Report of cruise 'Moundforce 2003'

with R.V. Pelagia

Cruise 64PE215, Texel – Galway, 24 July – 19 August

The distribution, morphology and sedimentology of mud mounds in the Faeroe Shetland Channel and carbonate mounds at the SW Rockall Trough Margin

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Introduction

Project background

Cruise M2003 (R.V. Pelagia cruise no. 64PE215) was carried out within the framework of the European Science Foundation funded Moundforce project, which forms part of the EUROMARGIN program. The aim of the project is to study the forcing conditions of cold water carbonate mound formation and to test the hypothesis of a possible linkage between (hydrocarbon related) cold seeps and the development of carbonate mounds, cold water benthic communities and authigenic carbonate formation. Furthermore the geological, geochemical and oceanographical conditions and processes forcing the development of carbonate mounds are studied. The benthic ecosystems and environmental conditions of carbonate mound and cold water coral reefs in contrasting areas of the NE Atlantic Ocean and Mediterranean Sea are subject of study as well. The final objective is to establish the factors governing lithification and stabilisation of carbonate mounds, and to use these as modern analogues of fossil carbonate build ups.
For the present cruise the SW Rockall Trough margin was chosen as study area.

A second goal of the cruise was to study irregular shaped mound-like structures at the seabed in the northern Faeroe-Shetland Channel. Earlier studies (de Haas and de Stigter, 2001) revealed that these structures are mud volcanoes or diapirs. These structures are studied in cooperation with the Southampton Oceanography Centre (SOC, Southampton), the British Geological Survey (BGS, Edinburgh) and the Danish Geological Survey (GEUS, Copenhagen).

Deep water carbonate mounds are well known from the Paleozoic and Mesozoic sedimentary record, but modern analogues are not well described (Riding, 2002). Carbonate mound reefs have been features of Earth's history ever since Cambrian times. These mounds frequently form giant reservoir rocks for hydrocarbon accumulations. However, their formation and environmental controls are the subject of much discussion and disagreement. The discovery of modern coral (mainly Lophelia *pertusa* and Madrepora *oculata)* and coral covered carbonate mounds along the European continental margin (Porcupine Bight, Rockall Trough, Faeroes and Norwegian margins) provides an opportunity to study the processes that create carbonate mounds. The presence of cold water corals on the margins subject of this cruise has been discussed earlier by Wilson (1979a, 1979b), Scoffin et al. (1980), Scoffin and Bowes (1988), Frederiksen et al. (1992), Mortensen et al. (1995), Tudhope and Scoffin (1995), Freiwald et al. (1997) and Freiwald (1998). The biology of the main coral in the research area (Lophelia *pertusa*) has been extensively described by Rogers (1999).
Mound structures with a cross section between 100-1800 m at their base, and rising over 100 m above the seabed and surrounded by a circular depression of 60-90 m deep were noticed in the Porcupine Bight in water depths of 650-1000 m by Hovland et al. (1994). A more recent overview describing more mounds in the Porcupine Bight was published by de Mol et al. (2002). On (3D-)seismic records the mounds on the SW and SE Rockall Trough margins do not show a clear internal structure. Some internal reflectors can be traced troughout a large part of some of the mounds, but the main seismic facies within the mounds is best described as chaotic. A more detailed description of the seismic character of the mounds is given by van Weering et al. (2003b). On both margins the base of the mounds is buried and is formed by an unconformity dated by Stoker et al. (2001) as of Late Early Pliocene age. The mounds in the Porcupine Bight were

suggested to represent modern carbonate knolls, made up of active bioherms or living carbonate reefs composed of ahermatypic corals, possibly developed through seepage of disintegrating gashydrates and other hydrocarbons from below through faults and fissures (Hovland et al., 1994; Henriet et al., 1998). This cold seepage in turn would lead to a higher than normal concentration of bacteria and micro-organisms at the seabed and in the water immediately above, and would have a significant influence on local benthic community development (Hovland and Thomsen, 1989, 1997; Hovland et al., 1998). Prolonged seepage then would result in local accumulation of organisms, the accumulation of skeletal debris and formation of authigenic carbonate, and ultimately in the development of the carbonate mounds. Hovland et al. (1998) proposed that the cold water carbonate reefs with their numerous and rich fauna, would represent a final phase in a natural seep sealing process, after which the ecosystem would be maintained in equilibrium with extant conditions at the seabed. A comparable relationship between hydrocarbon seepage and the formation of carbonate knolls, mounds and massive carbonate build ups, covered with corals and extensive, deviating from normal, benthic community development as advocated above is well known from cold seeps and vents in the Gulf of Mexico (see overview in Aharon, 1994).
By contrast, Kenyon et al. (1998) argue on the basis of sidescan sonar and underwater TV records that current induced structures around the mounds are evident. They suggest that these currents would support abundant living corals and organisms by causing enhanced particulate and organic matter concentrations in the benthic boundary layer. Side scan sonar and seismic data from the Porcupine Bank margin indeed show an erosional moat in the front and along the rim of the mounds, with subsequent sedimentation in the lee side of the mounds (O'Reilly et al., 2000; van Weering et al., 2003b). Other data presented by Kenyon et al. (1998, 2003) also show current induced sediment transport. Similarly, the distribution of cold water coral Lophelia *pertusa* (200-500 m depth) around the Faeroe margin and banks is considered to be due to enhanced food supply by topography induced resuspension on the slope, forced by internal waves or strong currents (Frederiksen et al., 1992) rather than by hydrocarbon seepage. Near-bed current velocity- and turbidity measurements in any of the areas indicated above however, are rare and show variation of current velocities between 1-100 cm s^{-1}. The influence of sea bed morphology on coral development and vice versa is supported by Freiwald (2002) in his discussion on the cold water corals on the Norwegian margin.

Geological setting and oceanography
The present day large scale morphology of the eastern Atlantic margin largely results from rifting during the Mesozoic which resulted in the formation of the North Atlantic Ocean. The area investigated in the N Faeroe-Shetland is located east of Fugloy Ridge, a prominent submarine ridge at 200-1500 meters water depth, extending from the eastern Faeroe shelf in NE direction. The eastern margin of this ridge forms the W slope of the Faeroe-Shetland Channel (FSC). The latter is a NE-SW oriented 1100-1700 m deep basin separating the W Shetland Shelf from the Faeroe Plateau.
The sediments deposited in the FSC are thought to be transported and redeposited by the southward flowing Norwegian Deep Sea Water. This water mass is formed in the Norwegian Sea by cooling and sinking of the surface water. It partly flows southward through the FSC and subsequently either into the Faeroe Bank Channel (S of the Faeroe Islands) or over the Wyville Thomson Ridge into the Rockall Trough (van Aken and Becker, 1996; Rasmussen et al, 1998).

The topographic highs and lows west of Ireland and the British Isles (Porcupine Seabight, Porcupine Bank, Rockall Trough, Rockall Bank, Hatton-Rockall Basin and Hatton Bank) are the product of several successively failed attempts to extend the axis of mid-Atlantic sea-floor spreading to the north east (Naylor and Mounteney, 1975). From the shelf edge west of Ireland and Great Britain the continental slope deepens to a maximum depth of around 3000 m in the southeast Rockall Trough. In the northern part of the Rockall Trough, between Scotland and the islet of Rockall the maximum water depth is about 2 km. The top of Rockall Bank, bordering Rockall Trough in the west, is between 500 and 200 m below sealevel, with only Rockall islet emerging in the north. In the south Rockall Trough deepens into the almost 5 km deep Porcupine Abyssal Plain.
An overview of the oceanographic circulation in the northeastern Atlantic Ocean and water mass properties of the Rockall Trough are given by van Aken and Becker (1996) and Holliday et al. (2000). The Rockall Trough forms one of the gateways of relatively warm surface waters flowing to the north, and cold deep water flowing south, and thus is an important transport path in the global thermo-haline circulation. Internal tides and tidally driven currents that could possibly play a significant role in coral growth and mound formation (Frederiksen et al., 1992) are present at the depth interval in which carbonate mounds are found on both sides of the Rockall Trough (White and Bowyer, 1997; van Weering et al., 2002, de Stigter et al., in prep., White et al., in prep.).

The cruise
The cruise was originally planned to start at Texel (The Netherlands) on 22 July and end in Galway (Ireland) on 20 August. Due to technical problems with the cranes on board of the Pelagia the start of the cruise was delayed until 24 July and the cruise ended on 19 August in Galway for repairs on the electronic controls of the steering system of the research vessel.
The M2003 cruise was organised by the Royal Netherlands Institute for Sea Research (Royal NIOZ) based at Texel, The Netherlands, and carried out with the Royal NIOZ owned and operated research vessel Pelagia. The scientific crew was formed by two scientists from Royal NIOZ, one scientist from the National University of Ireland in Galway and four students from the International University Bremen (Germany), supported by one Royal NIOZ electronic engineer, two marine technicians and the R.V. Pelagia crew. A list of participants is shown in appendix I.

In order to study the mud volcanoes/diapirs and the cold water coral carbonate mounds two study areas were chosen (figure 1). Of the two areas in which mud volcanoes are presently known in the northern Faeroe-Shetland Channel the most eastern one was studied since more information of this site is already known from earlier cruises. The cold water coral mounds were studied in an area on the SW margin of the Rockall Trough, which has been studied in detail during earlier Royal NIOZ cruises (van Weering et al, 1998; van Weering et al, 1999; de Haas et al, 2000; de Stigter et al, 2001; de Haas et al, 2002). During the cruises described in the above mentioned cruise reports the carbonate mounds have been extensively covered by seismic surveys, box and piston coring, sea bed photography and video imaging, CTD water column observations, BOBO benthic lander observations and TOBI side scan sonar. The position of seismic lines and sampling stations during the M2003 cruise was based on the information from the earlier cruises and (in the Faeroe-Shetland

Channel) on a detailed bathymetry map with data obtained during earlier cruises prepared Andrey Akhmetzhanov (SOC, Southampton).

In both research areas seismic lines were recorded, box and piston cores were taken, a BOBO lander was deployed, CTD watercolumn observations were made and seabed photography and video runs were recorded using a hoppercamera system.

Acknowledgements
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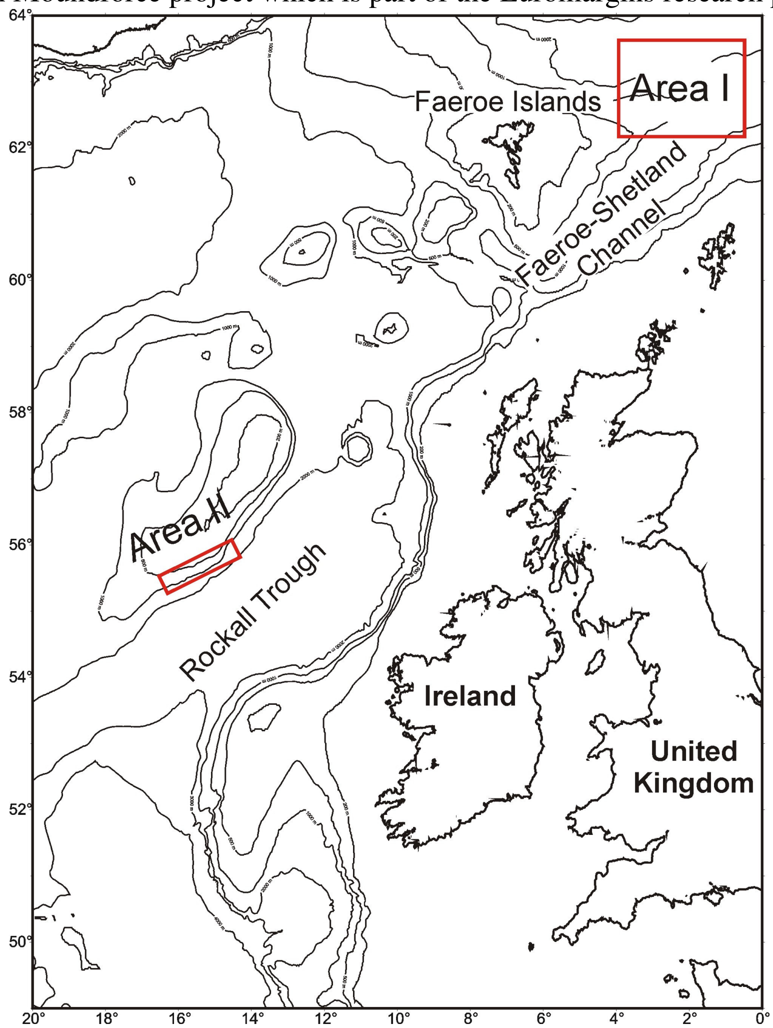

Figure 1. Map of the NW European continental margin with research area I and II indicated.

Methods and results

In both areas seismic lines have been rocorded to obtain an overview of the morphology and the underlying strata of the research areas. During the cruise each seismic survey was followed by a few days of sampling, with the locations of the station based on the seismic surveys and TOBI side-scan sonar dated recorded during the M2002 cruise (de Haas et al., 2002)

Seismics

Two seismic systems were used. A 6 channel system that was used in all survey blocks, and a 24 channel system (running with 18 channels only) that was tested in part of the blocks simultaneously. In both cases the same source was used. Which was an array of 4 TI SG-I sleeve guns (10, 20 and 2x40 cubic inch) shooting at a pressure of 115-120 bars. The shooting rate was 7000 ms. The guns are towed in a frame and chained together with a spacing of 55 cm, center to center. The array is towed by the umbilical cable, in the centre of the ship at a distance of 37 m from the stern. The trigger delay of the guns (so the time interval between the Delph system generating the trigger pulse and the opening of the guns) was 14ms.
The first seismic recording system was a Triton Elics International seismic acquisition equipment and Delph Seismic software (version 1.37). The recording time was 3328 ms and sampling rate 3 kHz. A 6 channel Teledyne streamer consisting of 3 active sections with 2 channels each was used as a receiver. Each channel consisted of 40 Teledyne T2 hydrophones at 17 m in length. The channel interval is 18.75 meters from centre to centre. Digital readout to monitor the depth of the streamer is provided by a depth transducer placed in the front part of each active section. All are calibrated to 30 feet with 1 Bar applied to the pressure gauge.
The second acquisition system consisted of an 18 channel Teledyne streamer made up out of three 63 m active sections with 6 channels each. Each channel consisted of 10 Teledyne T2 hydrophones at 10.5 m in length. The hydrophone interval is 1 m. The streamer is ended by a 0.5 m tailend which contains the last terminating end connector. The receiver was attached to the ship by a tow leader of 60 meters and a stretch member of 25 meters. Seismic recording was performed using the Geo-Resources Geo-Trace 24 hard- and software (version 6.4). This has a 24 channel digital pre-amplification system and 24 channel bandpass filter already integrated. (whereas the 6 channel software is digitizing unfiltered data).

Faeroe Shetland Channel
The seismic survey in the Faeroe-Shetland Channel covered an area of mounds investigated before in 2001 during the STRAT01 cruise with R.V. Pelagia (de Haas and de Stigter, 2001). The mounds, possibly mud volcanoes or mud diapirs, can be up to 100 m in height and up to a few km in diameter. In between the mounds parallel layered sediments are present. The internal structure of the mounds however is hard to determine from the unprocessed data. See appendix IV for a data example. At depth a continuous strong reflector is present in all profiles. This is the extension of Fugloy Ridge, a basalt ridge dipping in northeasterly direction from the Faeroe plateau.

SW Rockall Trough Margin
All the lines were recorded perpendicular to the slope, except for line M2003-24 that was recorded parallel to the slope, crossing all the other lines.

The lines M2003-18, M2003-20 and M2003-21 show the presence of major sediment ripples up to 50m high at the upper slope of the margin. All other profiles show the presence of elongated downslope cold water carbonate mound clusters and single mounds. The mounds can be several kilometres long and can be up to more than 300m high. Internally the mounds mainly show a chaotic reflection pattern. At the lower slope several slumps/slides have been observed.
Line M2003-14 was extended to see if the C10 reflector of Stoker would appear at the surface going more up slope (Stoker et al., 2001). Unfortunately the whole Rockall Bank seems to be covered with a layer of sediment on top of the C10 reflector. Line M2003-13 was recorded across a mound feature that appears (semi-)circular on the TOBI mozaic. On line M2003-13 this mound appeard to consist of two parts (Appendix IV). A strong reflector can be observed in the middle of the mound on which corals seem to have started to grow.

