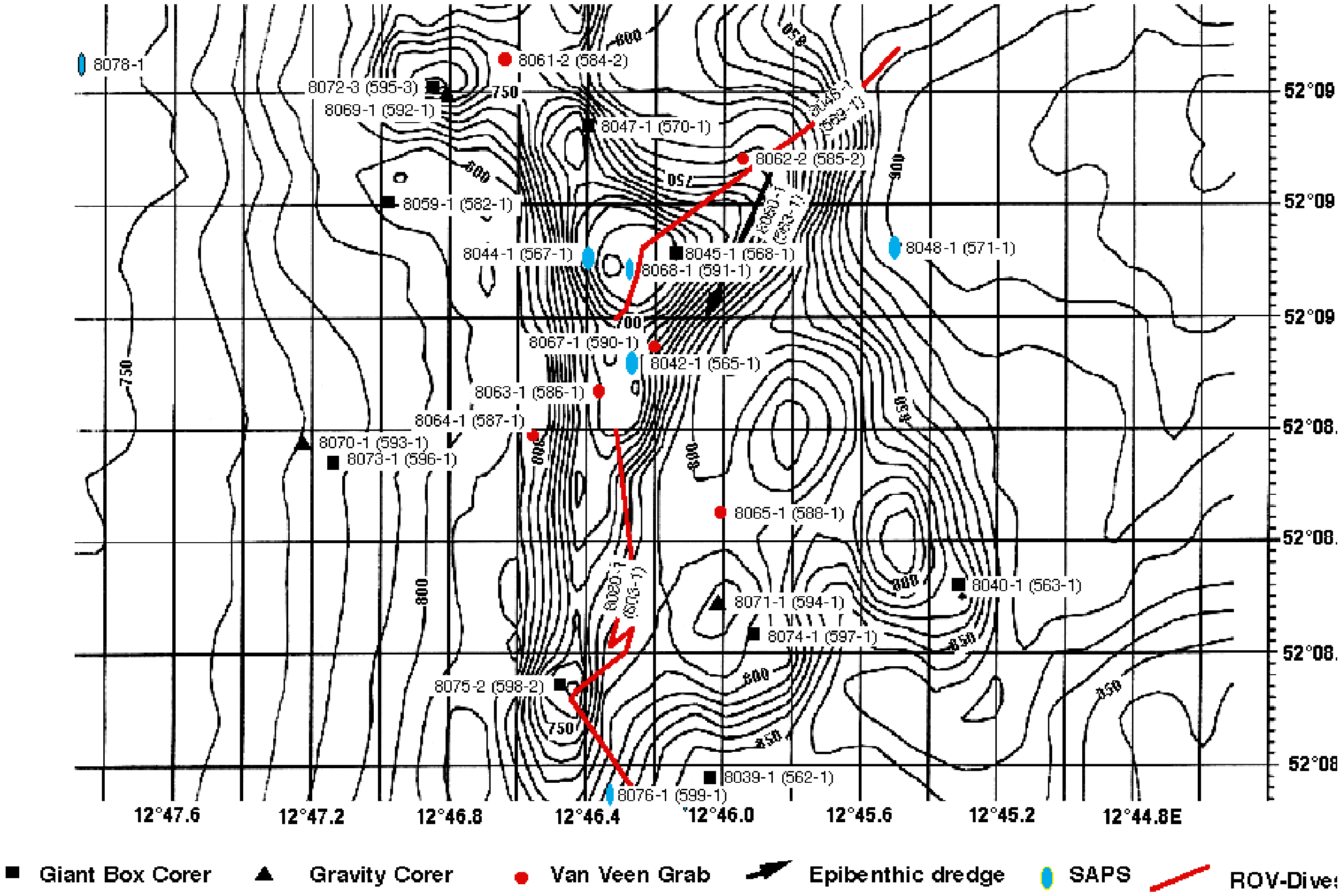


Fig. 44. Station plot and bathymetry of the Propeller Mound, Hovland Mound Province, northern Porcupine Seabight.

interspur slopes are much steeper with 12° to 20° respectively. The northwestern spur has an isolated summit at 694m water depth. East of the southern spur three smaller well-defined mounds are developed with summits at 752m, 746m and 770m. The orientation of the crest lines of Propeller Mound and its satellite mounds shows a narrow range from 0° - 20°. West of the southern spur, a moat is developed which indicates an erosive hydrodynamic regime at present and/or in the past. The vicinity of the Propeller Mound is dominated by an extended north-west to south-east sloping drift sediment wedge with 740m water depth in the western section, and 920m water depth in the eastern section of the surveyed grid.

During POS-292, a total of 15 box-corer stations (7 with no recovery), 10 grab stations (4 with no recovery), 3 6m-long gravity cores, 1 dredge haul, 6 SAPS stations and 2 ROV-dives were carried out (Fig. 44).

Description of box-corer stations:

#8039-1 (562-1; —850m) (Fig. 45A):

0 – 4cm: Living fauna compose of encrusting tunicates and sponges, bryozoans, serpulids, solitary corals *(Desmophyllum cristagalli),* muniid crustaceans, polychaetes, octocorals and echinoids. Surface packed with rounded, polymict dropstone boulders and *Lophelia* fragments. Matrix sediment is a gelatinous silty mud with fine sandgrains and mollusc debris (2.5Y 6/2).

4 – 7cm: Evades into a more cohesive unit with the same composition as above (2.5Y 6/2).

7 – 10cm: Clay of varying thickness and variable coloration (2.5Y 6/4, 2.5Y 6/2), highly fossiliferous containing abundant coral fragments, molluscs, brachiopods, echinoderm remains and few dropstones.

10 – 24cm: Mottled clay unit with undulating contact to the previous unit. Same fossiliferous content as above but much fewer dropstones. Coral fragments appear whitish, iron-stained or highly degraded and filled with ferric-stained clay.

#8040-1 (563-1; —809m) (Fig. 45B):

0 – 6cm: Living fauna compose of ophiuroids, encrusting sponges, octocorals, anemones and muniid crustaceans. The sediment is a well-consolidated

carbonate mud with fine sand, dead iron-stained *Lophelia* colony and shell hash (2.5Y 6/2).

6 – 22cm: Less consolidated mud with layered occurrences of coral debris, gradational contact to the unit above (2.5Y 5/2).

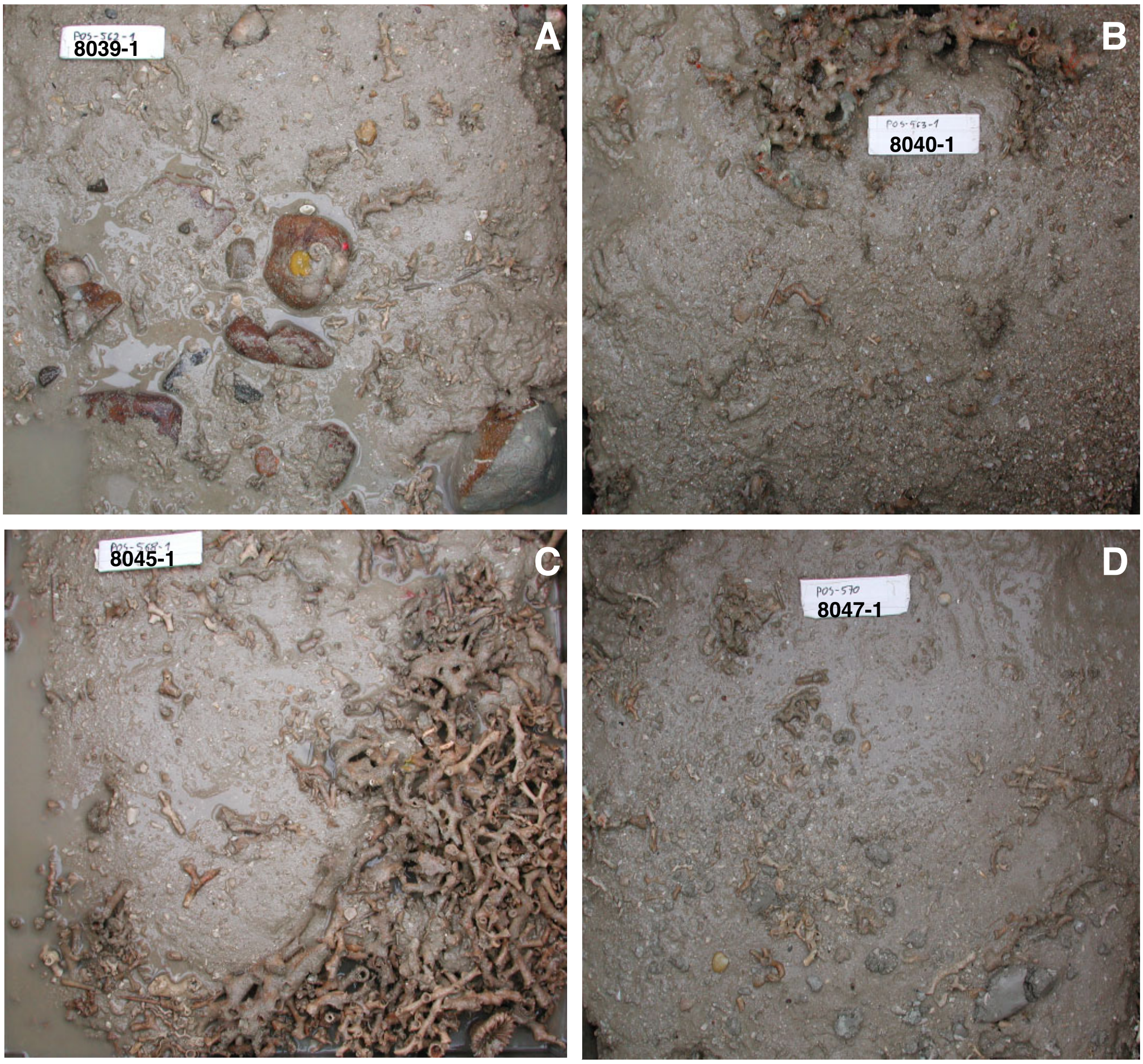


Fig. 45. Sediment surfaces of Propeller Mound box-corer stations: #8039-1 **(A),** #8040-1 **(B),** #8045-1 **(C)** and #8047-1 **(D).**

#8045-1 (568-1; —682m) (Fig. 45C):

Surface composed of a coral rubble layer of predominantly dead *Lophelia pertusa*. Intensely diverse associated fauna: decapods (including muniid crustaceans}, ophiuroids, polychaetes and encrusting sponges.

0 – 6cm: Semi consolidated, highly fossiliferous mud with corals, molluscs, brachiopods, echinoderm fragments (5Y 5/3).

6 – 30cm: Cleaner mud with much less bioclasts; corroded corals, foraminifer rich sand pockets. Sharp colour change to 5Y 6/1 and 5Y 7/0.

#8047-1 (570-1; —795m) (Fig. 45D):

0 – 6cm: Living fauna composed of *Astarte sulcata, Hiatella arctica*, muniid crustaceans, polychaetes and living *Lophelia pertusa.* Silt to fine calcareous sand and locally coarse shell hash with littered coral fragments (2.5Y 5/2). Loose surface sediments are underlain by a cohesive mud.

7 – 23cm: Very cohesive grey carbonate mud with more abundant *Lophelia* fragments. *Lophelia* occurs in an extremely thickly calcified ecomorph habit. Rich in brachiopods, barnacles, bivalves and gastropods and few dropstones (5Y 5/2).

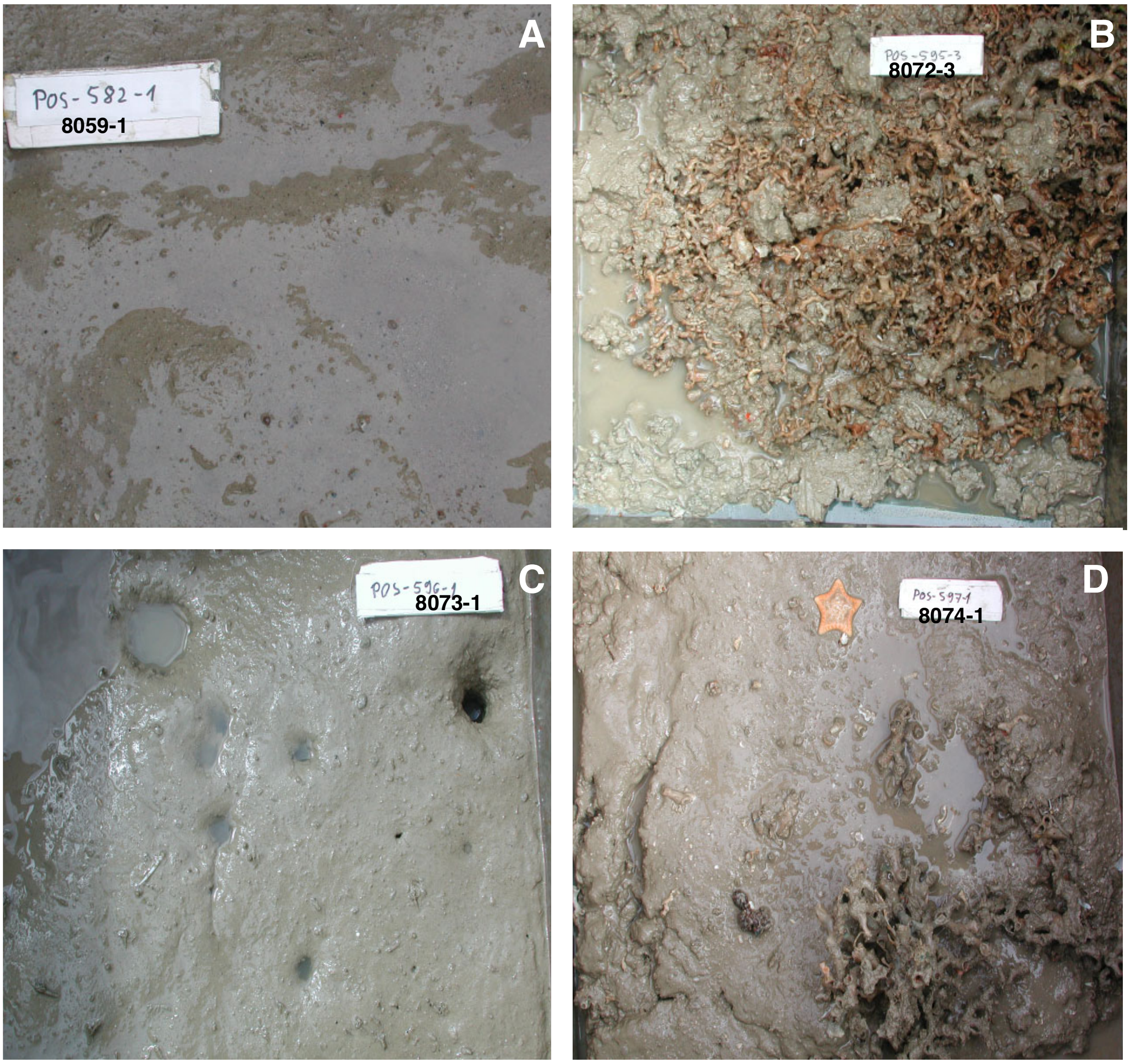


Fig. 46. Sediment surfaces of Propeller Mound box-corer stations: #8059-1 **(A),** #8072-3 **(B),** #8073-1 **(C)** and #8074-1 **(D).**

#8059-1 (582-1, —804m) (Fig. 46A):

0 – 3cm: Bioturbated sandy mud with dropstone pebbles, rich in foraminifers (2.5Y 5/2.