CTD
During the M2003 cruise with the R.V. Pelagia a 911plus SBE CTD with a rosette sampler consisting of 22 Noex bottles of 11 l capacity was used to measure variations in salinity, temperature and optical backscatter in the watercolumn. The CTD was equipped with the following sensors: a temperature sensor; aconductivity sensor; a Digiquartz Pressure sensor: a Chelsea Aqua 3 Fluorometer; a SBE 43 Oxygen sensor; a Seapoint turbidity OBS. The sampling rate was 24Hz and the CTD data was aquired using the Seasave Win32 software version 5.28c. CTD sampling stations for the present cruise included M2003-10 and M2003-13, east of the SW Rockall Trough coral mound region, M2003-20 located between a series of relatively high mounds and M2003-27 located at the lower slope aside the mounds.
At all stations a bottom water sample has been taken for measurements on stable isotopes. 5 litre water bottles have been filled and filtered to measure the amount of suspended matter in the water at specific depths. The subsamples have been filtered on board trough pre-weigth Poretics 0.45 µm polycarbonate filters resting on Orange Scientific 8 µm cellulose nitrate supporting filters, applying underpressure with a vacuum pomp. After filtration of the water the salt was removed from the filters by passing milli-Q water and ethanol trough the filters after which the filters have been stored in petridishes.

A strong decrease in temperature (seasonal thermocline) can be observed between 0 and 50m water depth in all the CTD measurements. Below the 50m depth the temperature continues at slightly different rates depending upon the sampling location and time. At the time during the cruise the surface water had a temperature of 14° C with a salinity of 35.35 psu (Appendix V).
Salinity increases strongly between 0 and 50 m depth, reaching a peak at 100 m. The value of this peak ranges between 35.45 and 35.55 psu. Untill 50 m depth, the turbidity decreases, afterwards generally reaching a relatively stable value for greater depths. The only station where a clear increase in turbidity was present close to the seafloor is M2003-10. The boundary nepheloid layer is found between 520 and 620 m water depth with a sharp peak around 530 m depth. M2003-20 only shows a small-amplitude smooth increase between 500 and 600 m water depth, peaking at about 550 m depth.

Station M2003-27, located just outside the coral mounds region, towards the SW of the area was sampled 5 times over an interval of 12 hours (every 3 hours, stations labelled A-E) to determine tidal influences in the region.
For all 5 sampling stations, salinity increases strongly between 0 and 50 m depth, reaching a peak at 50m. The value of this peak ranges between 35.50 and 35.51 PSU. Local minimums are reached at all 5 stations between 270 and 350 m depth. Local maximums appear clearly below this depth only for stations B and C, around 450 and 400 m respectively. A very small amplitude local maximum is present for 27A around 380 m depth, whereas D and E only show irregular peaks in the regions where the local maximums for the other measurements appear.
The turbidity versus depth profiles only show small, smooth peaks between 650 and 550 m. In time these peaks are changing in depth. At station A the peak is observed between 550 and 600 m water depth. In profile E the peak is shifted towards 600-650 m water depth. This depth is in correspondance with the peaks of the mounds, which might indicate that the corals at the mounds prevail on an enhanced food supply.

BOBO-lander
A NIOZ designed and build BOBO (BOttom BOundary) benthic lander has been deployed in both research areas. The BOBO lander was used to record the temporal variability of bottom water hydrodynamic conditions. The BOBO is a free falling tripod lander with an array of industrially available and/or specifically designed or adapted instruments, designed for long in situ measurements in the lower three meters of the benthic boundary layers in water depths down to 5000m.
The lander was equipped with a downward-looking 1200 kHz RDI instrument ADCP, which is mounted 2m above the seabed for high resolution profiling of near-bed current speed and direction and acoustical backscatter in the lower 2m of the water column. A Seabird SBE-16 CTD is mounted at 3 m above the seabed to obtain records of temporal variabiability of salinity and temperature of the seawater with an interval setting of 5 minutes. Two Seapoint OBS sensors are mounted at respectively 1 and 3 m above the seabed for the detection of particles in suspension. A Technicap PPS 4/3 sediment trap was built into the frame to record particle fluxes at pre-set time (in this case one day) intervals.
In the Faroer Shetland channel the BOBO lander has been deployed for a period of 6 days at the top of a mud mound.
The lander at the SW Rockall Trough Margin was deployed at the upper slope of the margin in a ripple field for a period of 12 days. A survey with the hoppercamera was made to determine if the sediment surface was flat enough for the deployment. In both areas rhe deplolyments were succesful, meaning that all equipment worked throughout the deployments.

Underwater photography and video
Underwater imaging was performed with a Photosea 5000 deep water system (camera and flashlight) mounted in a frame. For making videos two lights were attached to the frame and two cameras. One of the cameras was removed in the second area to obtain better images (so both lights were illuminating the field of view of the remaining camera. The frame is lowered on a cable that relayed the signal of a bottom detector (a Benthos compass hanging on a rope 1.5 m below the frame). In this way a fairly constant distance can be maintained between the frame and the seabed. At each station thirty or more photographs have been made, while at the same time a video film of twenty minutes was running.

The hoppercamera was used at the stations before the sediment sampling to observe the surface and avoid dropstone fields.

At the Faeroe region photographing and videoing was difficult because of the fine sediment that was brought in suspension by the compass and sometimes the frame. The flow velocity of the water in the area was low at the sediment surface, because suspended sediment was not washed away very fast. Several living species espacially brittle stars and worm tubes have been observed on the video images.

Stations at the mounds show the presence of a dense coral cover. The distribution of the corals is very patchy and dead and living corals are present in patches of several dm to meters. Living corals have been found attached to coral debris or other hard substrate like dropstones. The most common corals at the mounds are the corals Madrepora *oculata* and Lophelia *pertusa*, but at other places Stylaster is the dominant species. Other living benthos like sponges, crinoids, echinoderms, fish and octocorals have been observed on the video. On the slopes of the mounds mainly coral debris is found.
A video line was made across the ripple area. Small scale sediment ripples have been found on the sediment waves observed on the TOBI map. A large difference can be seen between the two sides of the ripples. One side is dominated by dropstones, which are sometimes covered with corals or other living species. While the other side is formed by relatively homogenous sandy sediments. Most of the sediment around the mounds is covered with dropstones, which indicates that there has not been any net sedimentation since the last glacial period.

Boxcoring
During the cruise surface sediment cores have been taken using a boxcore with a cylindrical barrel of 30 (Faeroe-Shetland Channel) or 50 cm (Rockall Trough) in diameter and 55cm in height. At the moment of retrieval of the corer the box is closed by a lid, which allows the collection of undisturbed sediment and bottom water. Some of the coring failed due to the presence of big rocks or hard sediments. This resulted occasionally in a damaged coring barrel during retrieval and only the presence of some dropstones or coral branches in the barrel. In other cases the sediment in the boxcore was disturbed or tilted, due to insufficient penetration.
A list of all the boxcores taken during the cruise with related water depth and position is given in appendix II.
After recovery of the corer on the ship the water standing on top of the box was siphoned off. The surface of the box was photographed and a description is made of the biological and sedimentological characteristics of the surface of the boxcore. Subcores for sedimentological and radionuclide analysis were made by inserting or hammering wet PVC liners of 9 cm/11 cm diameter into the sediment. The core barrel was removed and a sedimentological description of the vertical profile of the boxcore was made. The whole boxcore was searched for large fossil content or the presence of dropstones. Occasionally parts of the boxcore have been sieved and have been analysed under a microscope.
The water samples and the subcores have been stored at 4°C. The dead skeletal material was stored dry in open air. Several living coral branches and large animals have been put in the freezer at -80°C.

Faeroe-Shetland area
The sediments in the area were very soft, resulting in good penetration of the cores. The boxcores taken in the Faeroe Shetland channel all show a two layered profile. The top of the boxcores consist of a ~10cm thick layer of olive brown/grey clayey silt. A difference in the second layer can be observed between the boxcores taken at the mud mounds and the boxcores taken beside the mounds. The second layer on the mud mounds is made of slightly silty clay, while the second layer besides the mounds is made of clayey silt. It is remarkable that no anoxic layers have been found in the boxcores.
On the surface brittle stars, worm tubes and big benthic foraminifera have been found. Fe-concretions are often found as well as cm-sized dropstones.
Sedimentary logs of all the boxcores are given in Appendix VI.

SW Rockall Trough margin
After retrieval of the boxcore on deck a water sample has been taken from the boxcores at each station for stable oxygen and carbon isotopic analysis (Appendix IX).
Living coral branches were taken out immediately and have been put in an aquarium in a cold container to keep them alive for further research at the International University Bremen (unfortunately they did not survive). Other living animals were removed and put into ethanol or in the freezer. If present large pieces of coral and other biogenic debris have been removed and stored into boxes.

A big difference in the appearance of the boxcores can be observed between boxes taken at the coral mounds and boxes taken besides the mounds.
The sediment found in the boxcores taken at the mounds consist of greyish yellow biogenic (mainly foraminifera) silty fine to very coarse sand with various amounts of coral debris throughout the core. The coarsest debris is usually found at the top of the core decreasing in size going downcore. Burrows have been found in the upper part of the boxcore, often observed by a difference in colour. Fe-oxidised zones have been found at the top layer of the boxcores. Microscopic analysis shows that the sediment mainly consists of foraminifera and other biogenic fragments of bivalves, brachiopods, corals and sponges only a small percentage is formed by siliciclastic grains. In almost all cores taken at the mounds living corals and coral debris were covering the sediment surface. Some cores were only covered with some loose coral debris, but in other cores branches of living corals and dead coral have been found up to 20cm high. The most common framebuilders are the corals Lophelia *pertusa* and Madrepora *oculata*, but also very common is the presence Stylaster sp., Gorgonians and solitary corals. Other living species associated with the corals have been found like free living ophiuroids, crinoids, star fish, polychaetes and crustaceans. Several species have been found attached to the corals like different sponge species, anemones, hydroids, bryozoans, brachiopods and bivalves.
The species diversity is related to the station position and differs from place to place. For instance large sponges (∅ 20cm) have been found at station M2003-21, while at station M2003-23 Stylaster is the most dominant species. The species diversity has also been observed on the videotapes made with the hoppercamera.
In several boxcores taken in the area dropstones have been found, which are ranging in size from several cm (M2003-15, M2003-26) up to 60cm (M2003-13). Most of the dropstones are metamorphic, but granites and some sedimentary rocks have been

found. Several animals like sponges, bryozoa and corals were attached to the dropstones.
The boxcore stations besides the mounds contained some living benthos, but no corals. The sediment is much coarser than the sediment of the mounds and consist mainly of greyish brown biogenic medium to very coarse sand. At station M2003-20 the sediment consists largey of the skeletal debris of pteropods.
Several attempts have been made to sample the sediment wave area at the upper slope, but only one good boxcore was recovered. M2003-18 consists of medium biogenic sand with some lenses of coarse sand and pebbles throughout the whole core.

Piston coring
Pistoncores were taken using the NIOZ piston corer with a core head weight of 1500kg and fitted out with a 6-12m long barrel and 9-11cm diameter pipes. On deck the liner was cut into pieces of approximately 1.10 m or shorter if necessary, capped, labelled, and stored at 4° C. In addition the magnetic susceptibility of all cores was measured with a Bartington MS2C magnetic susceptibility meter with a 12 cm diameter loop.

Faeroe-Shetland Channel
At locations M2003-04, M2003-05, and M2003-06 piston cores were taken with a length of 7.79 m, 6.58 m, and 5.58 m respectively. During the cruise cores M2003-04 and M2003-06 were opened and described in more detail. Descriptions of the pistoncores are given in Appendix VII.
Core M2003-04, taken at the top of a mudmound, consists mainly of dark brown silty clay with a distinct layer of green clay between 5 m and 6 m depth and dark and hard stiff clay between 7 m and 7.50 m. Underneath the clay layers a unit is observed of cm-sized clay pebbles in a matrix of silty clay. The upper 5 m shows alternations of water rich and more compacted layers with burrows and pebbles. Below the green clay layer carbonate debris was found.
The magnetic susceptibility of the silty clay layers varies between 50 and 140 cgs whereas the green clay and the dark stiff clay show very low values around 20 cgs. The green clay layer is thought to be related to an outflow of mud. Core M2003-06, taken in between the mud mounds, consists of different gradations of silty clay, which can be divided into two sections. The upper 2 m consists of water rich brownish layers, while the lower part of the core turns into more compacted grey, slightly sandy silty clay towards the bottom. In the top part (approx. 1 m) iron oxide grains were found while the second section contains biogenic carbonate debris, like foraminifera and parts of shells. Throughout the core burrows and small pebbles, also a clay pebble, were visible. Two big (~3cm) metamorphic pebbles have been observed at 500cm and 630 cm depth.
This distinction of the two sections was also supported by the magnetic susceptibility data. The first water rich unit is characterised by variations between 40 and 80 cgs with a pronounced peak of 112.3 cgs at 75 cm depth which can be attributed to the iron oxides in that part. The second unit shows nearly constant values around 30 cgs.
The magnetic susceptibility data from station M2003-05 can be compared with the data from M2003-06. The profile can also be divided in two sections with high magnetic susceptibility in the upper 2m and low susceptibility in the lower part of the core. Several high peaks in the upper section can be correlated and are indicated in red in Appendix VIII.

SW Rockall Trough Area
At the SW Rockall Trough margin several attempts have been made to pistoncore the coral mounds. A short pistoncore barrel of 6 m with a liner of 11 cm diameter was used, because less penetration was expected, due to extremely hard sediments and the presence of cemented layers in the sediment as revealed during earlier cruises. Several attempts failed and plastic noses and core catchers were lost, the steel nose was damaged and one core barrel was bended. Only three pistoncores at the stations M2003-21, M2003-23 and M2003-28 succeeded with a length of respectively 86 cm, 432 cm, and 158 cm long.
None of the cores was opened on board. The sediment visible while cutting seemed to be of the same type as the boxcores (biogenic fine sand with coral debris). The steel nose of the pistoncore taken at station M2003-21 was covered with cemented sediment, which might also be the reason for the short length of the pistoncore.
The magnetic susceptibility of core M2003-21 appears to be quite stable and the low magnetic susceptibility is characteristic for carbonate rich sediments and lies around 20 to 30 cgs in the upper 50 cm to 60 cm. It increases to 53 cgs at about 70 cm which might be related to a dropstone or some grains of iron oxide.
The upper 180 cm of core M2003-23 have a quite high magnetic susceptibility probably due to dropstones and glacial debris throughout the core. Below 180 cm the values fall below 20 cgs as typical for carbonate rich sediments with a high peak at 300 cm.
Core M2003-28 shows higher values than typical for biogenic silt or clay with a peak in the upper 20 cm which might be due to iron oxidized burrows as seen in boxcores. These higher values can be attributed to glacial debris and small dropstones.

Core M2003-09 was taken to replace core ENAM9606, which has been almost entirely subsampled.

Microbiology and SAPS

The focus of sampling during the cruise was to collect sediment and filtered water samples from the Rockall Bank, in and around the Pelagia mounds. Table 1 lists the sediments collected from boxcore subsamples during the cruise. 4 cores were used for enzyme substrate utilization experiments. The cores were sectioned into 1 cm horizons from 0-1 cm to 4-5 cm and mixed with filtered, autoclaved seawater to make sediment slurries (3 parts water to 1 part sediment). 4 ml of the slurries were dispensed into 5ml tubes and amended with one of the fluorecently-labelled substrates MCA-leucine (aminopeptidase activity), MUF α– D glucoside (α-D glucosidase activity) or MUF β-D glucoside (β-D glucosidase activity). A time course was performed with subsamples fixed every 2 hours. The enzymes produced by the bacterial community cleave the substrates releasing the fluorescent tag which can be subsequently measured with a UV spectrophotometer. This part of the analysis will be carried out in Galway.
The cores for DNA analysis were sectioned at 1 cm intervals and frozen. Back in Galway, DNA will be extracted from the cores and a region of the 16S rDNA gene will be amplified with PCR. Fingerprints of the community structure of Bacteria and Archaea will be generated using Denaturing Gradient Gel Electrophoresis (DGGE).

All cores were subsampled for bacterial abundance. 1 cm^3 of sediment was fixed with 9 ml of 2% formaldehyde and stored at 4^0C. Bacterial numbers will be determined by epifluorescent microscopy of Sybr-Gold stained cells.

Table 1. Sediment samples used for microbiological studies.

Date	Station	Lat (N)	Long (W)	Enzymes	DNA
4/8/03	M2003-	55 39.02	13 59.10	1	
7/8/03	M2003-11	55 41.51	15 25.05		1
7/8/03	M2003-14	55 38.15	15 27.72	1	1
8/8/03	M2003-16	55 34.37	15 24.63		2
10/8/03	M2003-18	55 37.40	15 49.48	1	1
11/8/03	M2003-22	55 29.95	15 47.82		1
11/8/03	M2003-23	55 30.21	15 47.11	1	
12/8/03	M2003-24	55 29.85	15 48.71		1
15/8/03	M2003-30	55 25.42	16 06.90		1*

*NB: the core taken on the 15^{th} will be used to isolate and cultivate Bacteria. The core was sliced into 1cm sections and store at 4^0C

Water samples were collected using the Stand Alone Pumping System (SAPS). This pump can be deployed at any given depth and pump large amounts of seawater. The pump was set for 1 hour pumping time. The filters were wrapped in foil and ashed (4000C, 3-4 hours) before deployment whilst after deployment they were immediately frozen (-80^0C) for the rest of the cruise. Half of each filter was kept for microbiological analyses while the rest of the filters will be analysed for lipids, chlorophylls and isotopes (C, N) by the University of Liverpool (George Wolff) in order to obtain information about the quality and quantity of Particulate Organic Matter (POM) that may be available to the corals and associated fauna. The microbiological analysis will involve generating community fingerprints of extracted DNA in the same way as for sediments.

Table 2. SAPS samples

Date	Station	Lat (N)	Long (W)	Depth	Volume filtered
7/8/03	M2003-14	55 38.15	15 27.72	20 mab	161
8/8/03	M2003-17	55 33.40	15 31.59	827 (20 mab)	568
10/8/03	M2003-21	55 29.62	15 48.25	540 (20 mab)	613
11/8/03	M2003-23	55 30.21	15 47.11	100	584
15/8/03	M2003-33	55 20.00	16 26.00	976 (20 mab)	596

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Appendix I, Participants

Scientific crew

Judith Ahues	Student	International University Bremen
Lorendz Boom	Marine technician	Royal NIOZ
Donal Eardly	Microbiologist	National Univ. of Ireland, Galway
Henk de Haas	Geologist (expedition leader)	Royal NIOZ
Bob Koster	Electronic engineer	Royal NIOZ
Irene Maier	Student	International University Bremen
Furu Mienis	Geologist	Royal NIOZ
Ana Pascual	Student	International University Bremen
Willem Polman	Marine technician	Royal NIOZ
Aurora Simionescu	Student	International University Bremen

Pelagia Crew

Thomas Bijl	Second officer
Piet Boon	AB
Casper Brands	Stagiair
Charles Leeuw	Captain
Sjaak Maas	AB
Garl Mik	Cook
Jeroen Noordzij	Second engineer
Bert Puijman	Chief Officer
Jaap Seepma	Chief Engineer
Ron van der Slikke	AB
Ger Vermeulen	AB

Appendix II, Station data

Faeroe-Shetland Channel (Area I)

Seismic lines

Line	Date/Time	Position		Depth	Event
M2003-01	7/27/2003 21:48	62º 26.13 'N	1º 26.24 'W	1668	SOL (6/24 channel)
M2003-01	7/28/2003 6:01	62º 47.49 'N	1º 00.00 'W	1606	EOL
M2003-02	7/28/2003 8:37	62º 42.73 'N	1º 09.31 'W	1618	SOL
M2003-02	7/28/2003 11:10	62º 40.90 'N	1º 26.57 'W	1709	EOL
M2003-03	7/28/2003 13:12	62º 38.80 'N	1º 19.02 'W	1663	SOL
M2003-03	7/28/2003 15:18	62º 38.29 'N	1º 05.01 'W	1594	EOL
M2003-04	7/28/2003 17:11	62º 40.37 'N	1º 01.96 'W	1573	SOL
M2003-04	7/28/2003 20:55	62º 40.88 'N	1º 26.63 'W	1696	EOL
M2003-05	7/28/2003 23:18	62º 43.16 'N	1º 27.96 'W	1713	SOL
M2003-05	7/29/2003 2:30	62º 35.00 'N	1º 13.41 'W	1635	EOL
M2003-06	7/29/2003 3:36	62º 36.99 'N	1º 08.49 'W	1606	SOL
M2003-06	7/29/2003 5:30	62º 42.69 'N	1º 09.39 'W	1618	EOL
M2003-07	7/29/2003 7:54	62º 44.00 'N	1º 22.01 'W	1651	SOL
M2003-07	7/29/2003 11:39	62º 33.00 'N	1º 16.00 'W	1647	EOL

3.5 kHz

Line	Date/Time	Position		Depth	Event
M2003-08	7/29/2003 20:39	62º 39.44 'N	1º 10.15 'W	1617	SOL
M2003-08	7/29/2003 21:30	62º 42.60 'N	1º 06.15 'W	1598	EOL
M2003-09	7/29/2003 22:29	62º 40.41 'N	1º 04.02 'W	1583	SOL
M2003-09	7/29/2003 23:33	62º 40.58 'N	1º 13.71 'W	1644	EOL
M2003-10	7/30/2003 0:06	62º 40.35 'N	1º 19.96 'W	1671	SOL
M2003-10	7/30/2003 1:03	62º 36.65 'N	1º 17.87 'W	1656	EOL

CTD

Station	Date/Time	Position		Depth	Remarks
M2003-01	7/27/2003 8:23	62º 00.00 'N	1º 57.99 'W	1602	

Boxcores

Station	Date/Time	Position		Depth	Remarks
M2003-01	7/27/2003 10:44	62º 00.04 'N	1º 57.94 'W	1602	
M2003-04	7/30/2003 10:47	62º 40.75 'N	1º 08.33 'W	1479	
M2003-03	7/30/2003 14:37	62º 38.49 'N	1º 10.60 'W	1574	
M2003-02	7/30/2003 15:50	62º 38.54 'N	1º 12.05 'W	1586	failed
M2003-02	7/30/2003 17:00	62º 38.54 'N	1º 12.07 'W	1565	
M2003-05	7/30/2003 19:03	62º 42.24 'N	1º 06.45 'W	1592	failed
M2003-05	7/30/2003 20:02	62º 42.24 'N	1º 06.44 'W	1592	
M2003-06	7/31/2003 13:47	62º 38.59 'N	1º 18.93'W	1702	
M2003-07	7/31/2003 17:03	62º 38.77 'N	1º 20.26 'W	1610	failed
M2003-07	7/31/2003 17:59	62º 38.76 'N	1º 20.25 'W	1610	failed
M2003-07	7/31/2003 18:54	62º 38.75 'N	1º 20.26 'W	1574	failed
M2003-08	8/1/2003 11:03	62º 46.00 'N	1º 07.51 'W	1601	

Hopper camera

Station	Date/Time	Position		Depth	Remarks
M2003-02	7/29/2003 13:44	62º 38.58 'N	1º 12.10 'W	1553	failed
M2003-02	7/29/2003 15:12	62º 38.55 'N	1º 12.05 'W	1561	photo/video
M2003-03	7/29/2003 16:52	62º 38.49 'N	1º 10.56 'W	1576	photo/video
M2003-04	7/30/2003 8:37	62º 40.74 'N	1º 08.31 'W	1479	photo/video

M2003-06	7/31/2003 11:19	62º 38.59 'N	1º 18.94 'W	1671	photo/video

Pistoncore

Station	Date/Time	Position		Depth	Remarks
M2003-04	7/30/2003 12:28	62º 40.74 'N	1º 08.36 'W	1479	
M2003-05	7/31/2003 8:48	62º 42.25 'N	1º 06.43 'W	1592	
M2003-06	7/31/2003 15:38	62º 38.59 'N	1º 18.96 'W	1708	

BOBO lander

Station	Date/Time	Position		Depth	Event
M2003-01	7/27/2003 11:41	62º 00.01 'N	1º 58.03 'W	1602	deployment
M2003-01	8/01/2003 8:00	62º 00.01 'N	1º 58.03 'W	1602	recovery

SW Rockall Trough Margin(Area II)

Seismic lines

Line	Date/Time	Position		Depth	Event
M2003-11	8/5/2003 12:22	55º 49.51 'N	15º 16.81 'W	414	SOL (6 channel)
M2003-11	8/5/2003 17:16	55º 34.70 'N	15º 09.11 'W	1370	EOL
M2003-12	8/5/2003 19:07	55º 32.55 'N	15º 15.11 'W	1386	SOL
M2003-12	8/6/2003 0:09	55º 46.08 'N	15º 26.24 'W	471	EOL
M2003-13	8/6/2003 1:33	55º 44.68 'N	15º 33.24 'W	471	SOL
M2003-13	8/6/2003 3:39	55º 43.75 'N	15º 32.06 'W	471	EOL
M2003-13A	8/6/2003 3:49	55º 43.37 'N	15º 32.18 'W	471	SOL
M2003-13A	8/6/2003 8:13	55º 31.19 'N	15º 21.97 'W	1322	EOL
M2003-14	8/6/2003 9:35	55º 29.31 'N	15º 28.24 'W	1304	SOL
M2003-14	8/6/2003 18:30	55º 53.57 'N	15º 48.55 'W	340	EOL
M2003-15	8/8/2003 22:03	55º 23.55 'N	15º 37.74 'W	1506	SOL (6 channel)
M2003-15	8/9/2003 4:03	55º 40.00 'N	15º 51.41 'W	475	EOL
M2003-16	8/9/2003 5:17	55º 38.62 'N	15º 55.80 'W	481	SOL
M2003-16	8/9/2003 10:14	55º 25.08 'N	15º 44.53 'W	1234	EOL
M2003-17	8/9/2003 11:21	55º 23.60 'N	15º 49.35 'W	1252	SOL
M2003-17	8/9/2003 16:05	55º 37.10 'N	16º 00.63 'W	490	EOL
M2003-18	8/9/2003 18:45	55º 30.30 'N	16º 05.01 'W	676	SOL
M2003-18	8/9/2003 23:09	55º 40.18 'N	15º 49.90 'W	471	EOL
M2003-19	8/12/2003 19:03	55º 22.33 'N	15º 54.10 'W	1245	SOL (6/24 channel)
M2003-19	8/13/2003 0:19	55º 36.17 'N	16º 05.67 'W	498	EOL
M2003-20	8/13/2003 1:42	55º 33.97 'N	16º 12.51 'W	487	SOL
M2003-20	8/13/2003 4:02	55º 27.11 'N	16º 13.95 'W	810	EOL
M2003-21	8/13/2003 4:46	55º 27.13 'N	16º 17.40 'W	746	SOL
M2003-21	8/13/2003 6:19	55º 31.66 'N	16º 20.42 'W	554	EOL
M2003-22	8/13/2003 7:02	55º 32.37 'N	16º 18.02 'W	542	SOL
M2003-22	8/13/2003 12:08	55º 18.88 'N	16º 06.63 'W	1282	EOL
M2003-23	8/13/2003 13:47	55º 16.77 'N	16º 15.64 'W	1298	SOL
M2003-23	8/13/2003 18:37	55º 30.32 'N	16º 26.91 'W	557	EOL
M2003-24	8/16/2003 15:30	55º 23.10 'N	16º 36.76 'W	789	SOL (6/24 channel)
M2003-24	8/16/2003 19:36	55º 26.07 'N	16º 15.35 'W	804	TURN
M2003-24	8/17/2003 8:01	55º 42.01 'N	15º 16.22 'W	633	EOL
M2003-24A	8/17/2003 9:13	55º 41.86 'N	15º 16.76 'W	560	SOL
M2003-24A	8/17/2003 11:11	55º 44.46 'N	15º 07.11 'W	603	EOL

CTD

Station	Date/Time	Position		Depth	Remarks

M2003-10	8/7/2003 17:35	55º 41.92 'N	15º 18.11 'W	627	
M2003-13	8/7/2003 11:09	55º 37.31 'N	15º 19.07 'W	850	
M2003-20	8/10/2003 14:08	55º 31.90 'N	15º 50.18 'W	773	
M2003-27A	8/14/2003 8:22	55º 25.01 'N	16º 07.01 'W	932	
M2003-27B	8/14/2003 11:20	55º 24.99 'N	16º 06.96 'W	932	
M2003-27C	8/14/2003 14:08	55º 25.01 'N	16º 06.99 'W	932	
M2003-27D	8/14/2003 16:49	55º 24.98 'N	16º 06.94 'W	935	
M2003-27E	8/14/2003 19:38	55º 24.99 'N	16º 06.98 'W	935	

Boxcores

Station	Date/Time	Position		Depth	Remarks
M2003-09	8/4/2003 8:47	55º 39.10 'N	13º 59.13 'W	2548	
M2003-10	8/4/2003 19:51	55º 41.92 'N	15º 18.12 'W	627	Collapsed
M2003-11	8/7/2003 8:27	55º 44.50 'N	15º 25.04 'W	484	
M2003-12	8/7/2003 10:12	55º 39.32 'N	15º 20.66 'W	731	
M2003-13	8/7/2003 14:28	55º 37.34 'N	15º 19.10 'W	856	Failed, only water
M2003-13A	8/7/2003 15:01	55º 37.33 'N	15º 19.11 'W	837	Failed, boulder
M2003-14	8/7/2003 17:06	55º 38.14 'N	15º 27.72 'W	590	
M2003-15	8/8/2003 10:06	55º 37.59 'N	15º 27.30 'W	761	Failed, dumped on deck
M2003-15A	8/8/2003 10:39	55º 37.58 'N	15º 27.29 'W	761	Failed, pebble between barrel
M2003-15B	8/8/2003 11:15	55º 37.60 'N	15º 27.31 'W	758	Failed, pebble between barrel
M2003-16	8/8/2003 13:24	55º 34.38 'N	15º 24.60 'W	1026	
M2003-17	8/8/2003 15:58	55º 33.40 'N	15º 31.58 'W	834	Partly flushed out
M2003-18	8/10/2003 9:28	55º 37.40 'N	15º 49.47 'W	554	
M2003-19	8/10/2003 13:21	55º 33.98 'N	15º 51.89 'W	575	
M2003-20	8/10/2003 16:31	55º 31.90 'N	15º 50.16 'W	773	
M2003-21	8/10/2003 18:28	55º 29.62 'N	15º 48.24 'W	563	
M2003-22	8/11/2003 9:29	55º 29.95 'N	15º 47.81 'W	618	
M2003-23	8/11/2003 11:37	55º 30.22 'N	15º 47.11 'W	673	
M2003-24	8/12/2003 9:40	55º 29.85 'N	15º 48.45 'W	575	
M2003-25	8/12/2003 11:40	55º 30.11 'N	15º 48.69 'W	690	Failed, empty barrel
M2003-25A	8/12/2003 12:06	55º 30.12 'N	15º 48.69 'W	678	Tilted surface
M2003-26	8/12/2003 14:41	55º 30.41 'N	15º 48.70 'W	800	Failed, boulders
M2003-26A	8/12/2003 15:22	55º 30.42 'N	15º 48.71 'W	800	Failed, barrel bended
M2003-28	8/14/2003 10:45	55º 25.90 'N	16º 06.84 'W	825	90º tilted
M2003-29	8/14/2003 15:11	55º 26.15 'N	16º 06.96 'W	749	Failed, did not trip
M2003-29A	8/14/2003 15:48	55º 26.13 'N	16º 06.97 'W	792	Failed, did not trip
M2003-29B	8/14/2003 16:13	55º 26.13 'N	16º 06.92 'W	785	Failed, scrape off
M2003-30	8/15/2003 8:29	55º 26.43 'N	16º 06.90 'W	676	
M2003-31	8/15/2003 14:36	55º 25.30 'N	16º 12.34 'W	846	Failed
M2003-32	8/15/2003 17:08	55º 31.22 'N	16º 21.97 'W	569	Failed, hard sediment
M2003-34	8/16/2003 9:26	55º 25.36 'N	16º 20.64 'W	810	Failed, hard sediment
M2003-35	8/16/2003 11:42	55º 25.15 'N	16º 22.32 'W	734	

Hoppercamera

Station	Date/Time	Position		Depth	Remarks
M2003-10	8/4/2003 18:49	55º 41.93 'N	15º 18.13 'W	627	
M2003-13	8/7/2003 13:12	55º 37.34 'N	15º 19.10 'W	834	
M2003-14	8/7/2003 16:01	55º 38.16 'N	15º 27.72 'W	587	
M2003-15	8/8/2003 9:00	55º 37.57 'N	15º 27.30 'W	761	Video
M2003-17	8/8/2003 14:36	55º 33.40 'N	15º 31.59 'W	837	
M2003-18	8/10/2003 8:28	55º 37.59 'N	15º 49.24 'W	548	
M2003-19	8/10/2003 11:15	55º 33.97 'N	15º 51.87 'W	575	

M2003-20	8/10/2003 15:15	55º 31.89 'N	15º 50.19 'W	773	
M2003-21	8/10/2003 17:22	55º 29.63 'N	15º 48.24 'W	563	
M2003-22	8/11/2003 8:37	55º 29.94 'N	15º 47.82 'W	603	
M2003-23	8/11/2003 10:40	55º 30.22 'N	15º 47.11 'W	667	
M2003-24	8/12/2003 8:39	55º 29.85 'N	15º 48.45 'W	575	
M2003-25	8/12/2003 10:49	55º 30.11 'N	15º 48.71 'W	693	
M2003-26	8/12/2003 13:23	55º 30.42 'N	15º 48.71 'W	800	
M2003-28	8/14/2003 9:45	55º 25.91 'N	16º 06.84 'W	822	
M2003-29	8/14/2003 13:24	55º 26.14 'N	16º 06.98 'W	825	
M2003-30	8/14/2003 18:33	55º 26.42 'N	16º 06.90 'W	679	
M2003-31	8/15/2003 13:40	55º 25.30 'N	16º 12.33 'W	840	
M2003-32	8/15/2003 16:12	55º 31.38 'N	16º 12.96 'W	581	SOL of videoline
M2003-32	8/15/2003 16:37	55º 31.08 'N	16º 13.09 'W	575	EOL of videoline
M2003-34	8/16/2003 8:31	55º 25.37 'N	16º 20.64 'W	810	
M2003-35	8/16/2003 10:33	55º 25.15 'N	16º 22.34 'W	737	