3 – 32cm: Sandy mud, less oxic than above with few bivalves and dispersed dropstone pebbles, becoming more clay-rich downcore (5Y 5/2).

#8072-3 (595-3, —730m) (Fig. 46B):

0 – 8cm: Living fauna consist of ophiuroids, muniid crustaceans, pycnogonids, *Eunice norvegicus* and green encrusting sponges. Coral rubble with mud adhered to exterior of box-corer. Dead *Lophelia* and *Madrepora* with minor echinoid fragments, pteropod shells, gastropods *(Neptunea* sp., *Calliostoma* sp.), pectinids, bryozoans *(Sertella* sp.), *Aphrocallistes* skeletons and *Desmophyllum cristagalli.*

#8073-1 (596-1, —761m) (Fig. 46C):

0 – 2cm: Highly bioturbated sediment *(Nephrops* or *Munida).* Surface covered by faecal pellets, living *Astarte sulcata* and an anemone. Calcareous mud with scaphopods and few coral fragments (5Y 5/3).

2 – 37cm: Gradual colour change to 5Y 5/1, cohesive mud inceasing compaction downcore. Bioturbation fabrics dominant down to 20cm. Friable molluscs and dispersed dropstones throughout the core.

#8074-1 (597-1, —784m) (Fig. 46D):

0 – 2cm: Living fauna composed of asteroid, ophiuroids, bivalves, solitary corals and *Alvania* gastropods. *Lophelia* – *Madrepora* rubble with recolonised *Lophelia*. Chunk of ship slag. Cohesive calcareous mud to fine sand (5Y 5/3).

2 – 26cm: Anoxic cohesive mud with some mottling and bioturbation down to 15cm visible, coral fragments white in colour or iron-stained with mollusc remains throughout the core (5Y 5/2).

<u>Description of grab stations:</u>

The Van Veen grabs were taken mostly from on-mound sites in order to complete the biodiversity aspect and to add to the facies mapping of surface sediments.

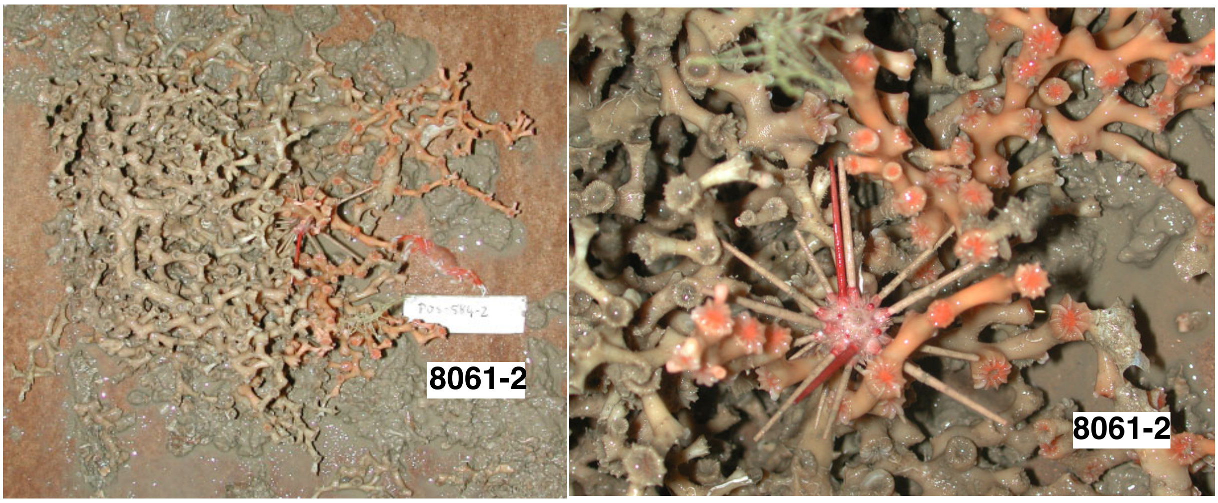


Fig. 47. **#8061-2** (584-2), —764m:
Live and dead *Lophelia pertusa* with *Cidaris* sp., decapods and sponges.

Fig. 48. **#8062-2** (585-2), —780m:
Muddy calcareous sand with *Lophelia* fragments.

Fig. 49. **#8063-1** (586-1), —745m:
Iron-stained *Lophelia* debris on top with muddy calcareous sand beneath.

Fig. 50. **#8064-1** (587-1), —800m: Muddy calcareous sand.

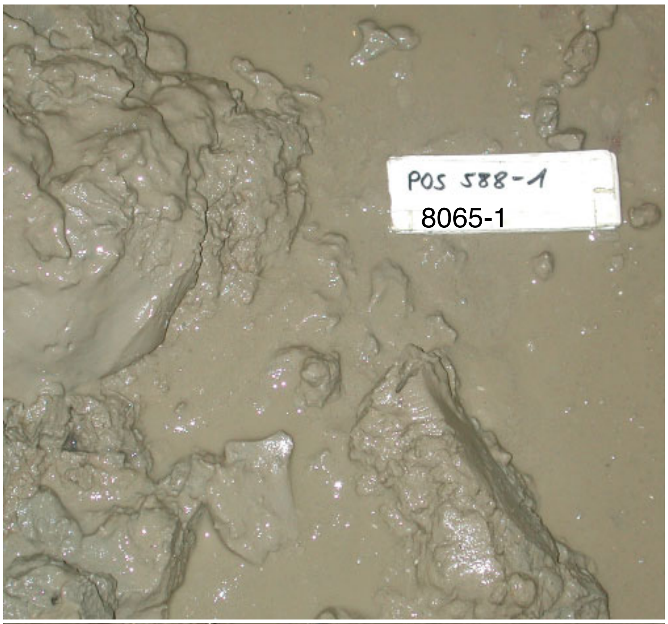


Fig. 51. **#8065-1** (588-1), —794m: Muddy calcareous sand with coral fragments.

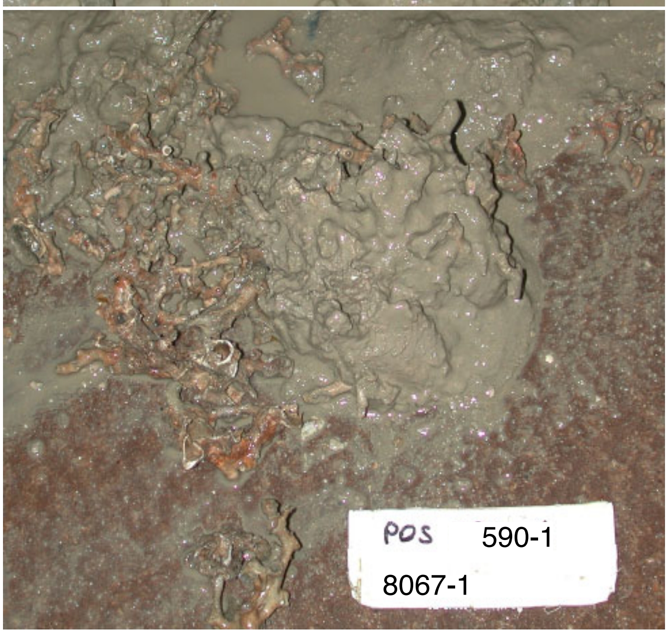


Fig. 52. **#8067-1** (590-1), —780m: Iron-stained *Lophelia* debris on top with muddy calcareous sand beneath.

Description of Dredge haul:

The haul #8021-1 (544-1) was carried out along the northeastern spur of the Propeller Mound beneath the living coral thicket facies (to avoid substantial damage on the living coral ecosystem). The dredge contained predominantly dead coral colony fragments with few live corals (Fig. 53A), crinoids, abundant encrusting sponges (Fig. 53B) and muniid crustaceans (Fig. 53C).

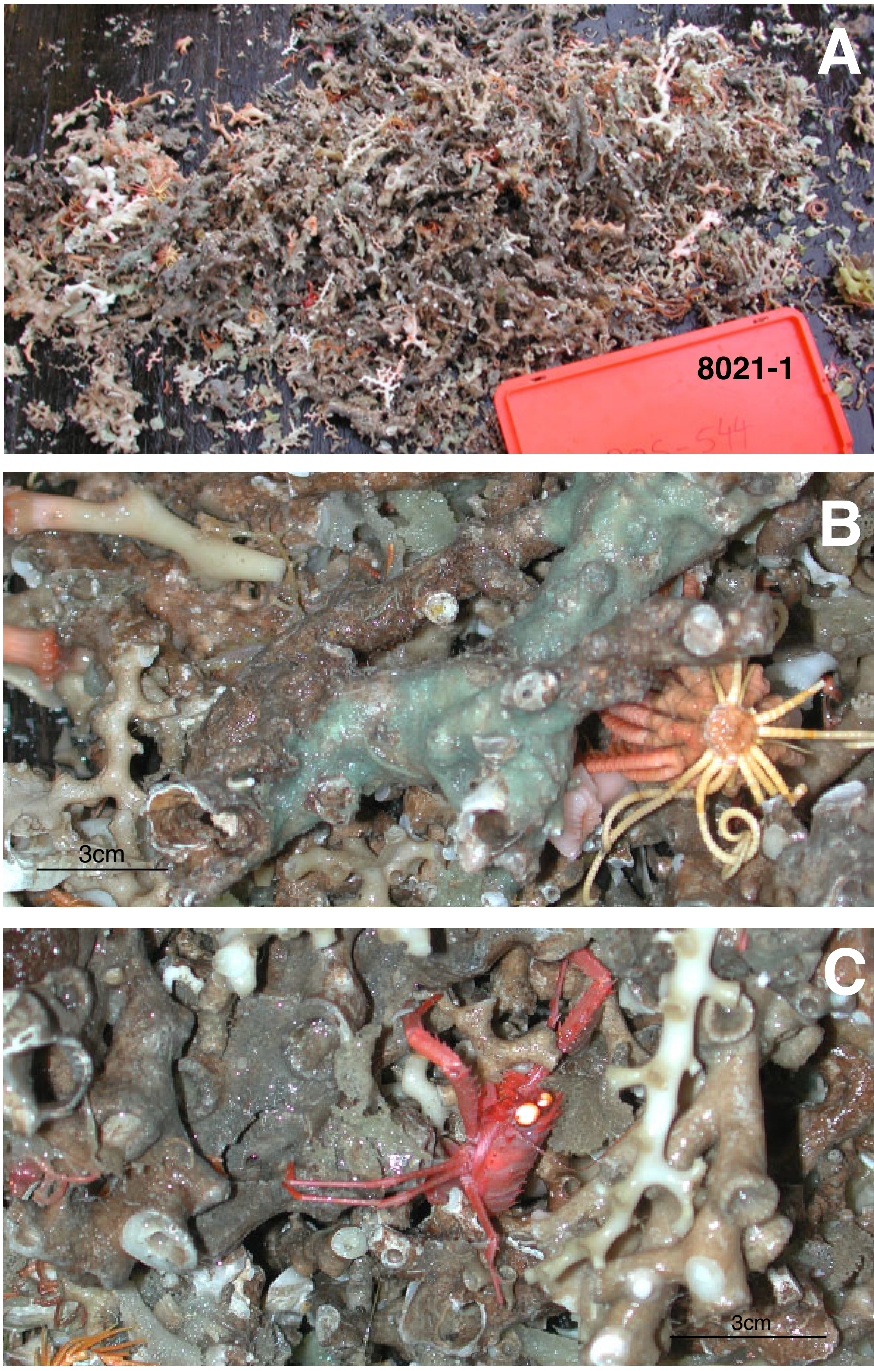


Fig. 53. Dredge #8021-1 with coral debris **(A). B)** Close-up with encrusting sponge and crinoid holdfast. **C)** Close-up of *Munida* sp.

Description of ROV-dives:

Two ROV-dives were performed on the Propeller Mound. Dive #8046-1 lasted 6:55hrs and dive #8080-1 lasted 7:50hrs (see Fig. 44). The first ROV operation was carried out to map the northeastern spur including the shallowest summit area of Propeller Mound. The second dive was carried out over the southern spur of the mound. Both dives started in the even off-mound muddy plains.

The off-mound area is formed by the characteristic sandy mud drape of the northern Porcupine Seabight. This area is a primary trawling zone with lots of trawl marks. Rich benthic life is represented by cerianthids (Fig. 54F), hermit crabs which are overgrown by anemones (Fig. 54A – B), and fishes (Fig. 54F - G). The base of Propeller Mound is a steeper inclined IRD boulder and hardground area with abundant brachiopods, stylasterids and predominantly dead coral framework or rubble. The boulders are densely populated by *Psolus* cf. *squamatus* (Fig. 54C – D). Currents were strongest in this area of the mound. The boulder-strewn area interfingers with outcropping hardgrounds which have been sampled with the ROV successfully. Upslope, increasingly higher abundances of coral thickets are attached along the now much steeper flanks of the mound (up to 60° inclination; Fig. 54I). These thickets provide shelter and a highly structured habitat for plenty of sessile and mobile prganisms (Fig. 54E, H – I). As in the Pelagia Mound area, also here along-slope megabar structures which are overgrown by coral thickets, exist. The narrow but flat summit area shows lesser densities of coral thickets than expected. Currents were much weaker at the level of the mid-slope coral thickets and at the summit area. Apart of a single lost net, no fishing impacts were detectable on the Propeller Mound.

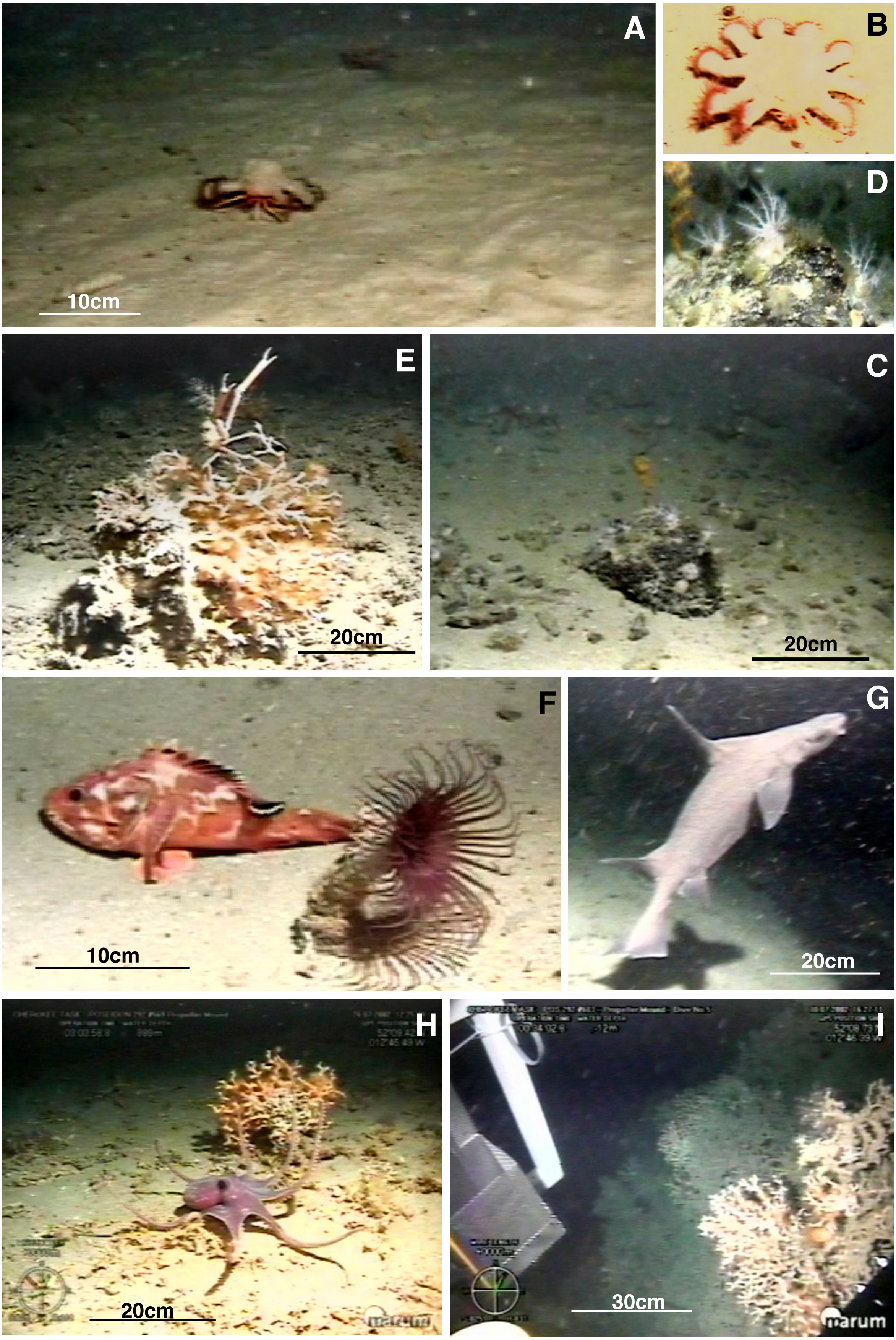


Fig. 54. ROV impressions of dives #8046-1 and #8080-1 to the Propeller Mound: **A)** Muddy sand flat with anemone overgrown hermit crabs. **B)** Close-up of hermit crab. **C)** IRD boulder-strewn deep flanlk with hardground (upper part of image). **D)** Close-up of boulder with *Psolus* cf. *squamatus*. **E)** *Lophelia* colony with a *Paromula mola* on top. **F)** Scorpaenid *(Trachyscorpia cristuala)* with ceriantharid from the muddy sand plain. **G)** Deep-water shark. **H)** Octopus becoming annoyed. **I)** Coral thickets clinging at the steeply inclined mid slope of the mound.

4.6 Porcupine Bank Transect

The Porcupine Bank transect was performed to understand the sedimentary facies change of the coral mound area onto the shallow bank. Therefore, an 82nm-long echosounder profile (#8049-1) was mapped from the Propeller Mound onto the shallowest plateau of the Porcupine Bank (Fig. 55).

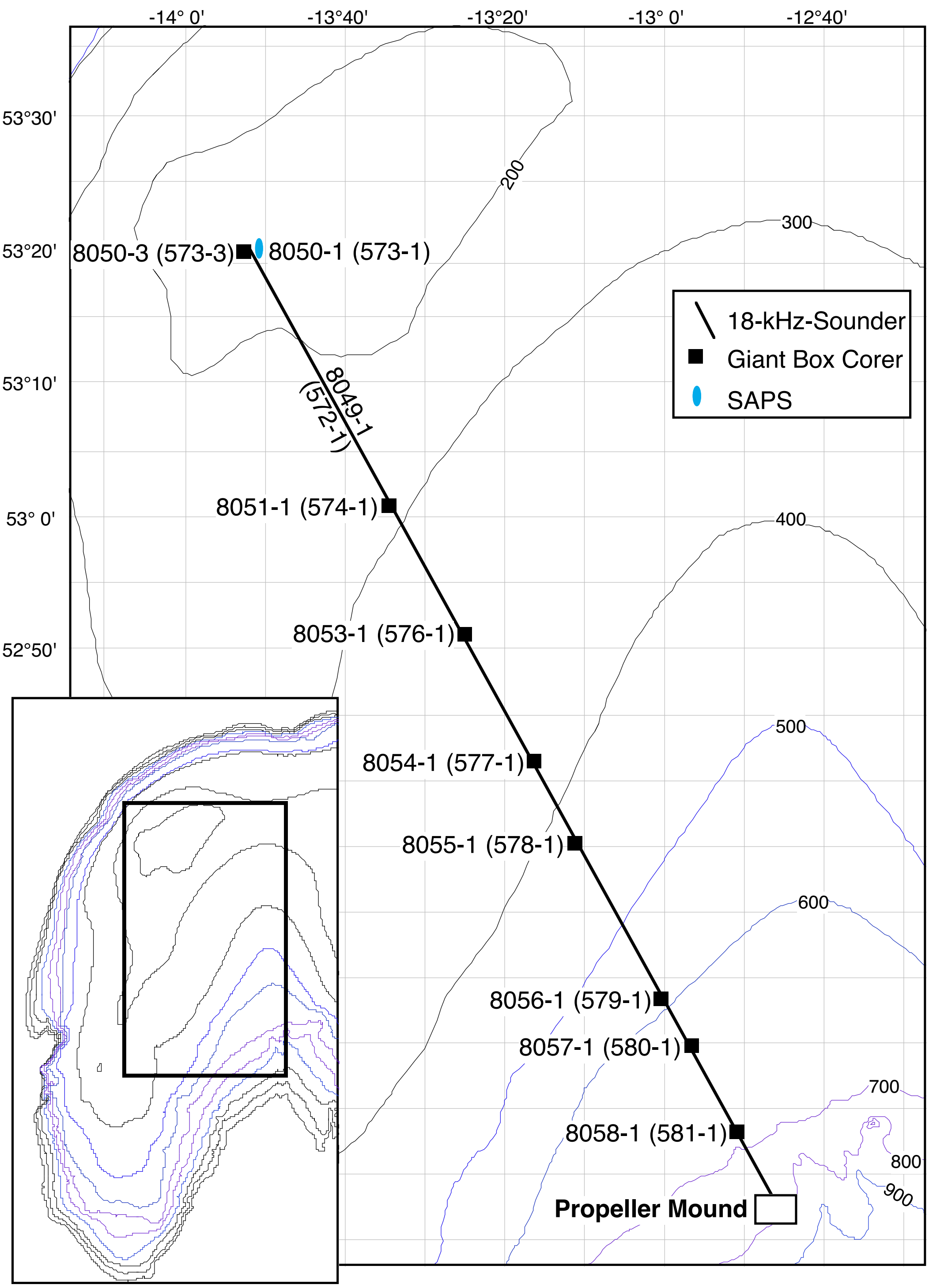


Fig. 55. Station plot and GEBCO-bathymetry of the Porcupine Bank transect (Line #8049-1).

Except for the immediate area of Propeller Mound, the Porcupine Bank slope in the northern Porcupine Seabight shows no peculiar seabed features. However, the bathymetric interval from 900m to 650m revealed the most variable changes in the seabed topography (Fig. 56). Due north of the Propeller Mound, a suite of 3 sedimentary drift bodies existed from 800m to 650m water depth (Fig. 57).

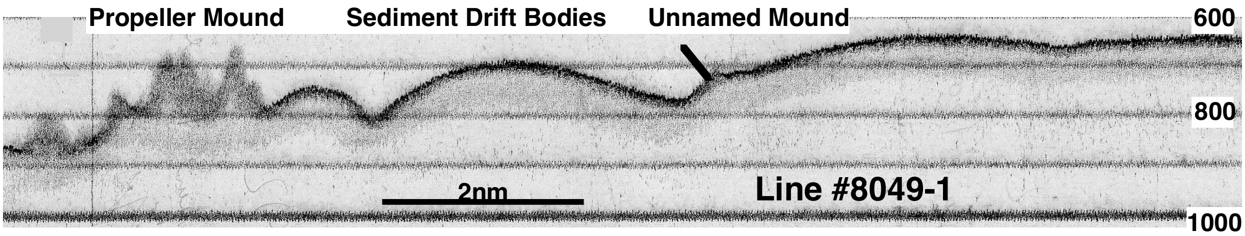


Fig. 57. Seabed topography as shown on the beginning of the long echosounder line #8049-1.

After the sounder line, 1 SAPS station and 8 box-corer were taken on the way back to Propeller Mound. Because of increasingly bad weather, this transect was interrupted but could be continued a day later. In between, the echosounder line #8052-1 to the western Porcupine Bank Margin was carried out. There, a mound-like structure was found within a canyon area between 600 and 700m water depth.

<u>Description of box-corer stations:</u>

#8050-3 (573-3, —153m) (Fig. 58A):

Poor recovery, probably due to rocky bottom. FORAMOL-sand (2.5Y 6/2).

#8051-1 (574-1, —202m) (Fig. 58B):

0 – 15cm: Well-sorted siliciclastic sand rich in irregular echinoids, ophiuroids and polychaete tubes. Living *Arctica islandica* in 4cm core depth and *Dentalium* tubes. No sedimentary layering evident downcore, few dropstones throughout and dispersed naticid bivalves and *Echinocardium* shells (5Y 5/4).