Pistoncores

Station	**Date/Time**	**Position**		**Depth**	**Remarks**
M2003-09	8/4/2003 11:26	55º 39.02 'N	13º 59.11 'W	2548	
M2003-23	8/11/2003 13:44	55º 30.22 'N	15º 47.13 'W	673	
M2003-21	8/11/2003 15:55	55º 29.62 'N	15º 48.26 'W	560	failed
M2003-21	8/11/2003 17:06	55º 29.62 'N	15º 48.23 'W	563	
M2003-28	8/15/2003 9:29	55º 25.91 'N	16º 06.84 'W	822	failed
M2003-28	8/15/2003 11:08	55º 25.91 'N	16º 06.84 'W	822	

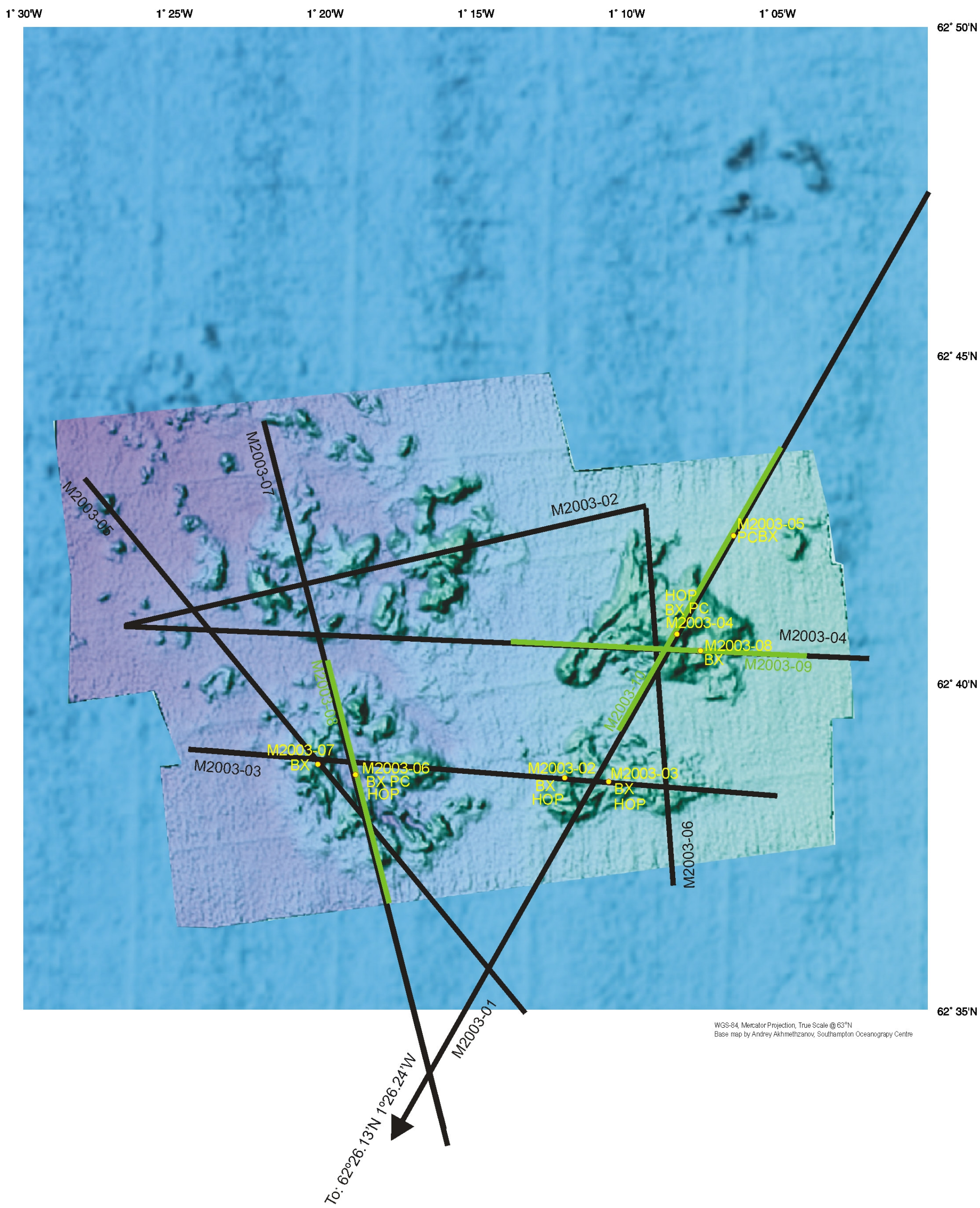
BOBO lander

Station	**Date/Time**	**Position**		**Depth**	**Event**
M2003-10	8/5/2003 8:39	55º 41.92 'N	15º 18.10 'W	627	deployment
M2003-10	8/17/2003 13:44	55º 41.81 'N	15º 17.99 'W	633	recovery

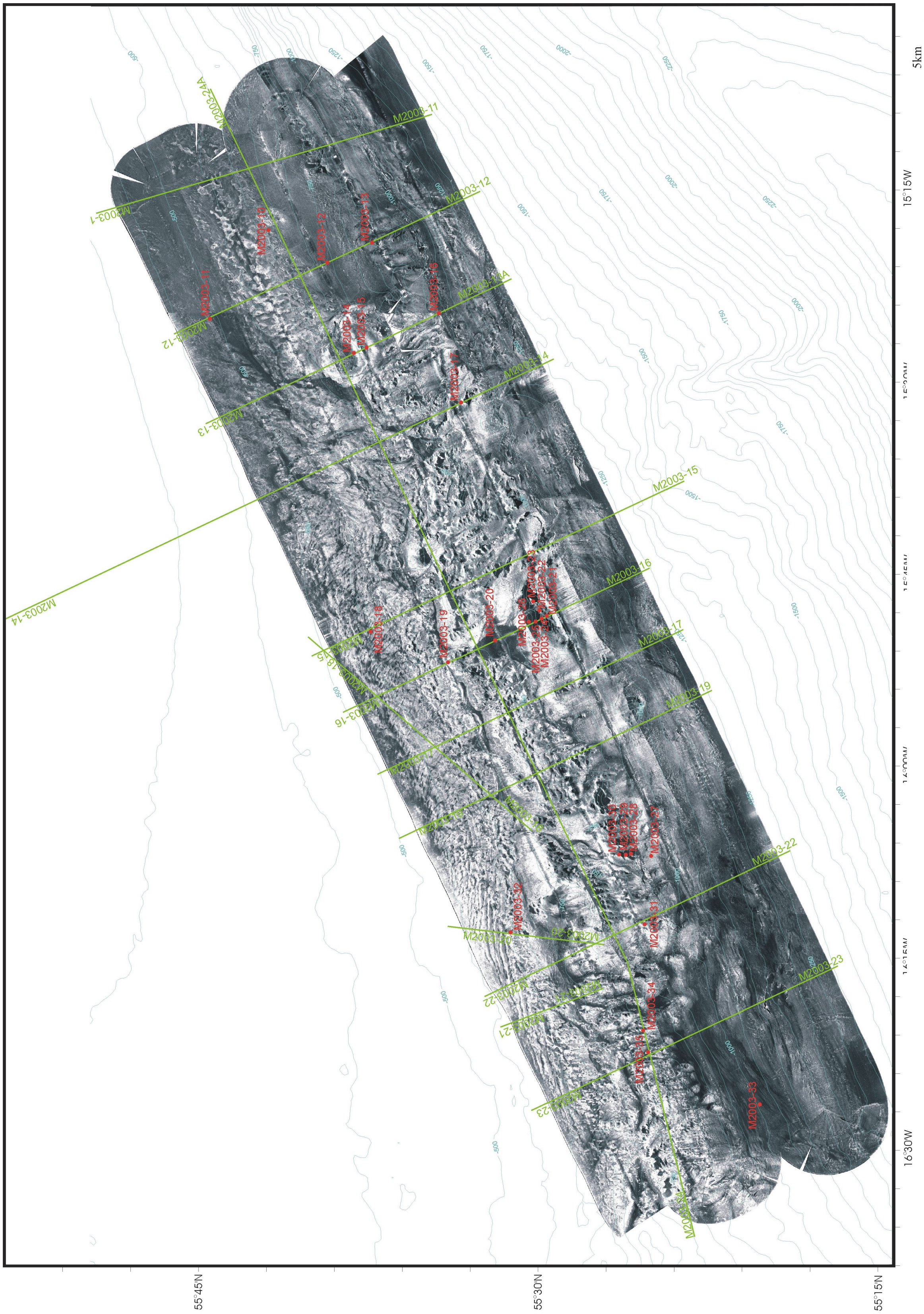
SAPS

Station	**Date/Time**	**Position**		**Depth**	**Remarks**
M2003-14	8/7/2003 17:38	55º 38.16 'N	15º 27.71 'W	587	
M2003-17	7/8/2003 16:43	55º 33.40 'N	15º 31.55 'W	846	
M2003-21	7/10/2003 18:57	55º 29.61 'N	15º 48.23 'W	563	
M2003-21	7/11/2003 17:46	55º 29.61 'N	15º 28.17 'W	566	
M2003-33	7/15/2003 19:09	55º 20.22 'N	16º 26.41 'W	996	

Appendix III, Maps with station positions

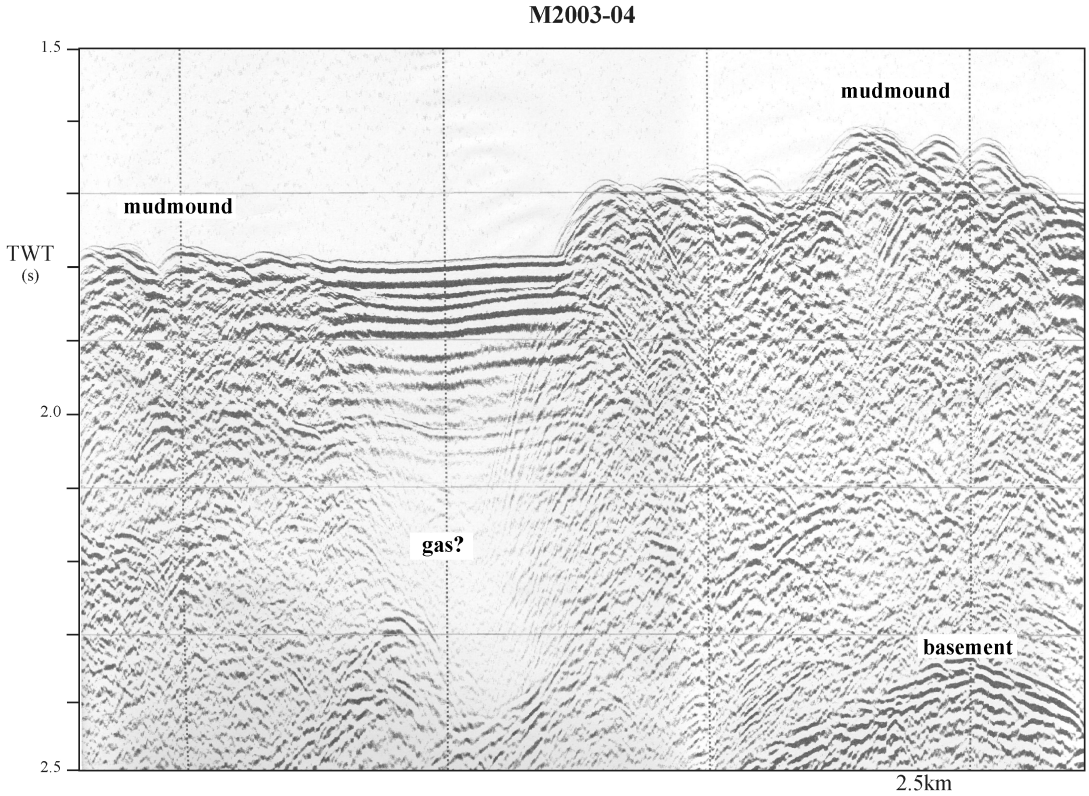


Stations and lines Faeroe-Shetland Channel (Area1)

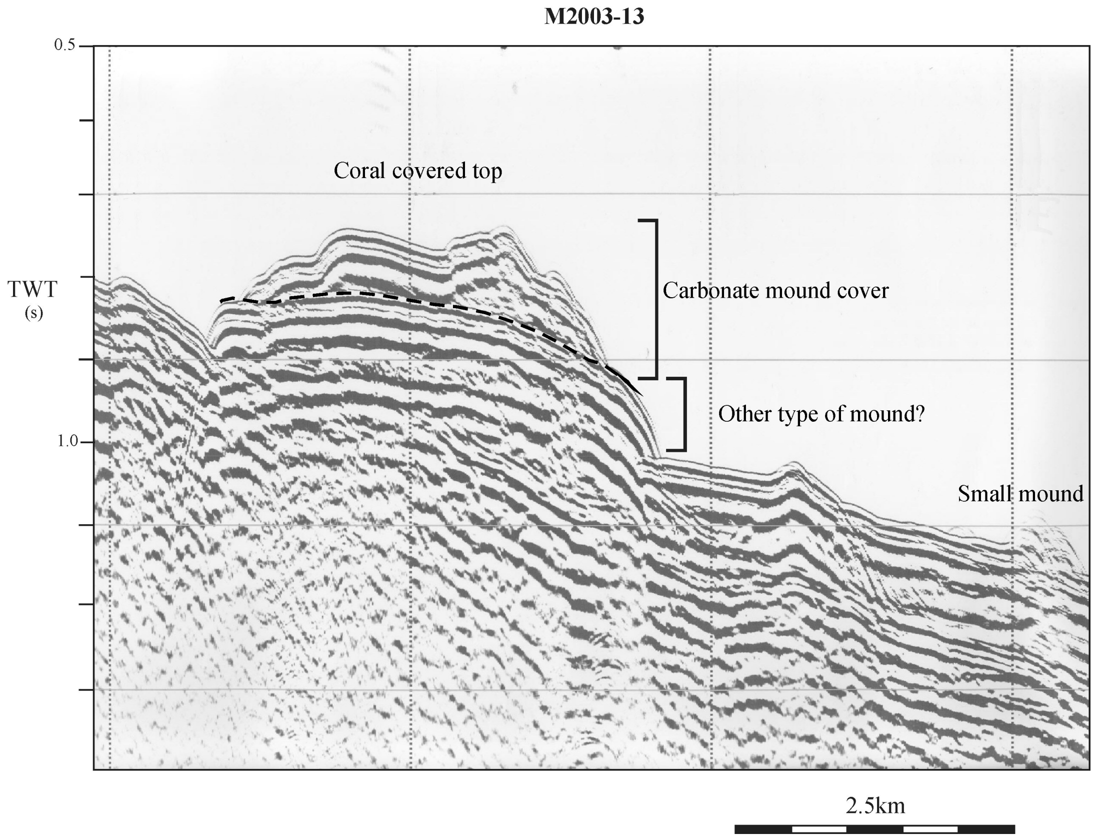


Stations and lines SW Rockall Trough (Area II)

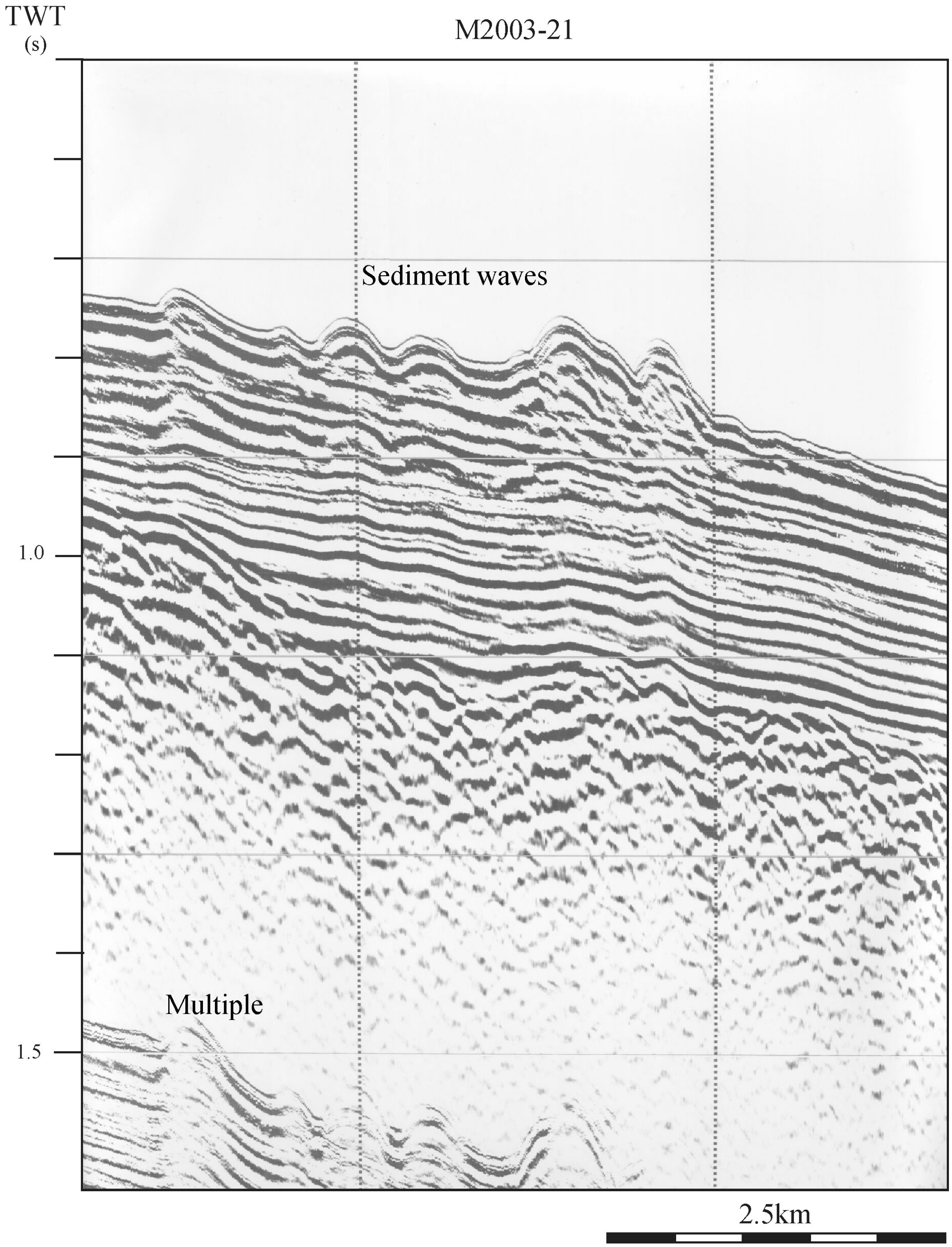
Appendix IV, Seismic profiles



Example of a seismic line across the mud mounds in the Faeroe-Shetland Channel. The lack of internal reflectors in the centre of the image might result from the presence of gas.