#8053-1 (576-1, —249m) (Fig. 58C):

0 – 15cm: Well-sorted siliciclastic medium to coarse sand with some *Cibicides lobatulus* and scattered molluscs. Living fauna consists of irregular echinoids, a holothurian and small burrowing crustaceans. Shells belong to *Monia* sp. and *Aporrhais pespelecani.*

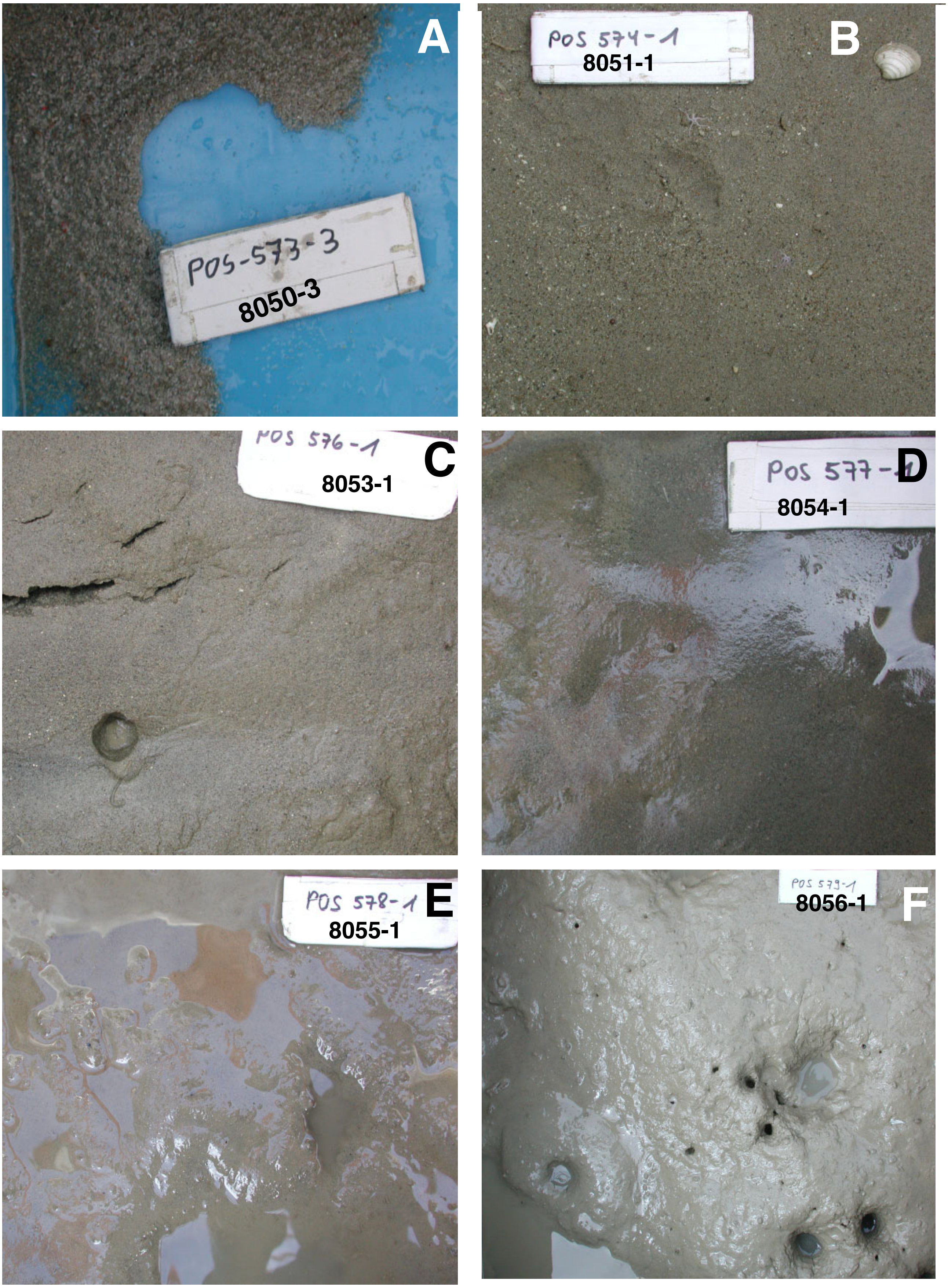


Fig. 58. Sediment surfaces of box-corer taken during the Porcupine Bank transect I: **A)** #8050-1. **B)** #8051-1. **C)** #8053-1. **D)** #8054-1. **E)** #8055-1 and **F)** #8056-1.

#8054-1 (577-1, —356m) (Fig. 58D):

0 – 24cm: Well-sorted siliciclastic medium sand with patches of muddy fine sand throughout the core. Fragmented mollusc remains and scattered IRD pebbles (5Y 4/2).

#8055-1 (578-1, — 450m) (Fig. 58E):

0 – 4cm: Surface composed of siliciclastic and carbonate sand, extremely bioturbated by *Nephops* burrows, few living ophiuroids and abundant faecal pellets on the surface (5Y 4/3).

4 - 31cm: Sand becomes more compacted and well-sorted, scattered with mollusc fragments. Burrows visible down to 15cm. Downcore some lenticular patches of mud (5Y 4/3).

#8056-1 (579-1, —554m) (Fig. 58F):

0 – 1cm: Surface extensively bored by *Nephrops* with some smaller polychaete burrows. Very cohesive mud with some foraminifers (2.5Y 5/2). H_2S smell.

1 – 44cm: More cohesive mud with solitary corals (Flabellum sp.) and mollusc remains. Dropstones throughout the core but more common near the base. Continuous bioturbation (2.5Y 5/2) throughout the core (5Y 5/2).

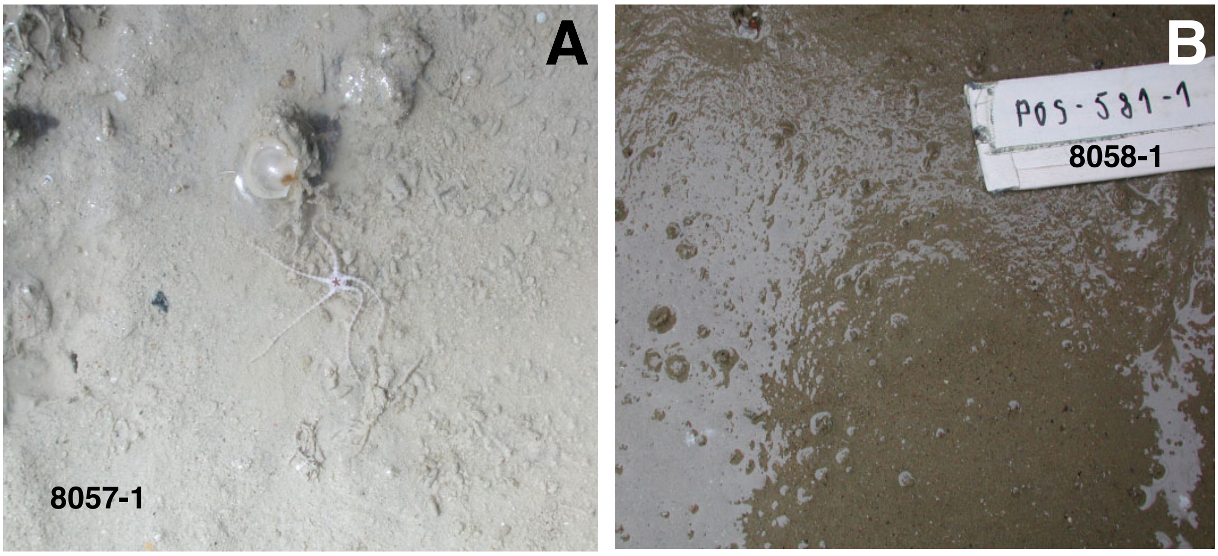


Fig. 59. Sediment surfaces of box-corer taken during the Porcupine Bank transect II: **A)** #8057-1. **B)** #8058-1.

#8057-1 (580-1, —630m) (Fig. 59A):

0 – 2cm: Surface covered by faecal pellets and is highly bioturbated by *Nephrops*. Living fauna composed of hydroids, worm tubes which serve as settling ground for *Delectopecten vitreus.* Mud with foraminifers.

2 – 39cm: Becoming anoxic mud and better consolidated than above. Poor in fossil remains (buccinid gastropod, *Flabellum* sp.) and scattered dropstones. Bioturbation extends from the surface to base of core (5Y 5/2).

#8058-1 (581-1, —736m) (Fig. 59B):

0 – 23cm: Sandy mud with abundant faecal matter, worn mollusc remains (including scaphopods) and few dropstones. *Haplophragmoides* is common. Sediment is bored by polychaetes (5Y 5/3).

23 – 35cm: Undulating boundary to clay unit with scattered dropstones and mollusc and serpulid remains (5Y 5/2).

4. 7 Belgica Mound Province

The Belgica Mound Province is located at the eastern slope of the northern Porcupine Seabight (see Fig. 1). This area was mapped with multibeam on a previous RV Polarstern cruise in collaboration with the GEOMOUND Project (Fig. 60). During cruise POS-292 an echosounder grid (lines #8082-1 to 7) was carried out over the region during a bad weather period. Based upon these results, the area Therese Mound and a previously unnamed mound that we now intend to name tentatively as "Poseidon Mound" are taken into further consideration for the last major scientific program of the cruise.

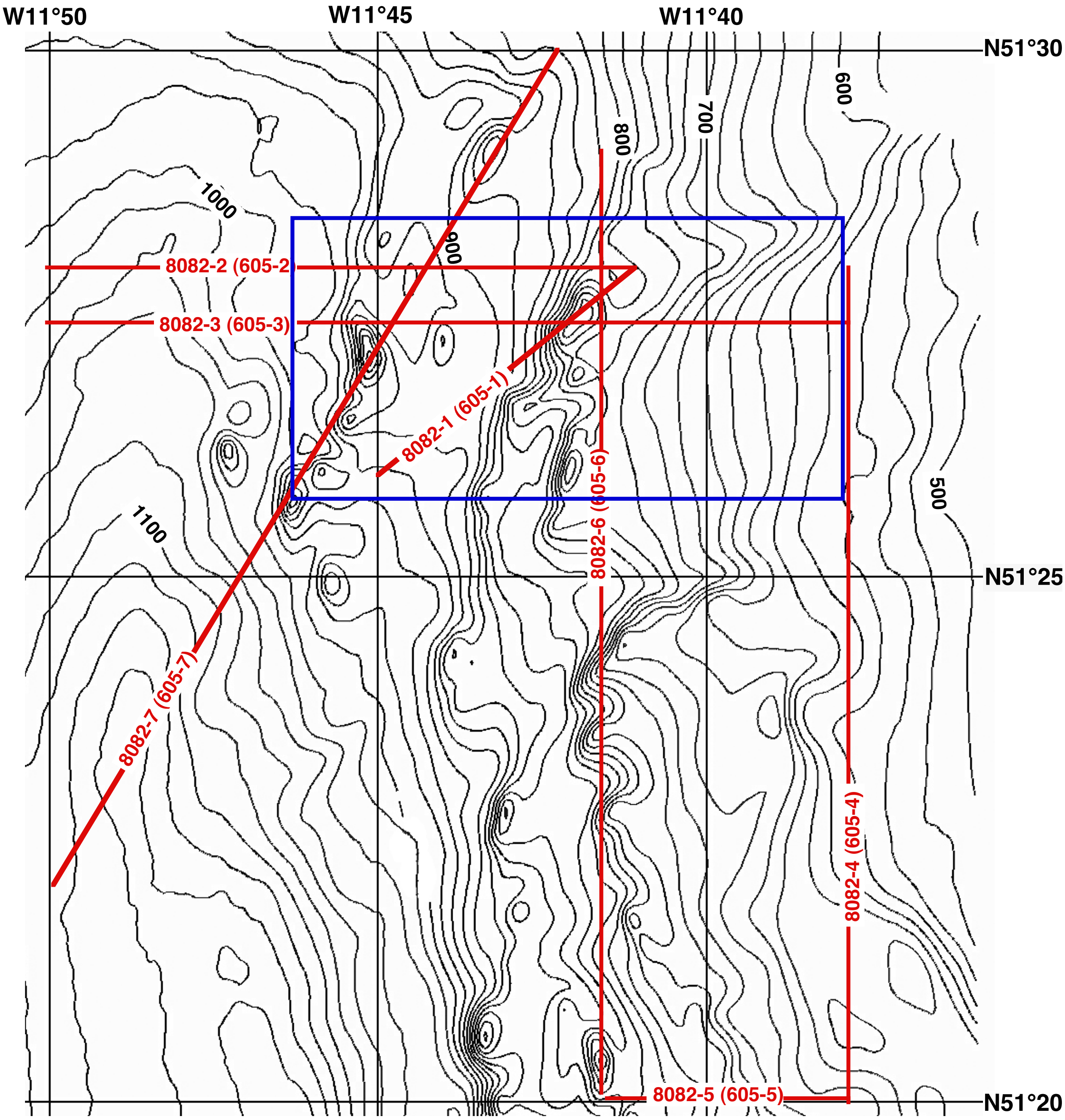


Fig. 60. Echosounder grid in the Belgica Mound Province. Map provided by the AWI for internal use. The blue rectangle marks the detailed working area — Poseidon Mound and Therese Mound.

Both, Therese Mound and Poseidon Mound form prominent seabed structures with more than 150m positive relief at the continental margin off southwestern Ireland (Fig. 61). The bathymetric interval of the deeper Therese Mound is 980m (western slope) to 920m (eastern slope) with a summit at 770m water depth. The bathymetric interval of the shallower Poseidon Mound is 850m (western slope) to 730m (eastern slope) with a summit at 670m water depth (Fig. 61).

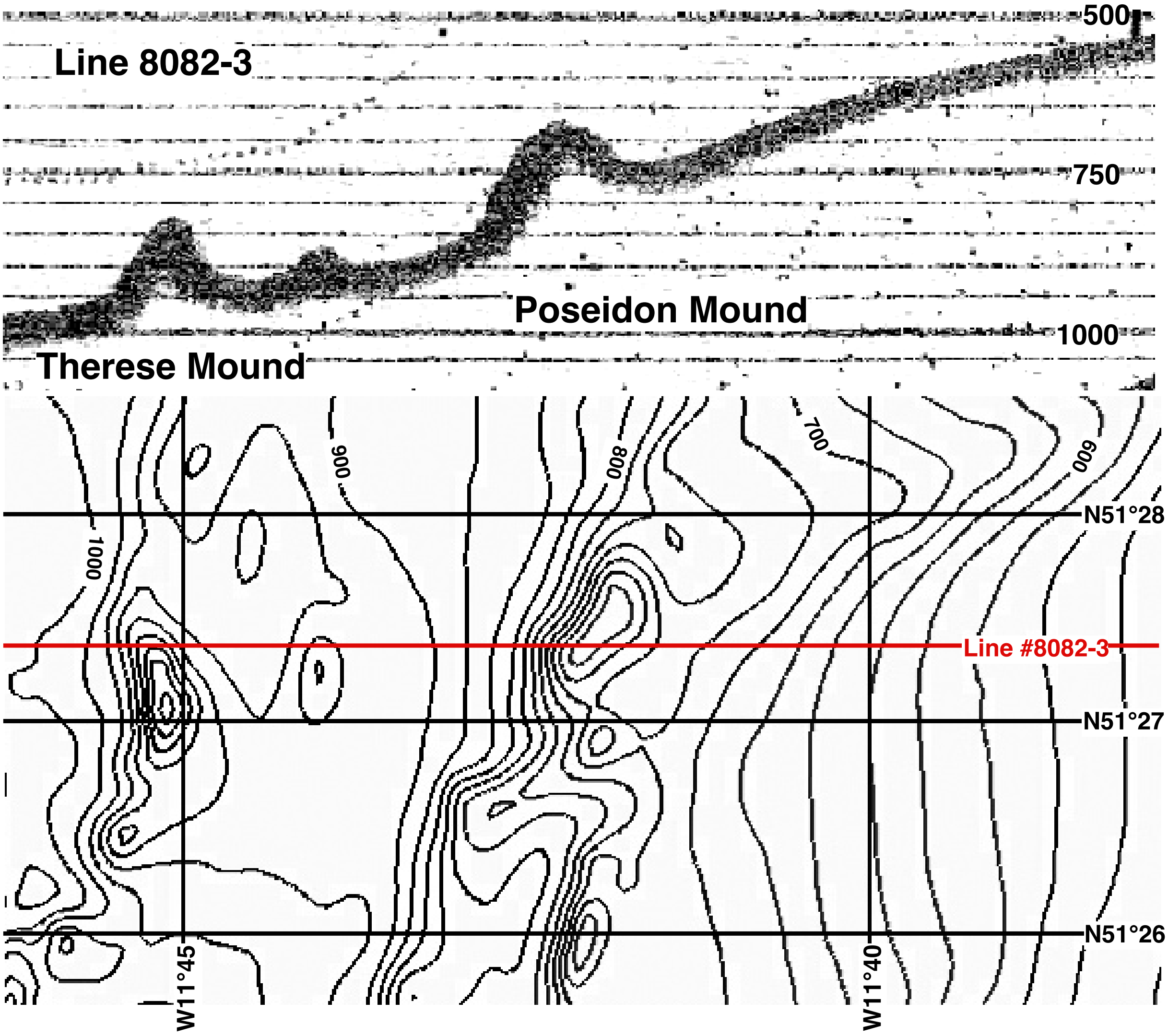


Fig. 61. Bathymetry and echosounder line #8082-3 of the Therese and Poseidon Mounds, Belgica Mound Province.

On the **Poseidon Mound** and the nearby seabed, 2 SAPS stations, 8 box-corer stations (2 showed no recovery), 13 grab stations, 2 dredge hauls and 1 ROV-dive have been carried out (Fig. 62).

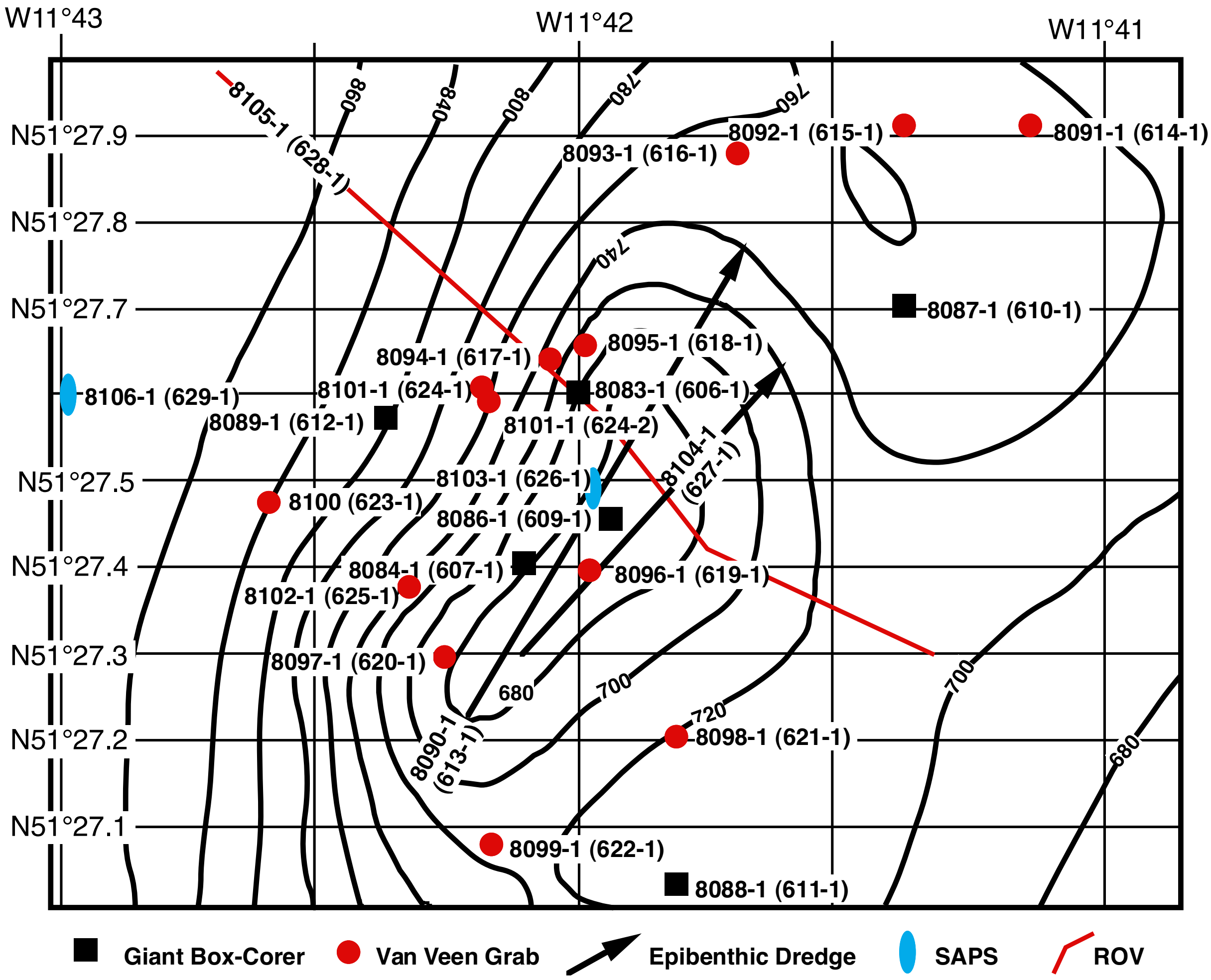


Fig. 62. Bathymetry and station plot of the Poseidon Mound survey.

<u>Description of box-corer stations:</u>

#8083-1 (606-1, —670m) (Fig. 63A):

0 – 8cm: *Madrepora* rubble with fossiliferous carbonate mud (5Y 6/3). Living fauna composed of whitish fistulous demosponges, pink-coloured octocorals, bivalves, *Calliostoma* sp., polychaetes, ophiuroids, squat lobsters and shrimps.

#8084-1 (607-1, —691m) (Fig. 63B):

0 – 5cm: *Madrepora* rubble with minor *Lophelia* and *Desmophyllum* contribution. Fossil *Acesta* shells. Living fauna consists of *Cidaris* sp., shrimps, sponges, polychaetes, bivalves, hydroids, pink-coloured octocorals and few live *Lophelia pertusa.* The mud underneath is fossiliferous with few dropstones (2.5Y 5/4).

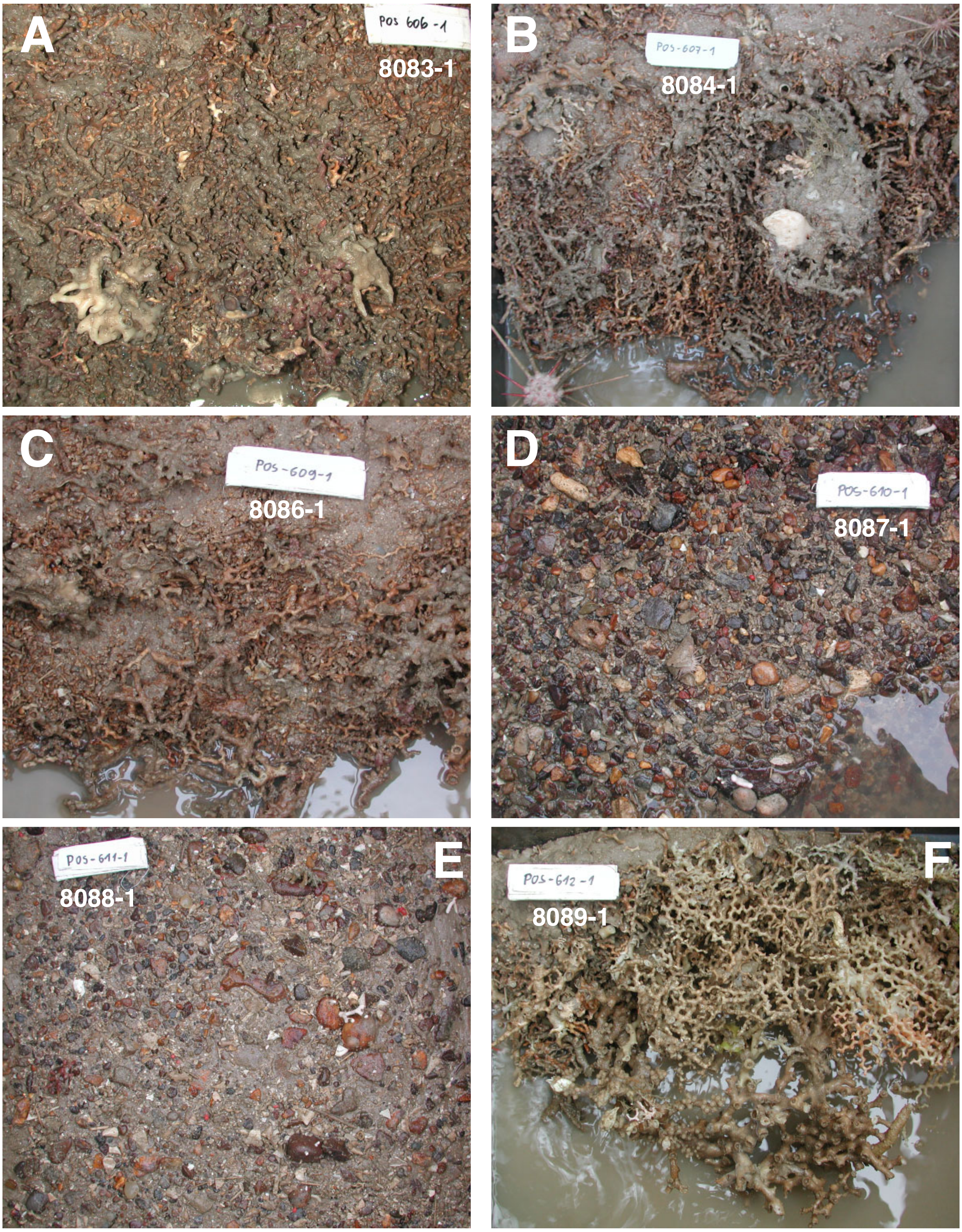


Fig. 63. Sediment surfaces of box-corer taken from and near Poseidon Mound: **A)** #8083-1. **B)** #8084-1. **C)** #8086-1. **D)** #8087-1. **E)** #8088-1. **F)** #8089-1.

#8086-1 (609-1, —680m) (Fig. 63C):

0 – 6cm: *Madrepora* rubble with encrusting zoanthids, octocorals, serpulids, molluscs, polychaetes and ophiuroids. Sandy fossiliferous mud (5Y 5/3).

#8087-1 (610-1, —767m) (Fig. 63D):

0 – 7cm: Polymict dropstone pavement. Pebbles often colonised by *Pliobothrus* sp., pink-coloured octocorals and *Psolus* cf. *squamata*. Sediment with pteropod shells, echinoid remains, barnacle plates, gastropods and otoliths. Pebbles stick in a sandy fossiliferous mud.

7 – 11cm: Very cohesive mud that gradually changes to the unit below (5Y 5/3 on top to 2.5 Y5/4 below).

11 – 38cm: Very cohesive mud with few organic streaks and fine dropstones (5Y 5/2).

#8088-1 (611-1, —740m) (Fig. 63E):

0 – 7cm: Polymict dropstone pavement. Pebbles often colonised by *Pliobothrus* sp., pink-coloured octocorals, anemones, brachiopods and *Psolus* cf. *squamata*. Sediment with pteropod shells, echinoid remains, barnacle plates, gastropods and otoliths. Pebbles stick in a sandy fossiliferous mud. Dropstones fade out at the base of this unit (2.5Y 5/2).

7 – 28cm: Very cohesive mud (2.5Y 4/2 top to 5Y 4/2 base) with bioturbation from the surface that brings sand and pebbly dropstones into the mud. Few angular dropstones and a mud ball (5 – 7cm in diameter) with different colour zones (5Y 4/1 and 5Y 5/2).