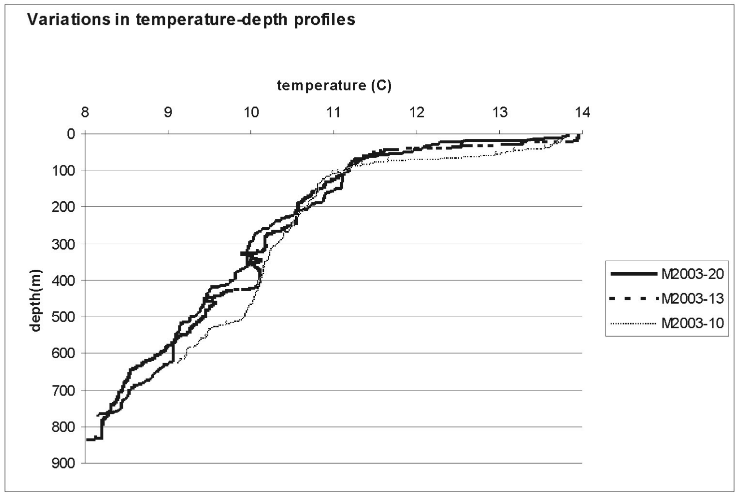


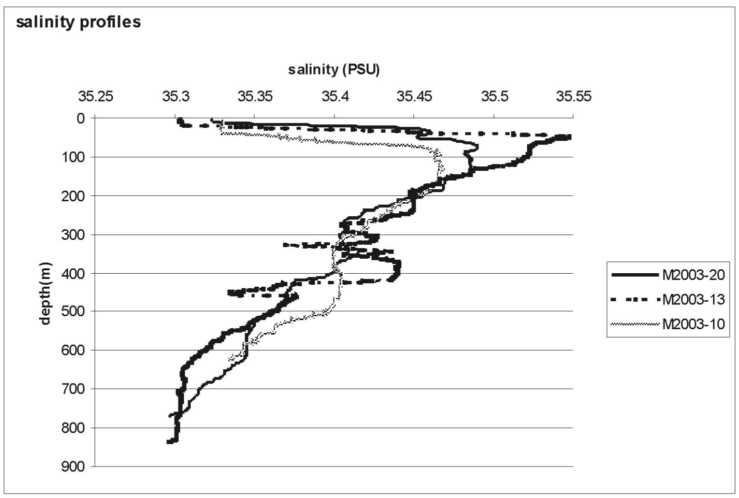
Seismc profile across a mound on the slope of the Rockall Bank. This mound appears as a circular structure on the M2002 TOBI side scan mozaic (Appendix III, right hand side of the TOBI image). A clear internal reflector (dashed line) is present on which a cold water carbonate mound appears to have developed.

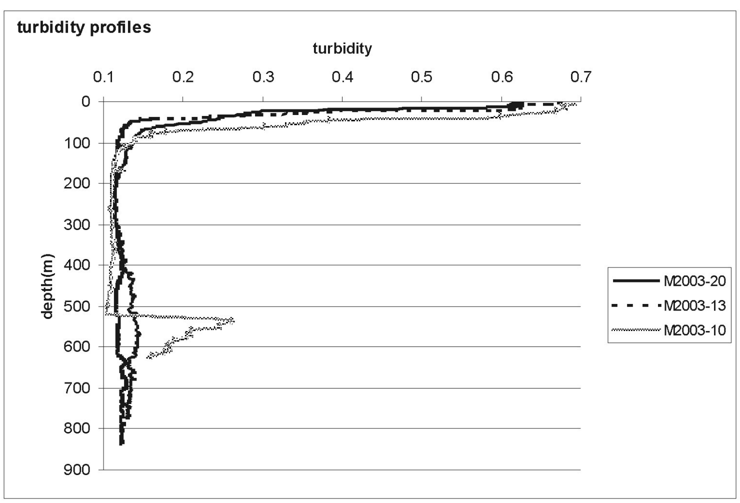


Seismic line across megaripples shown on the upper left hnd side of the M2002 TOBI mozaic (Appendix III).

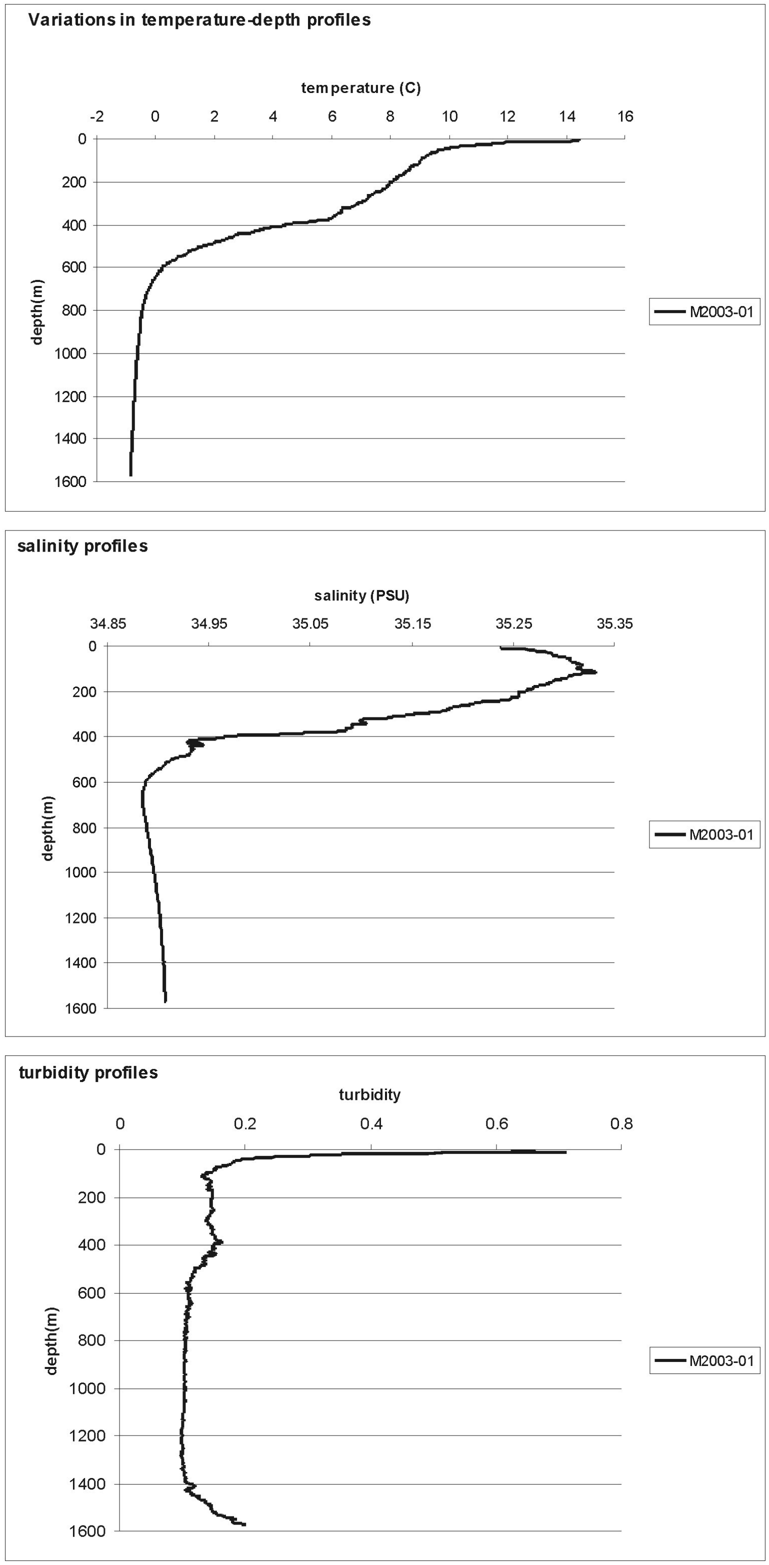
Appendix V, CTD profiles



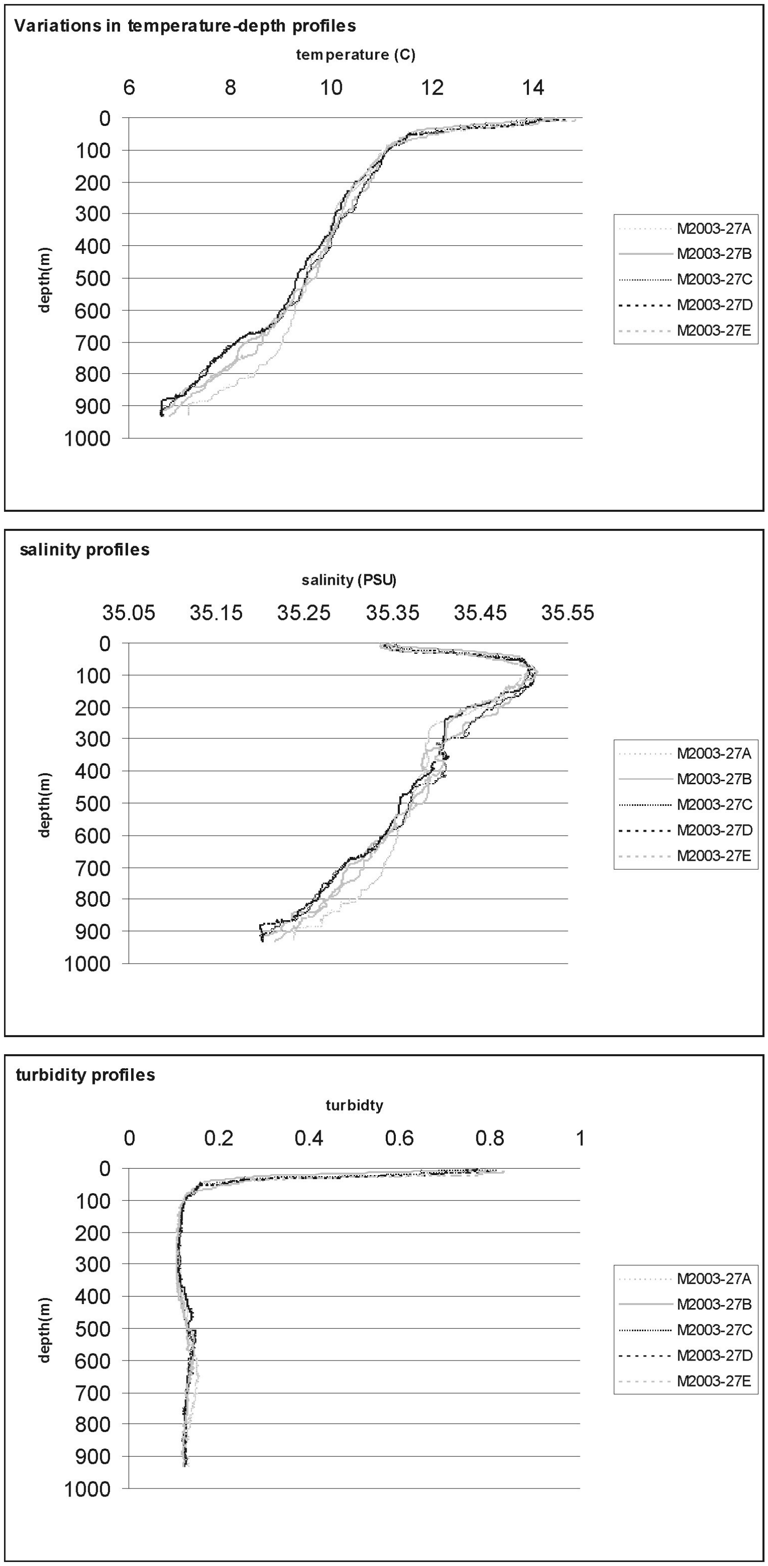




CTD data of stations 10, 13 and 20 in the Rockall Trough.

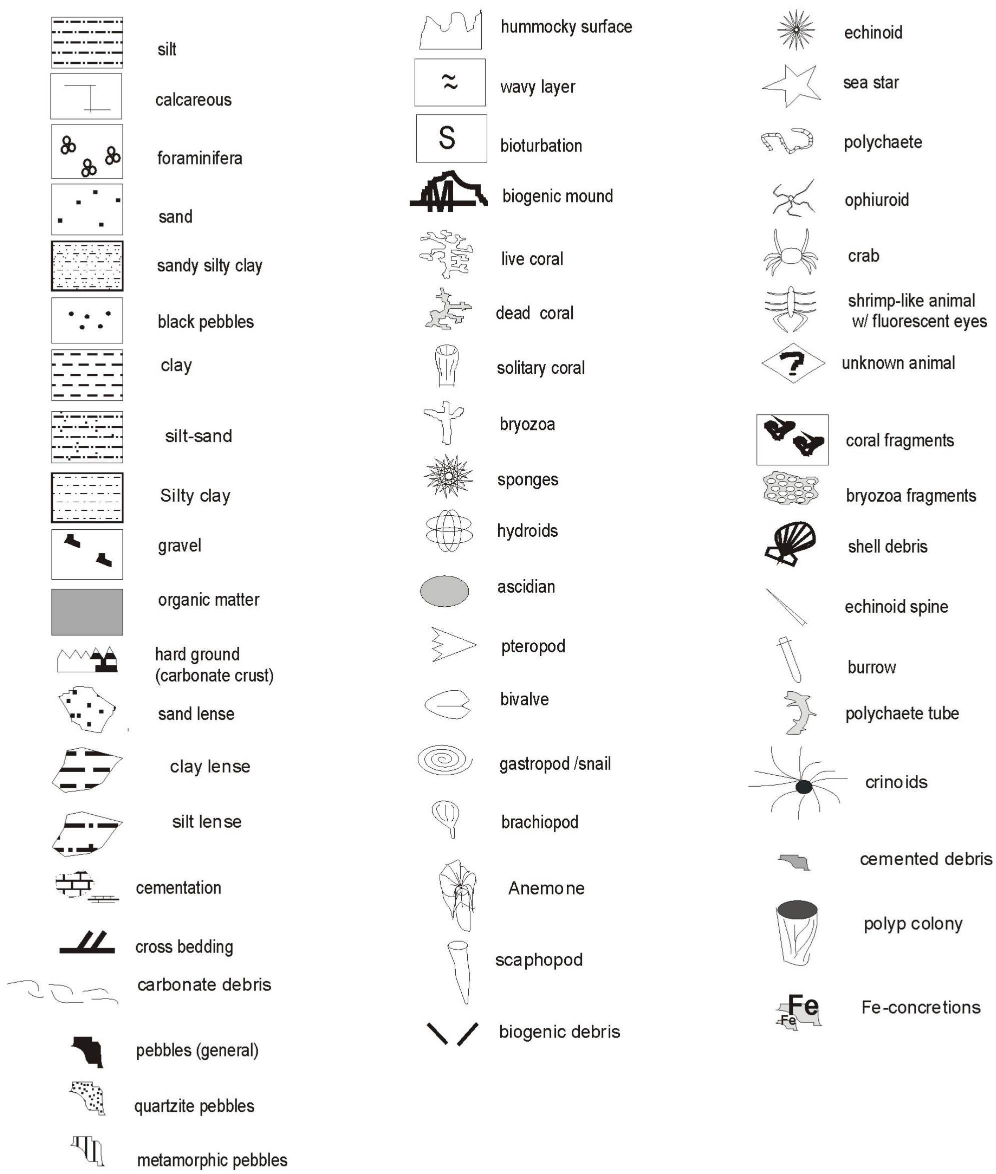


CTD data of station 1 in the Faeroe-Shetland Channel.



CTD data of the tidal station 27 in the Rockall Trough.

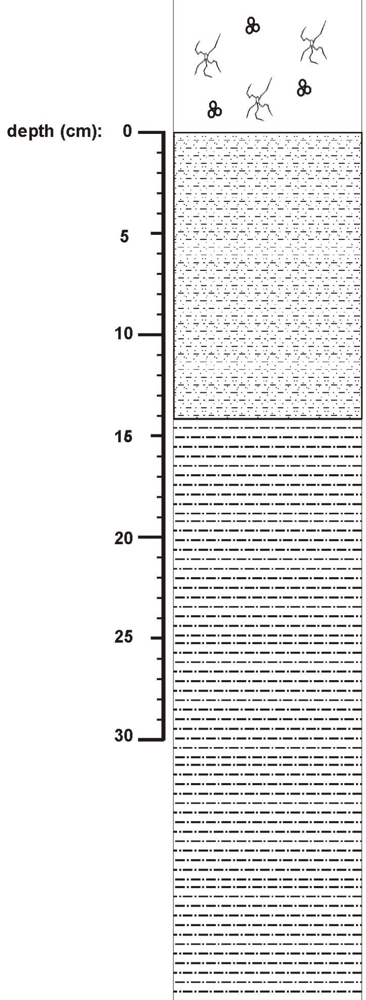
Legend M2003 Bx and Pc



Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-01

27-07-03, GMT: 10:44
Lat.: 62°00.04 N / Lon.: -1°57.94 W
Waterdepth: 1602 m.

LITHOLOGY | COLOUR | DESCRIPTION



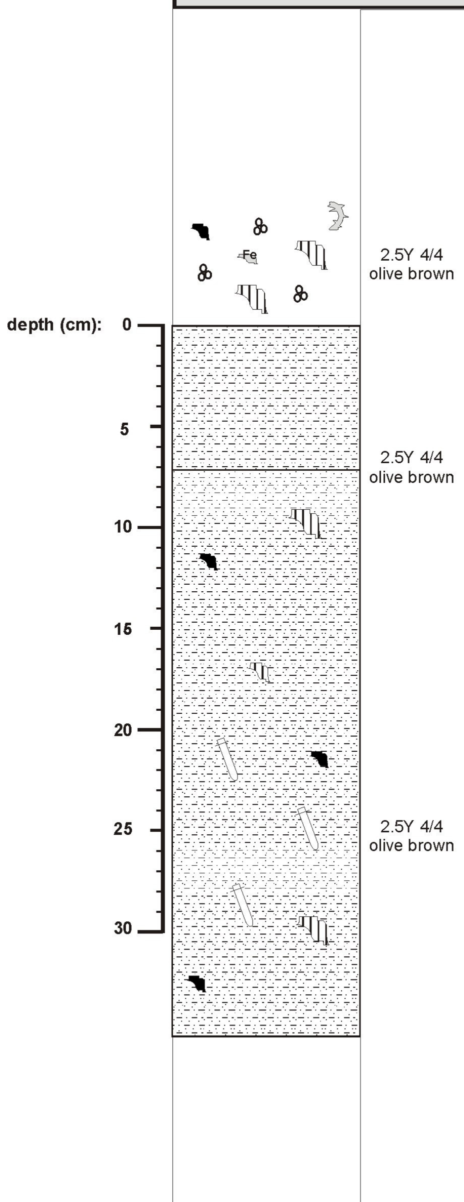
COLOUR	DESCRIPTION
5Y 4/4 dark olive	***Surface:*** (undisturbed boxcore) *Fossil/living faunal content:* - 4 brittle stars - big benthic formanifera (1mm diameter) - iron rich concretions (1-3mm) - tube worms *Sediment surface:* water rich silty clay with some (biogenic) sand (<1%)
5Y 4/4 dark olive	***Downcore:*** - 1-14cm: water rich layer of silty clay with some biogenic sand, oxidized
1.5Y 4/1 grey	- 14-47cm: layer of slightly silty clay, unoxidized

Penetration : 47 cm
Core compaction : 3 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-02

30-07-03, GMT: 17:00
Lat.: 62° 38.54 N / Lon.: -1°12.07 W
Waterdepth: 1565 m.

LITHOLOGY | COLOUR | DESCRIPTION



Surface: (first attempt failed, second attempt(slightly disturbed surface)

Fossil/living faunal content:
- large benthic foraminifera
- (metamorphic) pebbles (< 4cm)
- soft Fe-concretions
- some tube worms

Sediment surface:
clayey silt

Downcore:
- 0-7cm: watery sandy clay
- 7-35cm: sandy silty clay with pebbles (< 5cm) and burrows, which are more wet or sandy, getting more compacted downcore

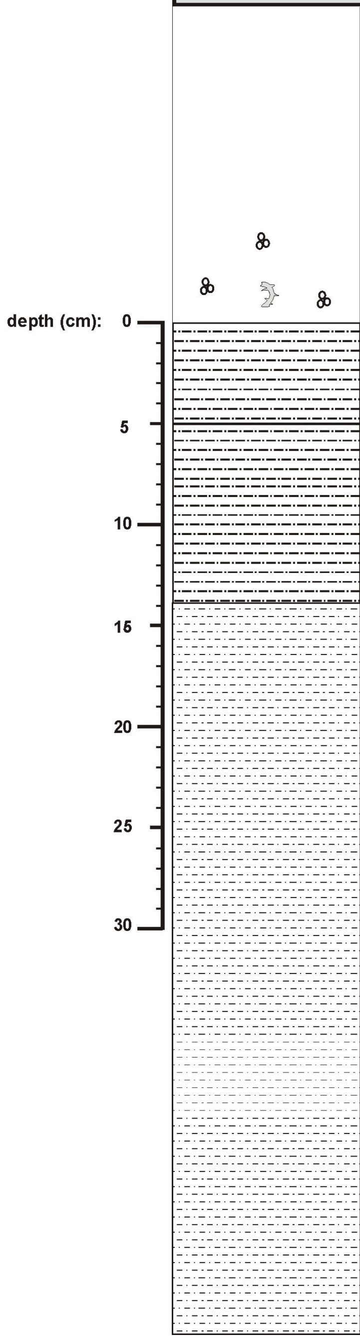
Remark: no anoxic layer

Penetration : 35 cm
Core compaction : 1 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-03

30-07-03, GMT: 14:37
Lat.: 62° 38.49 N / Lon.: -1°10.60 W
Waterdepth: 1574 m.

LITHOLOGY	COLOUR	DESCRIPTION



COLOUR

2.5Y 4/4 olive brown

10YR 4/4 brown

10YR 4/3 dull yellowish brown

2.5Y 4/1 yellowish grey

DESCRIPTION

Surface:
Fossil/living faunal content:
- large benthic foraminifera
- some tube worms

Sediment surface:
fluffy silt

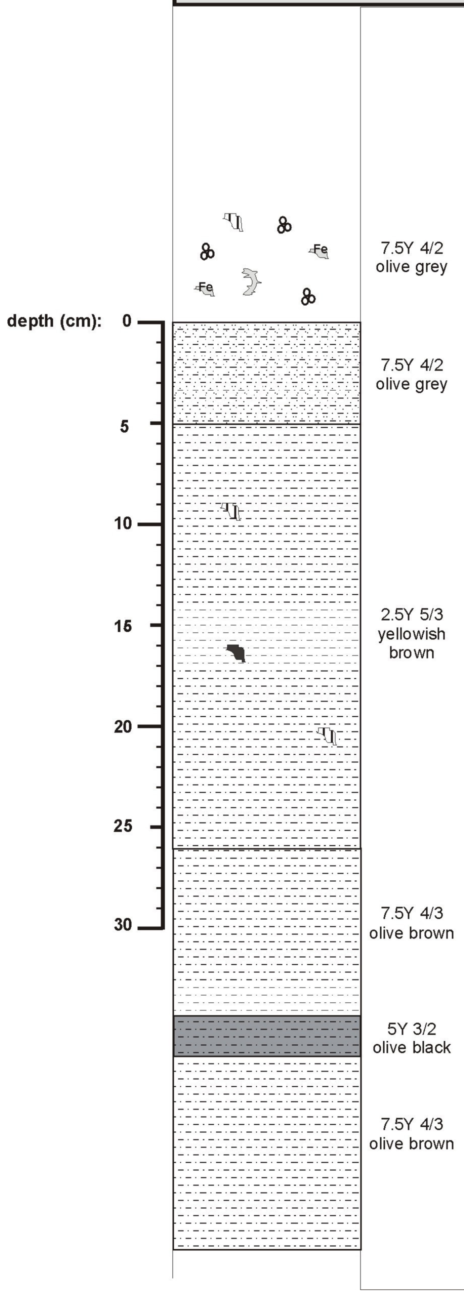
Downcore:
- <u>0-5cm:</u> fluffy silt
- <u>5-14cm:</u> silt
- <u>14-49cm:</u> watery clayey silt, getting more compacted and more clayey downcore

Penetration : 49 cm
Core compaction : 2 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-04

30-07-03, GMT: 10:48
Lat.: 62° 40.75 N / Lon.: -1° 08.33 W
Waterdepth: 1479 m.

LITHOLOGY | COLOUR | DESCRIPTION



Surface: (undisturbed boxcore)

Fossil/living faunal content:

- big benthic forminifera (diameter 1-2mm)
- several pebbles (< 1cm)
- tube worms
- soft Fe-oxide concretions (< 1cm)

Sediment surface:
(very fine sandy) clayey silt, high water content

Downcore:

- <u>0-5cm:</u> water rich sediment, clayey very fine sandy silt
- <u>5-26cm:</u> silty clay with small (metamorphic) pebbles (cm-sized)
- <u>26-46cm:</u> silty clay with an organic rich? layer (34-36cm depth)

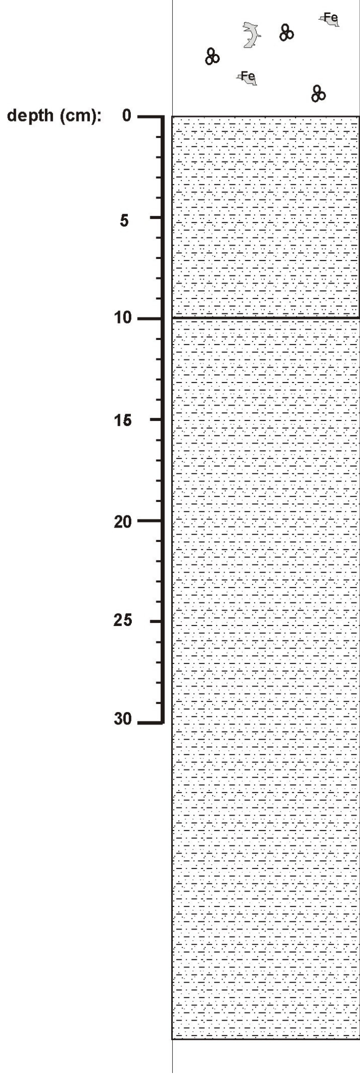
Remark: no anoxic layers

Penetration : 46 cm
Core compaction :1..5 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-05

30-07-03, GMT: 20:02
Lat.: 62° 42.24 N / Lon.: -1° 06.44 W
Waterdepth: 1592 m.

LITHOLOGY	COLOUR	DESCRIPTION



2.5Y 4/3 olive brown

2.5Y 4/3 olive brown

5Y 4/1 grey

Surface: (first failed, second core undisturbed)
Fossil/living faunal content:
- large benthic foraminifera
- soft Fe-concretions
- tube worm

Sediment surface:
slightly sandy clayey silt

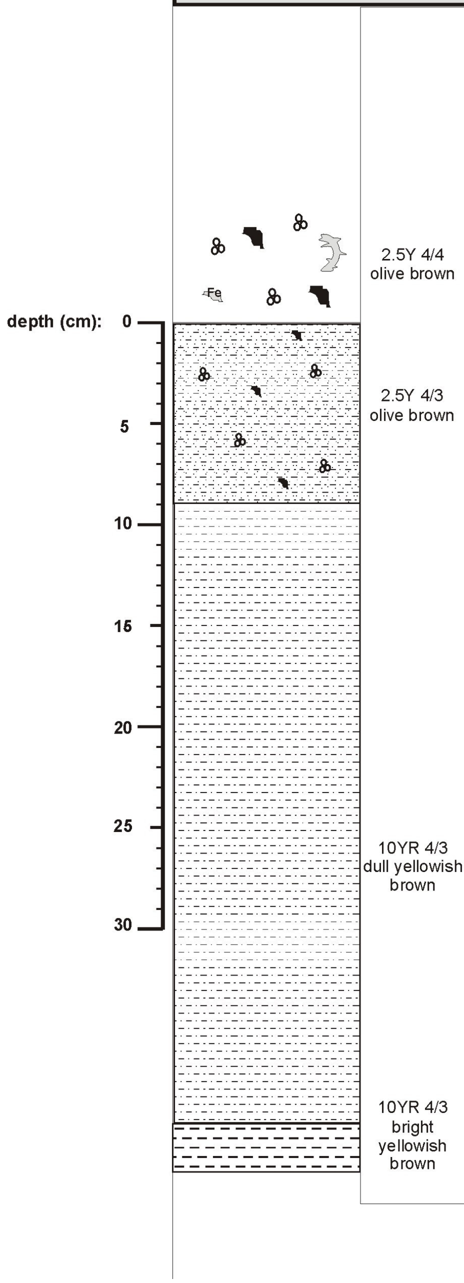
Downcore:
- 0-10cm: oxic layer of slightly sandy clayey silt
- 10-49cm: anoxic layer of slightly sandy clayey silt, downcore more clayey

Penetration : 49 cm
Core compaction : 6 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-06

31-07-03, GMT: 13:47
Lat.: 62° 38.59 N / Lon.: -1° 18.93 W
Waterdepth: 1702 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (probably taken on slope)
Fossil/living faunal content:
- large benthic foraminifera
- small pebbles (< 1cm)
- tube worms
- soft Fe-concretions

Dropstone of 15cm outside barrel in frame

Sediment surface:
sandy silty clay

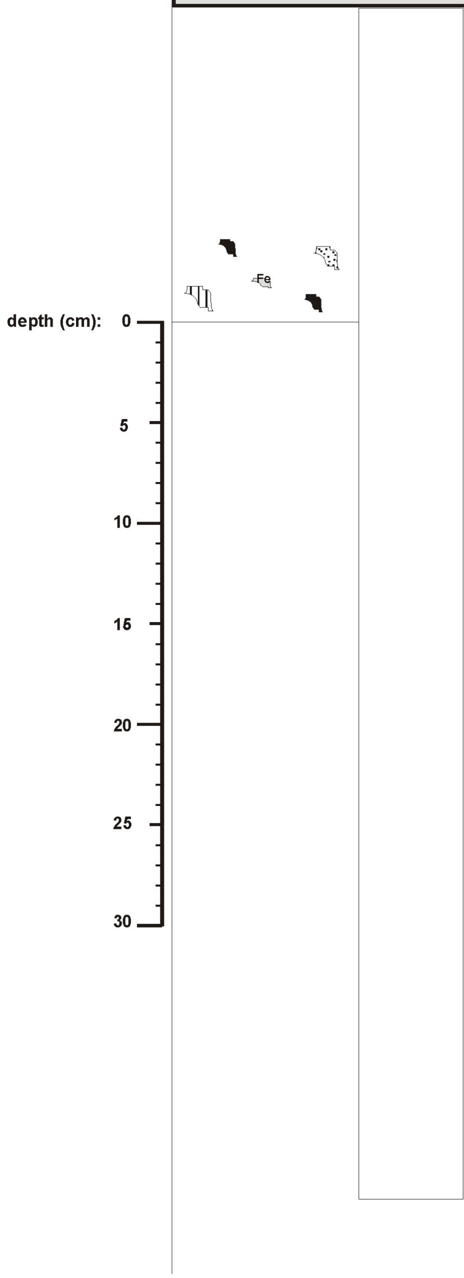
Downcore:
- 0-9cm: sandy silty clay with forams and small cm-sized pebbles
- 9-43cm: more compacted silty clay
- 43-46cm: dry clay

Penetration : 46-31 cm
Core compaction : 4 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-07

31-07-03, GMT: 17:04
Lat.: 62° 38.77 N / Lon.: -1° 20.26 W
Waterdepth: 1610 m.