#8089-1 (612-1, —834m) (Fig. 63F):

0 – 8cm: *Madrepora* – *Lophelia* – thicket with *Desmophyllum cristagalli.* Living fauna consists of a diverse sponge assemblage (including *Aphrocallistes beatrix),* polychaetes, ophiuroids, crustaceans, echinoids, asteroids and zoanthids. Few living barnacles are attached to *Lophelia*. Barnacles are infested by *Hyrrokkin sarcophaga*. Sediment consist of a coarse-grained calcareous sand (2.5Y 5/2).

Description of grab stations:

A total of 13 Van Veen grab stations have been carried out successfully on the Poseidon Mound and adjacent seabed.

Fig. 64. **#8091-1** (614-1, —770m): Polymict dropstone pavement at the sediment surface with sandy mud beneath.

Fig. 65. **#8092-1** (615-1, —780m): Rounded dropstones colonised by *Psolus* cf. *squamatus*.

Fig. 66. **#8093-1** (616-1, —760m): Rounded dropstones sticking in sandy mud. Beneath cohesive mud with fewer dropstone pebbles.

Fig. 67. **#8094-1** (617-1, —697m): Dropstone boulder with *Madrepora* rubble and barnacle plates.

Fig. 68. **#8095-1** (618-1, —701m): *Madrepora* rubble.

Fig. 69. **#8096-1** (619-1, —681m): Dropstone pavement littered with barnacle plates and *Pliobothrus* sp.. Beneath a muddy sand with dropstones.

Fig. 70. **#8097-1** (620-1, —696m): *Madrepora* rubble with *Desmophyllum cristagalli.*

Fig. 71. **#8098-1** (621-1, —738m): Dropstone boulder with sandy mud.

Fig. 72. **#8099-1** (622-1, —731m): Coral rubble.

Fig. 73. **#8100-1** (623-1, —798m): *Lophelia* and *Madrepora* colonies with octocorals.

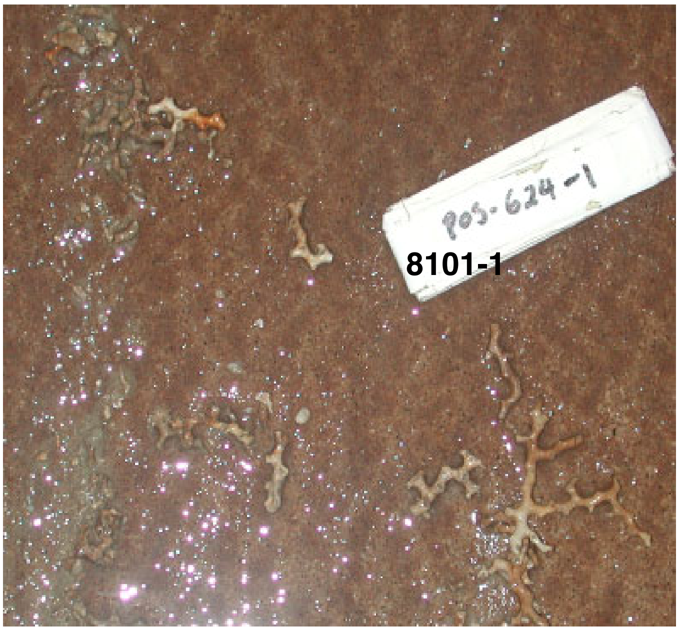


Fig. 74. **#8101-1** (624-1, —763m): *Madrepora* rubble.

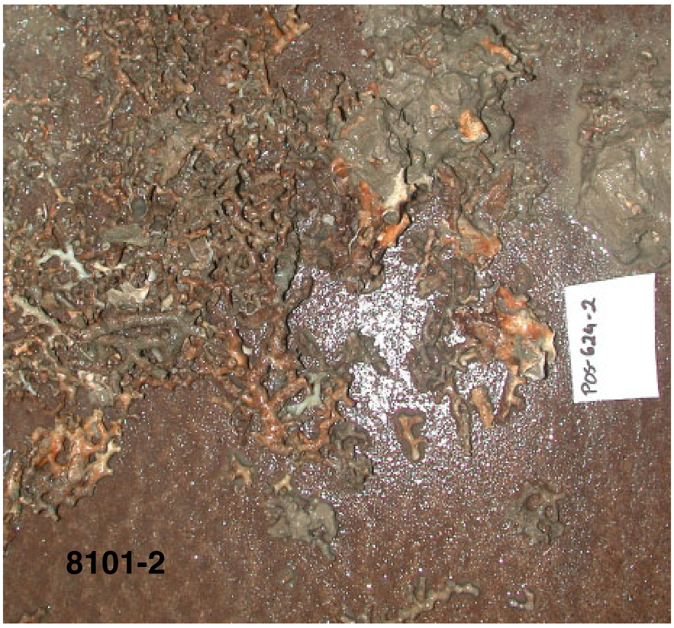


Fig. 75. **#8101-2** (624-2, —800m): *Madrepora* rubble with sandy mud.

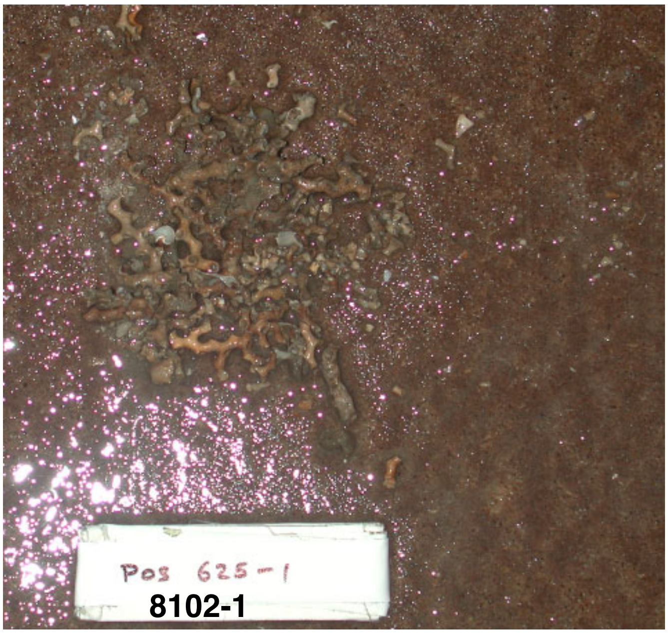


Fig. 76. **#8102-1** (625-1, —748m): *Madrepora* rubble.

Description of dredge hauls:

Two dredge hauls with nearly identical headings and deployment and recovery positions have been performed over the flat plateau of Poseidon Mound (see Fig. 62). Haul #8090-1 came on deck only filled with *Madrepora* rubble and fossil barnacle plates. The second haul #8104-1 retrieved again coral rubble, barnacle plates few living benthic organisms and a monkfish *(Lophius pescatorius;* Fig. 77).

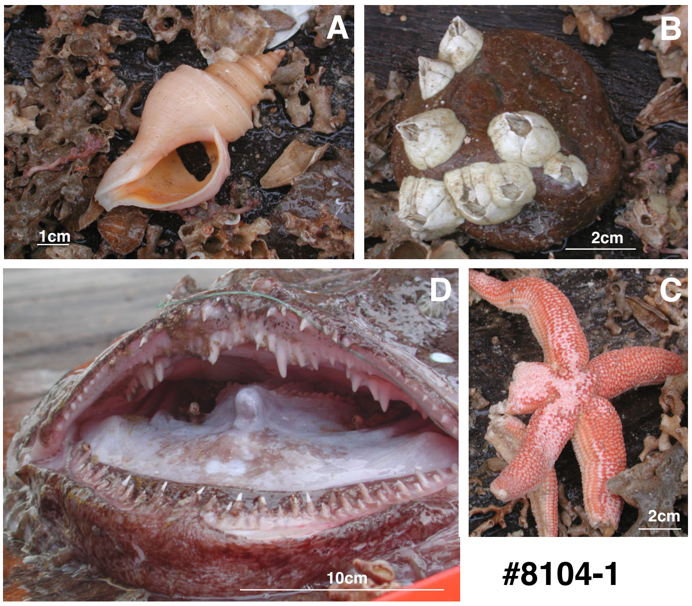


Fig. 77. Dredge haul #8104-1: **A)** Buccinid gastropod and coral rubble with barnacle plates. **B)** Living barnacles on a dropstone. **C)** Starfish. **D)** Monkfish *(Lophius pescatorius).*

On the deeper **Therese Mound**, the remaining shiptime was used for 1 SAPS station and 4 box-corer stations (Fig. 78).

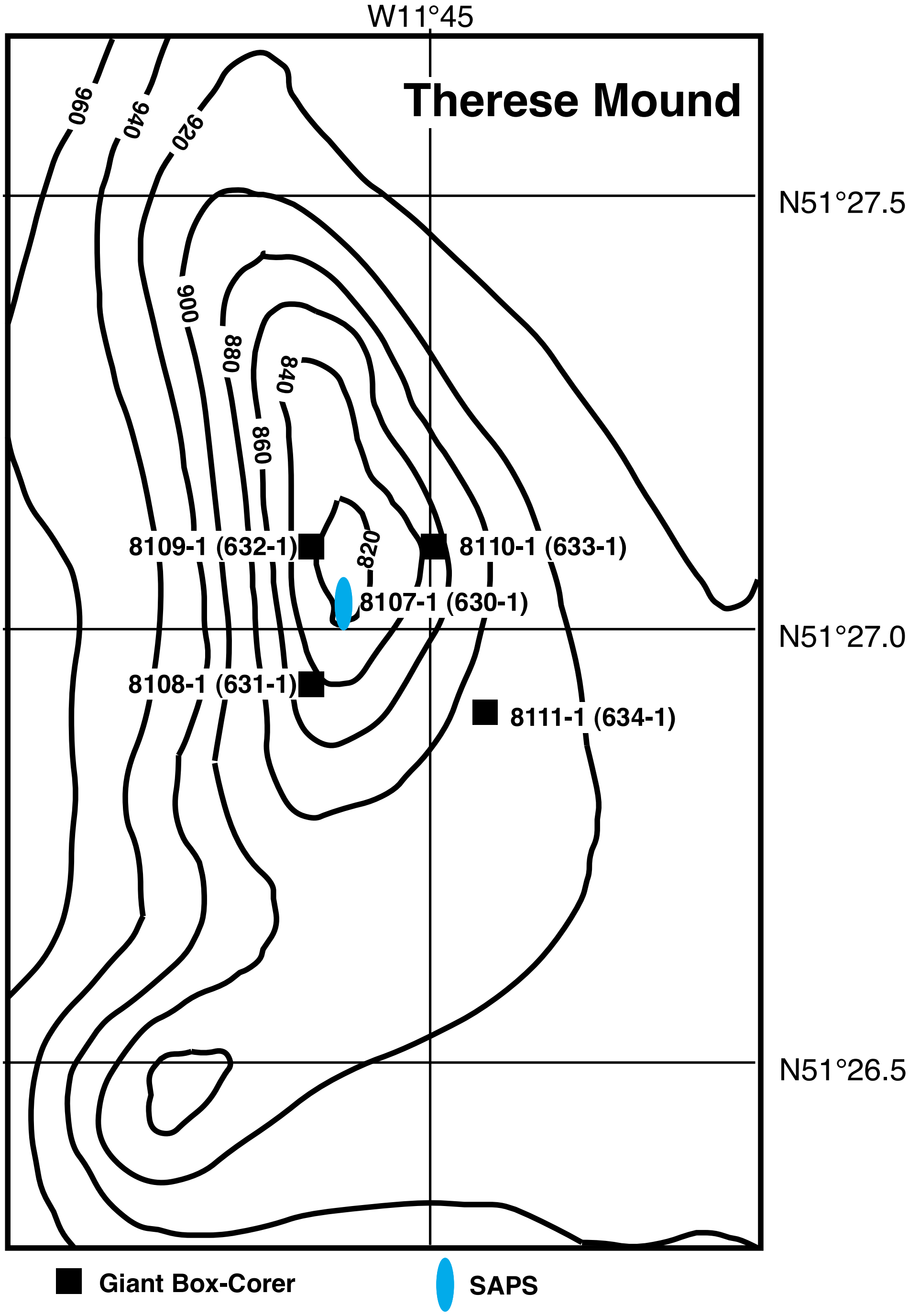


Fig. 78. Bathymetry and station plot on Therese Mound.

Description of box-corer stations:

#8108-1 (631-1, —810m) (Fig 79A):

Living coral framework, predominantly *Madrepora oculata, Anthotelia grandiflora, Desmophyllum cristagalli, Stenocyathus vermiformis, Aphrocallistes beatrix,* polychaetes, crustaceans, ophiuroids, asteroids, many agglutinated worm-tubes, gastropods, bivalves, pycnogonids, serpulids. Sandy mud (5Y 4/2), partly anoxic.