LITHOLOGY	COLOUR	DESCRIPTION

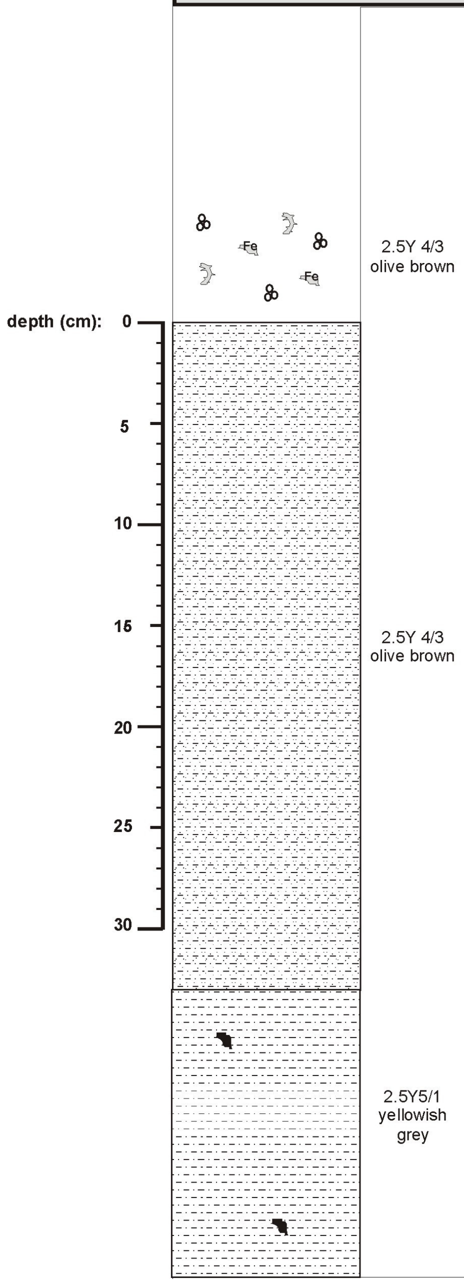


Surface:
Three attempts of boxcoring failed, due to pebbles between the knive and not tripping of the core disturbed sediment consist of sandy silt with a lot of pebbles up to 10cm big and some Fe-concretions

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-08

31-07-03, GMT: 11:04
Lat.: 62° 46.00 N / Lon.: -1° 07.51 W
Waterdepth: 1601 m.

LITHOLOGY | COLOUR | DESCRIPTION



Surface:
Fossil/living faunal content:
- soft Fe-concretions
- tube worms
- large benthic forminifera

Sediment surface:
clayey silt with a minor amount of very coarse sand

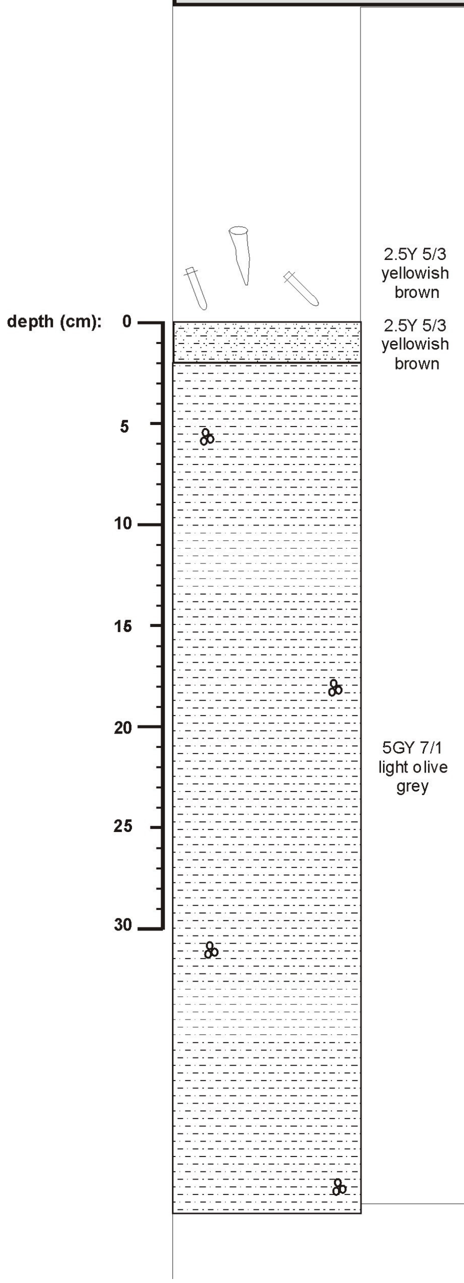
Downcore:
- 0-34cm: clayey sandy silt
- 34-49cm: silty clay, more compacted downcore with some cm-sized pebbles

Penetration : 49 cm
Core compaction : 1 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-09

04-08-03, GMT: 8:47
Lat.: 55° 39.10 N / Lon.: -13° 59.13 W
Waterdepth: 2548 m.

LITHOLOGY COLOUR DESCRIPTION



Surface: (cracked surface)
Fossil/living faunal content:
- large scaphopod shell (4cm)
- burrows

Sediment surface:
slightly sandy/silty mud

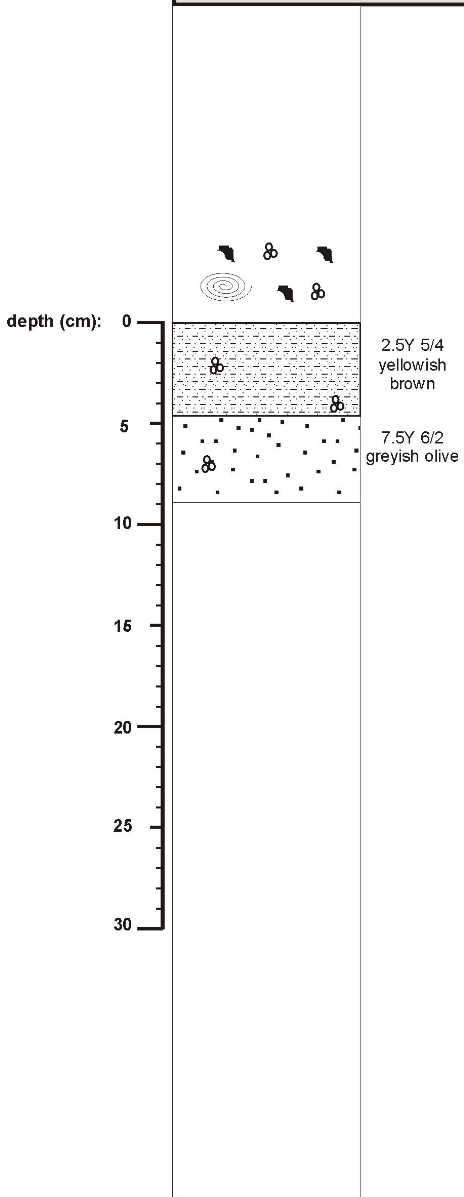
Downcore:
- 0-2cm: slightly sandy/silty mud, oxic layer
- 2-48cm: biogenic silty clay, extremely sticky

Penetration : 48 cm
Core compaction : 2 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-10

04-08-03, GMT: 19:51
Lat.: 55° 41.92 N / Lon.: -15° 18.12 W
Waterdepth: 627 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (collapsed)
Fossil/living faunal content:
- gastropods
- foraminifera
- pebbles (< 2cm)
- dark minerals

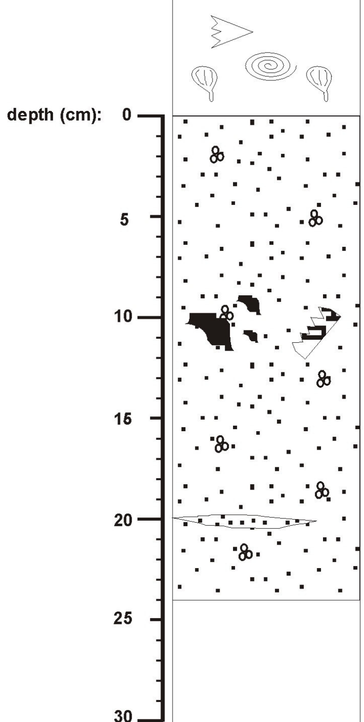
Sediment surface:
Biogenic sandy silt

Downcore:
- upper unit: biogenic sandy silt with pebbles (2.5Y 5/4 yellowish brown)
- lower unit: biogenic sand with pebbles (7.5Y 6/2 greyish olive)

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-11

07-08-03, GMT: 8:27
Lat.: 55° 44.50 N / Lon.: -15° 25.04 W
Waterdepth: 484 m.

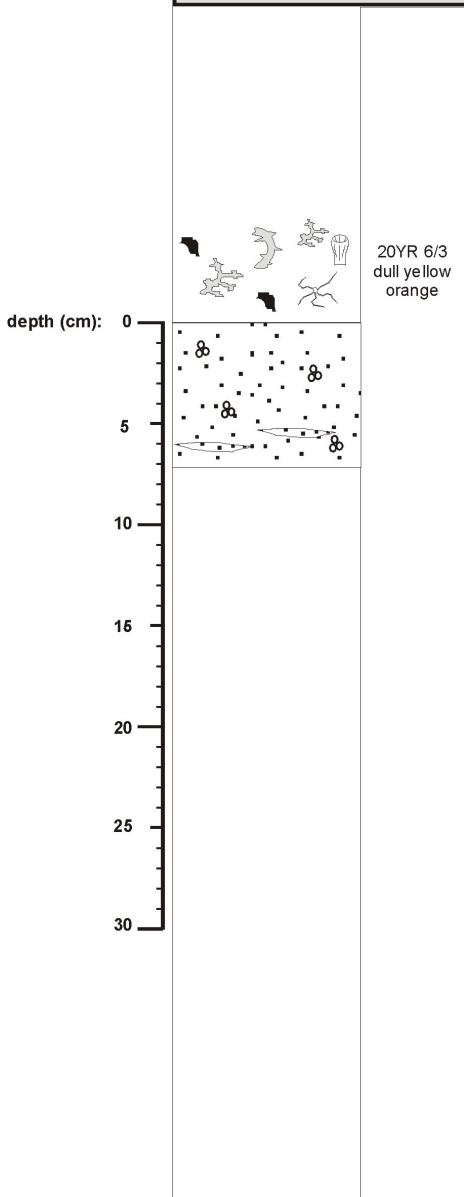
LITHOLOGY	COLOUR	DESCRIPTION
	2.5Y 6/3 dull yellow 2.5Y 6/2 greyish yellow	***Surface:*** (undisturbed) *Fossil/living faunal content:* - brachiopods - pteropods - gastropod - foraminifera *Sediment surface:* Foram sand with minor amount of siliciclastic grains and biogenic debris ***Downcore:*** - <u>0-24cm:</u> Foram sand with a minor amount of siliciclastic grains and biogenic debris, with a mottled appearance (burrows) - <u>10cm:</u> small pebbles, a large pebble (10cm) and a cemented crust with sand, pebbles and worm tubes (not in situ?) - <u>20cm:</u> coarse sand layer consisting of biogenic grains and a high % of lithic grains

Penetration : 24 cm
Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-12

07-08-03, GMT: 10:12
Lat.: 55° 39.32 N / Lon.: -15° 20.66 W
Waterdepth: 731 m.

LITHOLOGY COLOUR DESCRIPTION



Surface: (slightly disturbed)
Fossil/living faunal content:
- brittle stars
- tube worms
- coral debris of Madrepora, Lophelia, solitary corals (< 10cm)
- pebbles (< 2cm)

Sediment surface:
Foram sand with siliciclastic dark grains

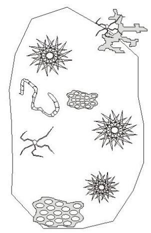
Downcore:
Bulk material consists of foram sand with coarse sand/ pebbly lenses downcore

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-13

07-08-03, GMT: 12:37
Lat.: 55° 37.34 N / Lon.: -15° 19.10 W
Waterdepth: 856 m.

LITHOLOGY COLOUR DESCRIPTION



Surface: (first attempt failed, second one big boulder)
Fossil/living faunal content:
- coral
- sponges
- brittle stars
- hydrozoa
- tube worms

depth (cm): 0
5
10
15
20
25
30

Sediment surface:
One big boulder of granite (60*44*26cm)

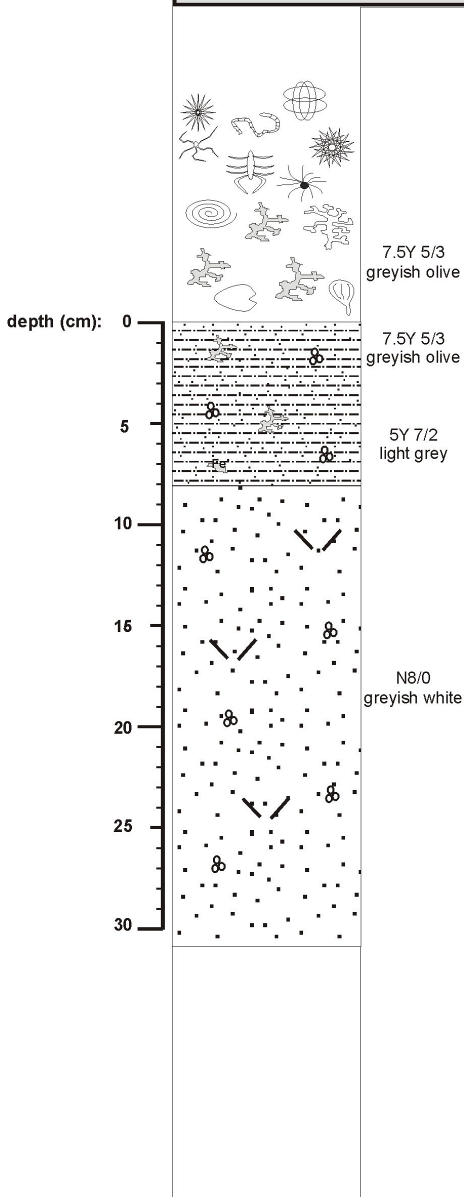
Downcore:

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-14

07-08-03, GMT: 17:06
Lat.: 55° 38.14 N / Lon.: -15° 27.72 W
Waterdepth: 590 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (small crack in surface)

Fossil/living faunal content:

- 15% coral cover of dead Madrepora, Lophelia and some living solitary corals
- living colony of Stylaster
- gastropods, brachiopods, bivalves attached to coral branches
- crinoid
- tube worms
- cidaris
- 2 living shrimps
- different sponge species
- hydrozoa

Sediment surface:
Biogenic silt-sand

Downcore:

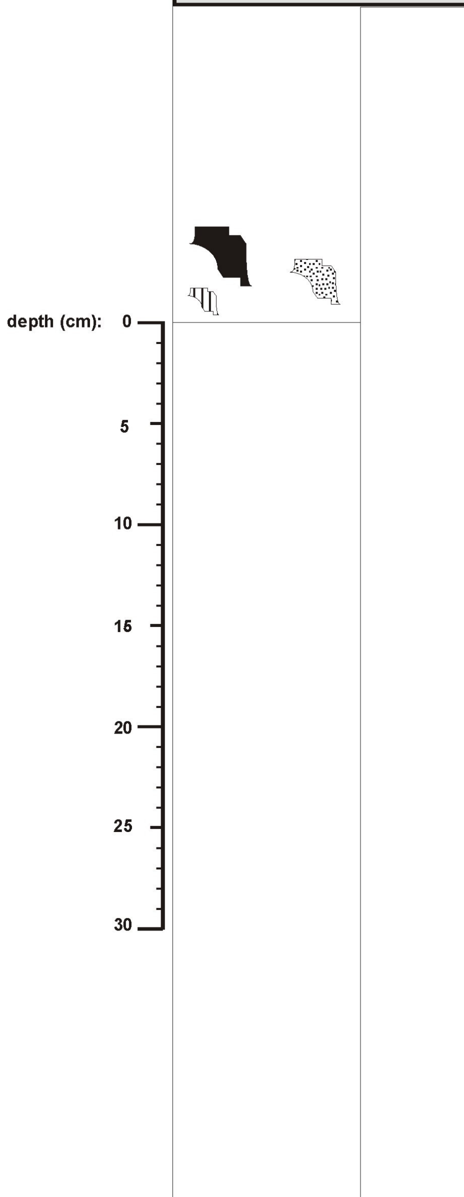
- 0-8cm: Biogenic silt-sand with cm-sized coral debris, between 5-8cm Fe-oxidized layers and grains (mm-sized)
- 8-31cm: more water rich biogenic medium sand with big forams

Penetration : 31 cm
Core compaction : 0.5 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-15

08-08-03, GMT: 10:06
Lat.: 55° 37.59 N / Lon.: -15° 27.30 W
Waterdepth: 761 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (first attempt failed, second and third attempt pebble underneath barrel)

Fossil/living faunal content:

- pebbles (<20cm second attempt, <10cm third attempt) of granite, quarzite, metamorphic

Sediment surface:
Biogenic silt-sand, 10% litihic grains

Downcore:

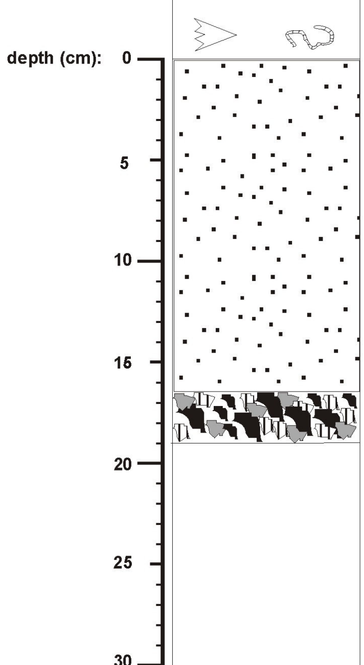
Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-16

08-08-03, GMT: 13:24
Lat.: 55° 34.38 N / Lon.: -15° 24.60 W
Waterdepth: 1026 m.