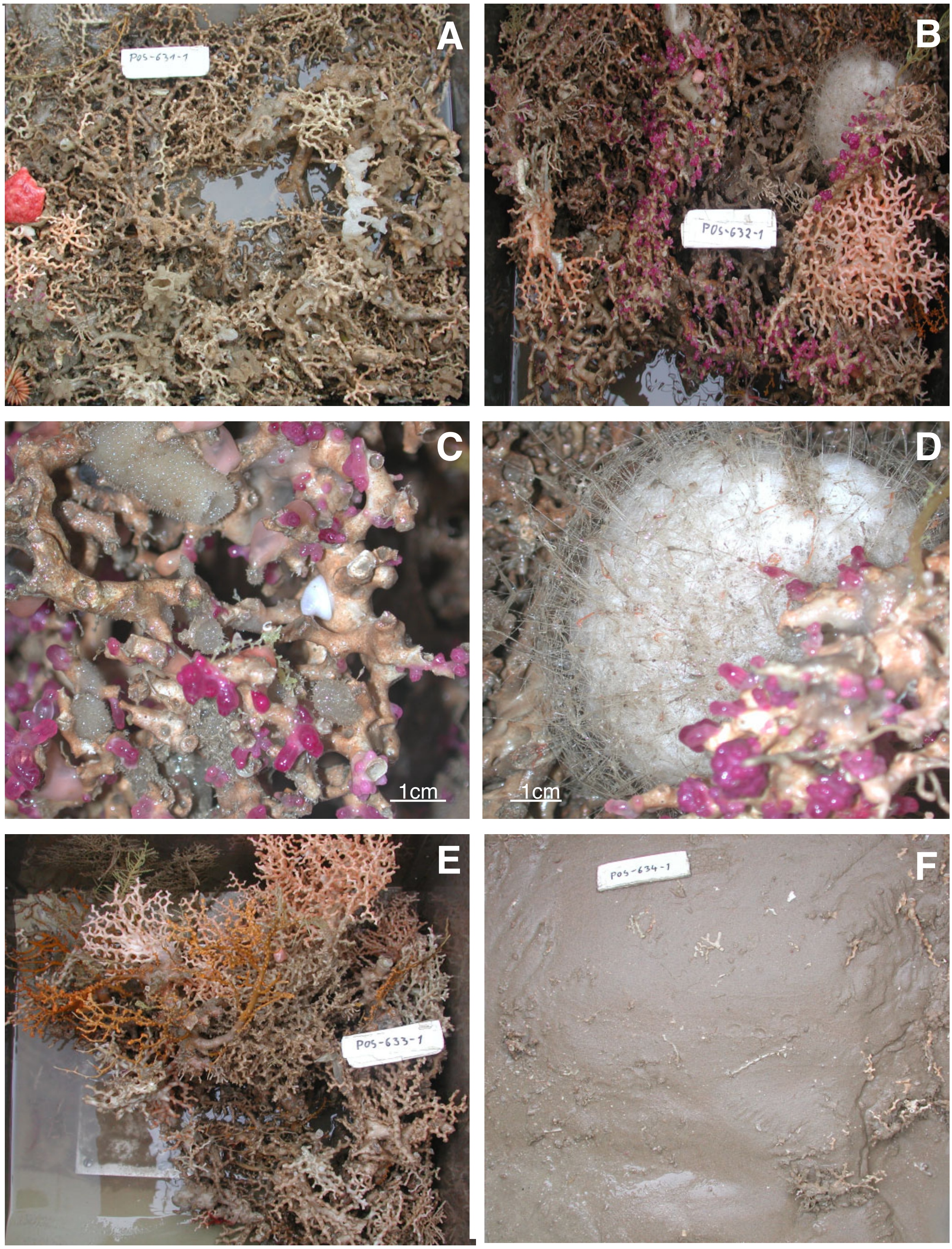


Fig. 79. Box corer stations and samples from Therese Mound: **A)** #8108-1 with *Madrepora* colonies. **B)** #8109-1 Coral thicket with octocorals. **C)** Close-up of #8109-1 with pink *Anthotelia grandiflora, Aphrocallistes beatrix* (top) and a grazing *Emarginula* sp.. **D)** Close-up of #8109-1 with a demosponge and *Anthotelia grandiflora*. **E)** #8110-1 Coral thicket with gorgonians. **F)** #8111-1 foraminifer sand with coral and stylasterid debris.

#8109-1 (632-1, —780m) (Fig 79B - D):

Madrepora-dominated thicket with plenty octocorals *(Anthotelia grandiflora),* zoanthids, demosponges, few *Lophelia pertusa, Emarginula* sp., *Calliostoma* sp., bryozoa, new species of *Eunice*, anemones, serpulids, crustaceans. Sandy mud at the base (5Y 5/2).

#8110-1 (633-1, —860m) (Fig. 79E):

Madrepora-dominated thicket with gorgonians, hydroids, polychaetes, asteroids, shrimps, squat lobsters, ophiuroids, *Calliostoma* sp. and two blennoid fishes. Highly foraminifer-rich sandy mud at the base is preserved (5Y 5/2).

#8111-1 (634-1, —869m) (Fig. 79F):

Mixed siliciclastic – calcareous sands with ripple structures. Scattered debris of *Madrepora, Lophelia,* barnacles, stylasterids, *Aphrocallistes*, bivalves and gastropods (2.5Y 5/2).

Acknowledgements

We want to express our sincere thanks to the captain and the crew of RV Poseidon for their always professional help and for the extremely nice working atmosphere during the entire cruise. We also want to thank those persons on land who were deeply involved in the logistics to make this cruise happen. This is a joint ACES and ECOMOUND cruise funded through the 5th Framework Programme by the European Commission.

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5. Station List

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
524-1	GeoB 8001-1	18 KHz-	18.07.02	Start: 23:02	Hatton Bank	59°25.99N	17°00.07W	1042	HDG: 198°, Speed: 6kn
		Sounder	19.07.02	End: 01:57		59°09.94N	17°10.04W	525	
524-2	GeoB 8001-2	18 KHz-		Start: 02:02		59°10.02N	17°10.43W	526	HDG: 310°, Speed: 6kn
		Sounder		End: 04:00		59°16.92N	17°27.37W	1000	
525-1	GeoB 8002-1	Dredge		Start: 08:02		59°18.71N	17°04.50W	839	1200m cable paid out
				End: 08:50		59°18.03N	17°03.50W	780	Live *Madrepora*
525-2	GeoB 8002-2	Dredge		Start: 09:16		59°18.26N	17°02.80W	810	1400m cable paid out
				End: 10:13		59°17.01N	17°00.34W	760	Corals, Dropstones
525-3	GeoB 8002-3	SAPS		11:25		59°18.19N	17°03.62W	790	1442 litres pumped
526-1	GeoB 8003-1	Dredge		Start: 15:16		59°11.06N	17°12.70W	513	1100m cable paid out
				End: 16:10		59°10.48N	17°11.21W	519	Gorgonians, *Lophelia*
527-1	GeoB 8004-1	18 KHz-	20.07.02	Start: 04:20	W-Rockall Bank	57°07.99N	16°29.97W	847	HDG: 270°, Speed: 6kn
		Sounder		End: 05:56	Margin	57°08.00N	16°46.01W	1225	
528-1	GeoB 8005-1	Dredge		Start: 08:17		57°08.06N	16°36.96W	745	1200m cable paid out
				End: 08:57		57°08.05N	16°34.15W	747	Antipatharia, Dropstones
528-2	GeoB 8005-2	GKG		09:45		57°07.86N	16°35.49W	715	Foram-Sand, IRD, 7cm rec.
528-3	GeoB 8005-3	ROV		08:17		57°07.97N	16°35.75W	---	Functional Test
528-4	GeoB 8005-4	SAPS		12:45		57°08.13N	16°35.74W	680	1451 litres pumped
529-1	GeoB 8006-1	SAPS	21.07.02	06:00	Pelagia Mound	55°31.93N	15°38.84W	854	1604 litres pumped
529-2	GeoB 8005-2	ROV		Start: 09:20		55°32.04N	15°39.00W	854	5 h video recorded
				End: 15:50		55°32.71N	15°38.72W	860	
530-1	GeoB 8006-1	BG		18:10		55°32.05N	15°39.27W	862	No recovery
530-2	GeoB 8006-2	BG		18:27		55°32.05N	15°39.27W	862	No recovery
530-3	GeoB 8006-3	BG		19:00		55°32.05N	15°39.27W	862	*Lophelia*, *Aphrocallistes*
531-1	GeoB 8007-1	BG		20:28		55°32.13N	15°38.25W	904	No recovery
531-2	GeoB 8007-2	BG		20:59		55°32.16N	15°38.35W	890	No recovery
531-3	GeoB 8007-3	BG		21:40		55°32.11N	15°38.36W	895	Dropstones, *Stylaster*
532-1	GeoB 8008-1	BG		22:38		55°32.08N	15°38.30W	894	Dropstones, *Stylaster*
533-1	GeoB 8009-1	BG		23:43		55°31.52N	15°37.92W	916	Failed
533-2	GeoB 8009-2	BG	22.07.02	00:15		55°31.53N	15°37.94W	916	Corals, bryozoa
534-1	GeoB 8010-1	BG		01:26		55°31.39N	15°38.13W	906	Corals and carbonate sand
535-1	GeoB 8011-1	BG		02:40		55°31.48N	15°38.47W	842	Corals, *Aphrocallistes*
536-1	GeoB 8012-1	BG		03:54		55°31.61N	15°38.92W	848	Dropstones
537-1	GeoB 8013-1	BG		04:50		55°31.49N	15°39.26W	810	No recovery
538-1	GeoB 8014-1	SAPS		06:02		55°33.05N	15°39.02W	837	1583 litres pumped
539-1	GeoB 8015-1	GKG		09:06		55°32.52N	15°39.08W	748	No recovery

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
539-2	GeoB 8016-2	GKG		09:38		55°32.43N	15°39.19W	839	Coral rubble, 13cm rec.
540-1	GeoB 8017-1	GKG		10:41		55°32.59N	15°40.29W	690	Coral rubble, 13cm rec.
541-1	GeoB 8018-1	GKG		11:20		55°32.21N	15°38.30W	885	No recovery
541-2	GeoB 8018-2	GKG		12:27		55°32.17N	15°38.32W	889	No recovery
541-3	GeoB 8018-3	GKG		13:13		55°32.18N	15°38.38W	889	Dead corals, 15cm rec.
541-4	GeoB 8018-4	SL-2m		14:22		55°32.21N	15°38.44W	890	No recovery
542-1	GeoB 8019-1	SL-2m		15:24		55°32.49N	15°39.16W	760	20cm recovery
543-1	GeoB 8020-1	SL-2m		16:22		55°32.56N	15°40.35W	670	151cm recovery
544-1	GeoB 8021-1	Dredge		Start: 18:00		55°31.37N	15°39.34W	835	1500m cable paid out
				End:19:15		55°31.09N	15°40.76W	858	Corals, stylasterids
545-1	GeoB 8022-1	18 KHz-		Start: 20:18	Rockall Bank	55°31.98N	15°39.00W	855	HDG: 10°, Speed: 5 kn
		Sounder	23.07.02	End: 05:00		56°10.66N	15°14.01W	216	
546-1	GeoB 8023-1	SAPS		05:10		56°10.67N	15°14.05W	234	1783 litres pumped
546-2	GeoB 8023-2	GKG		09:14		56°10.54N	15°13.90W	236	*Ditrupa,* 16cm rec.
547-1	GeoB 8024-1	GKG		09:07		56°07.53N	15°15.77W	249	No recovery
547-2	GeoB 8024-2	GKG		09:33		56°07.58N	15°15.78W	253	*Ditrupa,* 18cm rec.
548-1	GeoB 8025-1	GKG		12:18		55°51.55N	15°26.37W	348	Carbonate sand, 18cm rec.
549-1	GeoB 8026-1	GKG		13:28		55°44.63N	15°30°71W	447	Skeletal sand, 15cm rec.
550-1	GeoB 8027-1	GKG		14:33		55°41.35N	15°33.00W	498	Foram-sand, IRD, 10cm rec.
551-1	GeoB-8028-1	GKG		15:29		55°39.32N	15°34.38W	575	Foram-sand, IRD, 12cm rec.
552-1	GeoB 8029-1	SAPS		18:00	Pelagia Mound	55°32.24N	15°40.22W	700	1068 litres pumped
552-2	GeoB 8029-2	BG		21:19		55°32.19N	15°39.81W	830	Corals, porifera
553-1	GeoB 8030-1	BG		21:53		55°32.12N	15°40.44W	835	*Madrepora*, sediment
554-1	GeoB 8031-1	BG		22:50		55°32.42N	15°40.25W	660	*Lophelia, Madrepora*
555-1	GeoB 8032-1	BG		23:40		55°32.26N	15°39.46W	825	*Madrepora, Aphrocallistes*
556-1	GeoB 8033-1	BG	24.07.02	00:38		55°31.25N	15°38.46W	930	No recovery
556-2	GeoB 8033-2	BG		01:15		55°31.22N	15°38.38W	943	*Madrepora, Aphrocallistes*
557-1	GeoB 8034-1	BG		02:24		55°31.20N	15°39.23W	820	*Madrepora, Lophelia*
558-1	GeoB 8035-1	BG		04:20		55°31.20N	15°39.14W	781	*Madrepora, Lophelia*
559-1	GeoB 8036-1	SAPS		05:00		55°32.31N	15°40.01W	700	1127 litres pumped
560-1	GeoB 8037-1	GKG		08:10		55°32.44N	15°40.19W	704	No recovery
560-2	GeoB 8037-2	GKG		08:59		55°32.42N	15°40.24W	674	Corals
561-1	GeoB 8038-1	ROV		Start: 09:40		55°33.09N	15°38.96W	837	3h video recorded
				End: 14:54		55°32.13N	15°39.51W	871	
562-1	GeoB 8039-1	GKG	25.07.02	14:43	Propeller Mound	52°08.19N	12°46.09W	850	IRD, dead corals, 24cm rec.

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
563-1	GeoB 8040-1	GKG		15:57		52°08.52N	12°45.30W	809	Coral-rich mud, 22cm rec.
564-1	GeoB 8041-1	GKG		16:50		52°09.05N	12°46.05W	736	No recovery
565-1	GeoB 8042-1	SAPS		19:55		52°08.95N	12°46.28W	710	1139 litres pumped
566-1	GeoB 8043-1	18 KHz-		23:14		52°08.00N	12°46.27W	865	6 kn; HDG: 0°
		Sounder		23:42		52°10.49N	12°45.11W	807	
566-2	GeoB 8043-2	18 KHz-		23:43		52°10.49N	12°45.11W	807	6kn, HDG: 40°
		Sounder	26.07.02	01:40		52°18.12N	12°30.00W	660	
566-3	GeoB 8043-3	18 KHz-		01:50		52°18.14N	12°30.20W	660	6kn, HDG: 268°
		Sounder		02:10		52°18.14N	12°32.62W	685	
566-4	GeoB 8043-4	18 KHz-		02:11		52°18.14N	12°32.62W	685	6kn, HDG: 223°
		Sounder				52°09.02N	12°46.58W	804	
567-1	GeoB 8044-1	SAPS		05:00		52°09.10N	12°46.61W	805	1153 litres pumped
568-1	GeoB 8045-1	GKG		08:15		52°09.17N	12°46.13W	682	Coral rubble, 30cm rec.
569-1	GeoB 8046-1	ROV		Start: 11.11		52°09.43N	12°45.49W	880	4h video taped
				End: 15:44		52°08.97N	12°46.49W	795	
570-1	GeoB 8047-1	GKG		16:46		52°09.34N	12°46.40W	795	Coral rubble, 23cm rec.
571-1	GeoB 8048-1	SAPS		18:00		52°09.17N	12°45.55W	875	1116 litres pumped
572-1	GeoB 8049-1	18 KHz-		21:07	Porcupine Bank	52°08.40N	12°46.60W	855	82 nm, 9kn, HDG: 303°
		Sounder	27.07.02	05:40		53°20.00N	13°52.00W	152	
573-1	GeoB 8050-1	SAPS		05:50		53°20.02N	13°51.80W	153	1020 litres pumped
573-2	GeoB 8050-2	GKG		08:42		53°19.97N	13°51.92W	153	No recovery
573-3	GeoB 8050-3	GKG		09:00		53°19.95N	13°51.86W	153	FORAMOL-Sand, poor rec.
574-1	GeoB 8051-1	GKG		11:55		53°00.80N	13°34.04W	202	Sand, shells, 15cm rec.
575-1	GeoB 8052-1	18 KHz-		14:00		52°51.20N	13°25.60W	250	70 nm, 9kn, HDG: 237°
		Sounder		22:57		52°12.00N	15°05.00W	1167	
576-1	GeoB 8053-1	GKG	28.07.02	07:58		52°51.40N	13°25.39W	249	Quartzsand, 15cm rec.
577-1	GeoB 8054-1	GKG		09:52		52°41.78N	13°16.43W	356	Quartzsand, 24cm rec.
578-1	GeoB 8055-1	GKG		11:03	N-Porcupine SB	52°35.67N	13°10.74W	450	Quartzsand, 31cm rec.
579-1	GeoB 8056-1	GKG		12:56		52°23.62N	13°01.56W	554	Mud, 44cm rec.
580-1	GeoB 8057-1	GKG		13:58		52°20.46N	12°56.72W	630	Mud, 39cm rec.
581-1	GeoB 8058-1	GKG		15:32		52°13.40N	12°50.24W	736	Mud, 35cm rec.
582-1	GeoB 8059-1	GKG		16:43	Propeller Mound	52°09.20N	12°46.88W	804	Mud, 32cm rec.
583-1	GeoB 8060-1	Dredge		Start: 18:29		52°09.26N	12°45.88N	856	Dropstones
				End: 19:09		52°08.85N	12°46.16W	794	
584-1	GeoB 8061-1	BG		20:08		52°09.32N	12°46.70W	773	No recovery

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
584-2	GeoB 8061-2	BG		21:00		52°09.45N	12°46.66W	764	Corals, Carbonate sediment
585-1	GeoB 8062-1	BG		21:37		52°09.25N	12°45.97W	707	No recovery
585-2	GeoB 8062-2	BG		22:22		52°09.28N	12°45.90W	780	Corals, sediment
586-1	GeoB 8063-1	BG		23:02		52°08.57N	12°46.49W	745	Corals, sediment
587-1	GeoB 8064-1	BG		23:49		52°08.79N	12°46.65W	800	Sediment
588-1	GeoB 8065-1	BG	29.07.02	00:40		52°08.65N	12°46.01W	794	Sediment
589-1	GeoB 8066-1	BG		01:40		52°08.82N	12°46.60W	801	No recovery
589-2	GeoB 8066-2	BG		02:44		52°08.79N	12°46.62W	789	No recovery
590-1	GeoB 8067-1	BG		03:22		52°08.95N	12°46.23W	780	Sediment
591-1	GeoB 8068-1	SAPS		05:00		52°09.08N	12°46.30W	670	1140 litres pumped
592-1	GeoB 8069-1	SL-6m		08:28		52°09.40N	12°46.87W	777	Recovery: 382cm
593-1	GeoB 8070-1	SL-6m		09:50		52°08.79N	12°47.21W	760	Recovery: 447cm
594-1	GeoB 8071-1	SL-6m		10:45		52°08.48N	12°46.05W	761	Recovery: 575cm
595-1	GeoB 8072-1	GKG		12:48		52°09.36N	12°46.79W	680	No recovery
595-2	GeoB 8072-2	GKG		13:37		52°09.37N	12°46.80W	690	No recovery
595-3	GeoB 8072-3	GKG		14:07		52°09.41N	12°46.87W	730	Corals, sediment, 8cm rec.
596-1	GeoB 8073-1	GKG		14:41		52°08.75N	12°47.11W	761	Mud, 37cm rec.
597-1	GeoB 8074-1	GKG		15:38		52°08.43N	12°45.88W	784	Corals, sediment, 26cm rec.
598-1	GeoB 8075-1	GKG		16:35		52°08.34N	12°46.41W	711	No recovery
598-2	GeoB 8075-2	GKG		17:25		52°08.34N	12°46.53W	730	Small sediment sample
599-1	GeoB 8076-1	SAPS		18:00		52°07.99N	12°46.12W	850	1168 litres pumped
600-1	GeoB 8077-1	18 KHz-		21:07	Hovland Mound	52°09.33N	12°48.40W	747	2nm, HDG: 314°, 5kn
		Sounder		21:37	Province	52°10.75N	12°50.73W	748	
600-2	GeoB 8077-2	18 KHz-		21:38		52°10.75N	12°50.73W	748	5,2nm, HDG: 17°, 5kn
		Sounder		22:33		52°15.72N	12°48.24W	654	
600-3	GeoB 8077-3	18 KHz-		22:34		52°15.72N	12°48.24W	654	2,1nm, HDG:90°, 5kn
		Sounder		22:54		52°15.72N	12°44.79W	674	
600-4	GeoB 8077-4	18 KHz-		22:55		52°15.72N	12°44.79W	674	9,6nm, HDG: 166°, 5kn
		Sounder	30.07.02	00:20		52°06.42N	12°41.00W	658	
600-5	GeoB 8077-5	18 KHz-		00:21		52°06.42N	12°41.00W	658	5nm, HDG: 47°, 5kn
		Sounder		01:12		52°09.87N	12°35.00W	903	
600-6	GeoB 8077-6	18 KHz-		01:13		52°09.87N	12°35.00W	903	5,9nm, HDG: 0°, 5kn
		Sounder		02:18		52°15.75N	12°35.00W	712	
600-7	GeoB 8077-7	18 KHz-		02:19		52°15.75N	12°35.00W	712	4,1nm, HDG: 205°, 5kn
		Sounder		03:05		52°12.06N	12°37,83W	739	

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
600-8	GeoB 8077-8	18 KHz-		03:06		52°12.06N	12°37,83W	739	3,3nm, HDG: 270°, 5kn
		Sounder		03:47		52°12.06N	12°43,24W	820	
600-9	GeoB 8077-9	18 KHz-		03:48		52°12.06N	12°43.24W	820	4,2nm, HDG: 222°, 5kn
		Sounder		04:40		52°08.93N	12°47.87W	738	
601-1	GeoB 8078-1	SAPS		05:00	Propeller Mound	52°09.43N	12°47.86W	735	1157 litres pumped
602-1	GeoB 8079-1	GKG		08:16		52°08.29N	12°46.38W	698	No recovery
602-2	GeoB 8079-2	GKG		09:07		52°08.25N	12°46.39W	698	No recovery
603-1	GeoB 8080-1	ROV		Start: 11:10		52°08.04N	12°46.05W	848	5 hours video taped
				End: 16:34		52°08.80N	12°46.33W	700	
604-1	GeoB 8081-1	SAPS	31.07.02	05:00	Belgica Mounds	51°26.01N	11°43.93W	916	1154 litres pumped
605-1	GeoB 8082-1	18 KHz-		08:44	Poseidon Mound	51°26.03N	11°45.20W	766	HDG: 50°
		Sounder		09:08		51°28.00N	11°41.00W	748	
605-2	GeoB 8082-2	18 KHz-		09:09		51°28.00N	11°41.00W	748	HDG: 270°
		Sounder		10:11		51°28.00N	11°50.00W	1003	
605-3	GeoB 8082-3	18 KHz-		10:18		51°27.40N	11°50.00W	1026	HDG: 90°
		Sounder		11:47		51°27.40N	11°38.00W	575	
605-4	GeoB 8082-4	18 KHz-		12:07		51°28.00N	11°38.00W	578	HDG: 180°
		Sounder		13:30		51°20.00N	11°38.00W	601	
605-5	GeoB 8082-5	18 KHz-		13:32		51°20.00N	11°38.00W	601	HDG: 270°
		Sounder		14:07		51°20.00N	11°42.00W	822	
605-6	GeoB 8082-6	18 KHz-		14:07		51°20.00N	11°42.00W	822	HDG: 0°
		Sounder		15:53		51°30.00N	11°42.00W	840	
605-7	GeoB 8082-7	18 KHz-		16:05		51°30.00N	11°42.00W	840	HDG: 210°
		Sounder		17:30		51°22.00N	11°50.00W	1149	
606-1	GeoB 8083-1	GKG	01.08.02	08:07		51°27.61N	11°42.01W	670	*Madrepora* rubble, poor rec.
607-1	GeoB 8084-1	GKG		09:03		51°27.41N	11°42.07W	691	*Madrepora* rubble, poor rec.
608-1	GeoB 8085-1	GKG		10:01		51°27.32N	11°42.18W	679	No recovery
608-2	GeoB 8085-2	GKG		10:55		51°27.37N	11°42°23W	670	No recovery
609-1	GeoB 8086-1	GKG		12:29		51°27.46N	11°41.91W	680	*Madrepora* rubble, poor rec.
610-1	GeoB 8087-1	GKG		13:28		51°27.70N	11°41.42W	767	IRD Pavement, 38cm rec.
611-1	GeoB 8088-1	GKG		14:27		51°27.03N	11°41.71W	740	IRD Pavement, 28cm rec.
612-1	GeoB 8089-1	GKG		15:13		51°27.58N	11°42.43W	834	*Madrepora*, poor rec.
613-1	GeoB 8090-1	Dredge		Start: 16:08		51°27.22N	11°42.22W	681	Dead corals
				End: 17:05		51°27.78N	11°41.79W	774	
614-1	GeoB 8091-1	BG		18:05		51°27.91N	11°41.23W	770	Sandy mud, Dropstones

Poseidon Coding	Station #	Gear	Date	UTC	Geographic Region	Latitude	Longitude	Depth [m]	Recovery/Remarks
615-1	GeoB 8092-1	BG		18:52		51°27.91N	11°41.40W	780	Dropstones
616-1	GeoB 8093-1	BG		19:37		51°27.89N	11°41.67W	760	Dropstones, glacial clay
617-1	GeoB 8094-1	BG		20:30		51°27.62N	11°42.07W	697	Dropstones, Corals
618-1	GeoB 8095-1	BG		21:16		51°27.65N	11°42.03W	701	*Madrepora*
619-1	GeoB 8096-1	BG		21:58		51°27.40N	11°41.97W	681	Dropstones, Barnacles
620-1	GeoB 8097-1	BG		22:38		51°27.30N	11°42.30W	696	*Madrepora, Desmophyllum*
621-1	GeoB 8098-1	BG		23:25		51°27.20N	11°41.89W	738	Dropstones
622-1	GeoB 8099-1	BG	02.08.02	00:11		51°27.08N	11°42.18W	731	*Madrepora*
623-1	GeoB 8100-1	BG		01:00		51°27.49N	11°42.59W	798	*Madrepora*
624-1	GeoB 8101-1	BG		01:51		51°27.61N	11°42.16W	763	*Madrepora*
624-2	GeoB 8101-2	BG		02:56		51°27.60N	11°42.20W	800	*Madrepora*
625-1	GeoB 8102-1	BG		03:28		51°27.39N	11°42.42W	748	*Madrepora*
626-1	GeoB 8103-1	SAPS		04:57		51°27.49N	11°41.98W	680	1199 litres pumped
627-1	GeoB 8104-1	Dredge		Start: 08:34		51°27.30N	11°42.18W	683	Dead Corals, barnacles
				End: 09:20		51°27.84N	11°41.44W	764	
628-1	GeoB 8105-1	ROV		Start: 11:10		51°27.32N	11°41.43W	739	3.5h video taped
				End: 14:28		51°28.00N	11°42.70W	867	
629-1	GeoB 8106-1	SAPS		16:20		51°27.60N	11°43.00W	880	1337 litres pumped
630-1	GeoB 8107-1	SAPS	03.08.02		Therese Mound	51°27.02N	11°45.14W	796	1011 litres pumped
631-1	GeoB 8108-1	GKG		08:21		51°26.94N	11°45.20W	810	Corals, 10cm rec.
632-1	GeoB 8109-1	GKG		09:42		51°27.10N	11°45.20W	780	Corals
633-1	GeoB 8110-1	GKG		09:47		51°27.10N	11°44.98W	860	Corals
634-1	GeoB 8111-1	GKG		10:52		51°26.90N	11°44.88W	869	Rippled Sand, 15cm rec.