LITHOLOGY	COLOUR	DESCRIPTION

Surface: (undisturbed)
Fossil/living faunal content:
- tube worm
- pteropods



10YR 6/3
dull yellow
orange

Sediment surface:
Biogenic medium sized sand

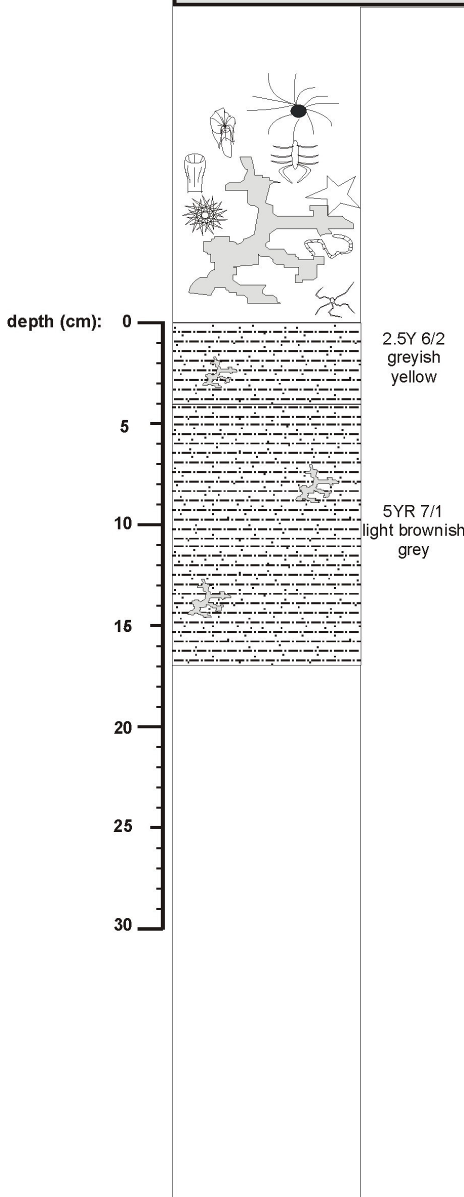
Downcore:
- 0-16cm: biogenic sand with oxidized burrows
- 16-19cm: lag deposit of pebbles (< 1cm) and biogenic debris (coral and shell fragments)

Penetration : 19 cm
Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-17

08-08-03, GMT: 15:58
Lat.: 55° 33.40 N / Lon.: -15° 31.58 W
Waterdepth: 834 m.

LITHOLOGY COLOUR DESCRIPTION



Surface: (sediment partly flushed out on deck)

Fossil/living faunal content:

- dead coral (38cm) branches, probably tilted during coring
- barbatia, bivalves attached to coral
- living solitary corals
- starfishes
- shrimps
- crinoid
- anemones
- brittle stars
- sponges (glass/soft)

Sediment surface:
Sandy biogenic silt

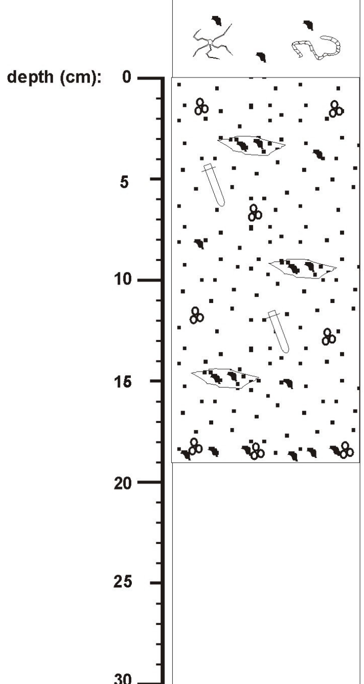
Downcore:

- 0-4cm: sandy biogenic silt with cm-dm sized coral debris
- 4-17cm: sandy biogenic silt with cm-dm sized coral debris, less water rich as surface layer

Penetration : 17 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-18

10-08-03, GMT: 9:28
Lat.: 55° 37.40 N / Lon.: -15° 49.47 W
Waterdepth: 554 m.

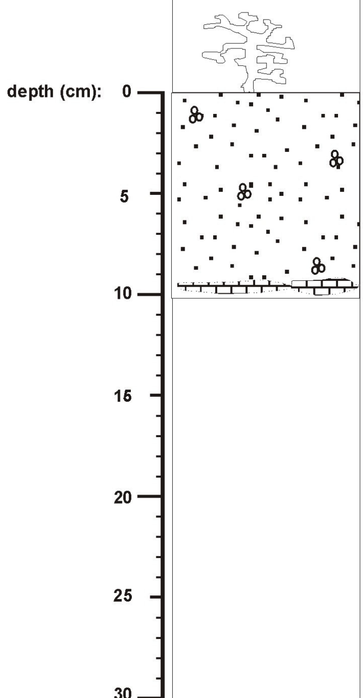
LITHOLOGY	COLOUR	DESCRIPTION
		Surface: (surface slightly tilted) *Fossil/living faunal content:* - brittle stars - tube worm - small lithic pebbles
	10YR 6/3 dull yellow orange	*Sediment surface:* Fine-medium foraminiferal and lithic sand
		Downcore: - <u>0-19cm:</u> fine-medium foraminiferal and lithic sand with dark minerals, throughout core cm-sized lenses of coarse-very coarse/pebbly sediment and dark burrows - <u>18-19cm:</u> very coarse sand/pebbles (50% biogenic)

Penetration : 19 cm
Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-19

10-08-03, GMT: 13:21
Lat.: 55° 33.98 N / Lon.: -15° 51.89 W
Waterdepth: 575 m.

LITHOLOGY COLOUR DESCRIPTION



10YR 5/2 greyish yellow brown

Surface: (possibly disturbed)
Fossil/living faunal content:
- colony of living Madrepora (20cm)

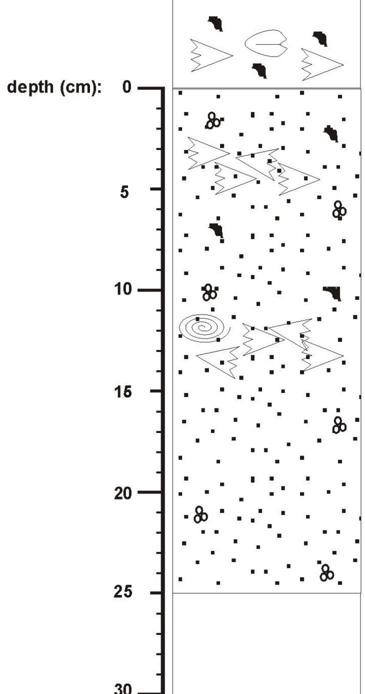
Sediment surface:
biogenic fine-very coarse sand (<<1% lithic grains)

Downcore:
- 0-7cm: biogenic fine-very coarse sand (<<1% lithic grains) with cm-dm sized Madrepora debris
- 7-10cm: slightly cemented horizon (soft hardground)

Penetration : ~10 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-20

10-08-03, GMT: 16:31
Lat.: 55° 31.90 N / Lon.: -15° 50.16 W
Waterdepth: 773 m.

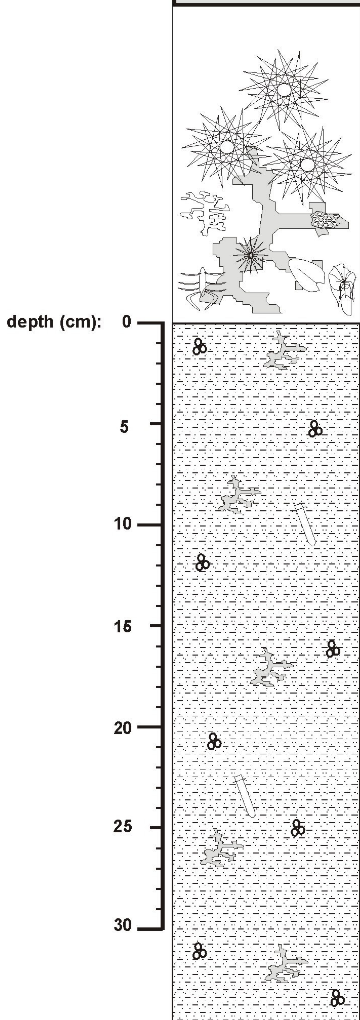
LITHOLOGY	COLOUR	DESCRIPTION
		Surface: (undisturbed) *Fossil/living faunal content:* - pteropods - bivalves - sponge debris - small pebbles (mm-sized)
	10YR 5/6 yellowish brown	*Sediment surface:* Biogenic fine-coarse sand with some lithic grains ***Downcore:*** - <u>0-25cm:</u> biogenic fine-corase sand with some lithic grains, downcore less amount of pebbles - <u>2-9cm/12-19cm:</u> latterally irregular pteropod layers - <u>12cm:</u> gastropod

Penetration : 25 cm
Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-21

10-08-03, GMT: 18:28
Lat.: 55° 29.62 N / Lon.: -15° 48.24 W
Waterdepth: 563 m.

LITHOLOGY	COLOUR	DESCRIPTION



2.5Y 6/2 greyish yellow

2.5Y 7/2 greyish yellow

Surface: (undisturbed, barrel filled till rim)
Fossil/living faunal content:
- 100% dead coral cover
- living colony of Madrepora and Stylaster
- 3 large sponge colonies, slimy sponges
- shrimps
- cidaris
- bivalves (dead)
- bryozoa
- anemones

Sediment surface:
Biogenic silt-coarse sand with cm/dm-sized coral debris

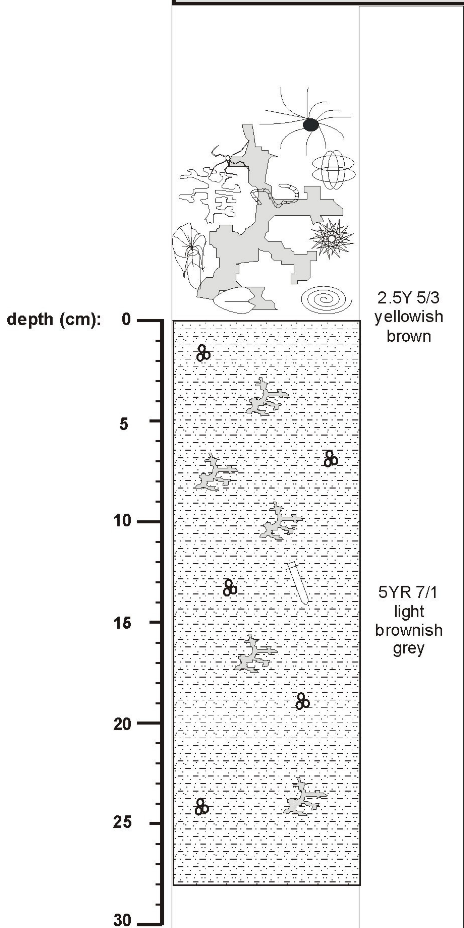
Downcore:
- 0-35cm: biogenic silt-very fine sand with coral debris (cm/dm-sized), burrows and sponge needles

Penetration : 35 cm
Core compaction : 3.5 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-22

11-08-03, GMT: 11:37
Lat.: 55° 30.22 N / Lon.: -15° 47.11 W
Waterdepth: 673 m.

LITHOLOGY | COLOUR | DESCRIPTION



Surface: (filled till rim with coral)

Fossil/living faunal content:

- dead (in various stages of degradation) /living coral branches of Lophelia, Madrepora, Stylaster, solitary corals
- hydroids
- brittle stars
- sponges
- anemones
- crinoid
- Eunice
- gorgonian coral
- gastropod
- bivalves

Sediment surface:
Biogenic carbonate silt-very coarse sand

Downcore:

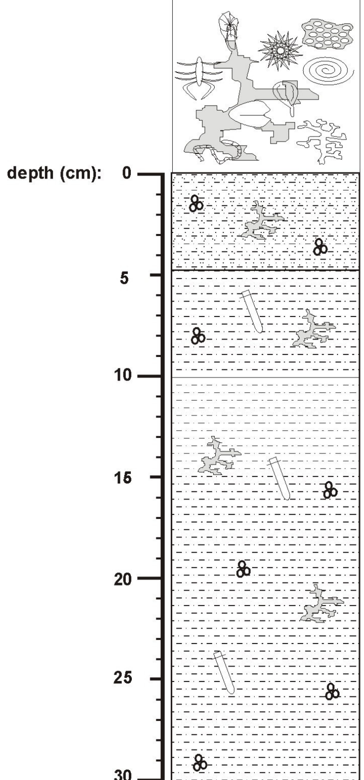
- 0-3cm: biogenic carbonate silt-very coarse sand with coral debris, grey layer at 3cm depth
- 3-28cm: biogenic carbonate silt-fine sand with coral debris, getting less downcore no difference in size distribution and burrows

Penetration : 28 cm
Core compaction : 1.5 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-23

11-08-03, GMT: 12:37
Lat.: 55° 32.71 N / Lon.: -15° 40.55 W
Waterdepth: 634 m.

LITHOLOGY	COLOUR	DESCRIPTION



2.5Y 5/3 yellowish brown

2.5Y 7/2 greyish yellow

5Y 6/1 grey

Surface: (filled till rim with coral)

Fossil/living faunal content:

- dead/living coral branches of (relatively a lot) Stylaster, Madrepora, Lophelia
- filter worm and Eunice
- sponges
- snails
- lobster
- anemones
- barbatia
- brachiopods
- bryozoa

Sediment surface:
Biogenic silt-very coarse sand with coral debris

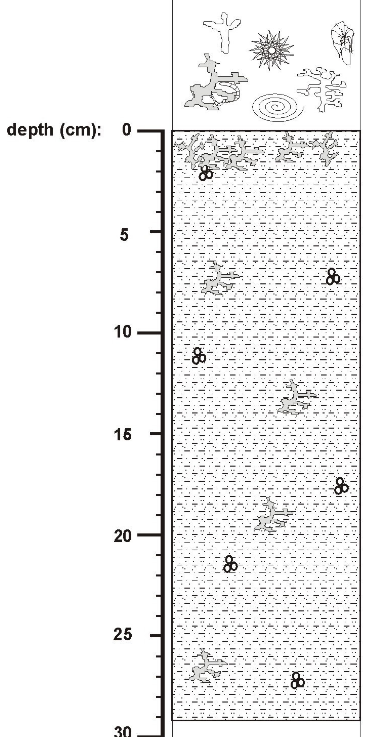
Downcore:

- 0-5cm: biogenic silt-very coarse sand with coral debris
- 5-10cm: dryer layer of clayey silty biogenic sand with coral debris with Fe-oxidized burrows
- 10-30cm: clayey silty biogenic sand with coral debris and burrows

Penetration : 30 cm
Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-24

12-08-03, GMT: 9:40
Lat.: 55° 29.85 N / Lon.: -15° 48.45 W
Waterdepth: 575 m.

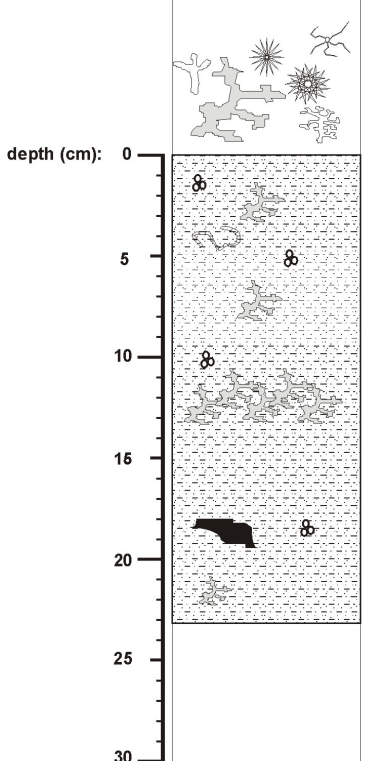
LITHOLOGY	COLOUR	DESCRIPTION
	10YR 5/2 greyish yellow brown 2.5YR 7/1 light reddish grey	***Surface:*** (undisturbed) *Fossil/living faunal content:* - cm/dm-sized coral debris mainly Stylaster, some Lophelia and shell debris (3cm thick) - 4 large colonies of living Stylaster - soft sponges - Gorgonian colonies - anemones - Eunice - dead bryozoa - dead gastropods *Sediment surface:* Biogenic silt-sand ***Downcore:*** - 0-3cm: coral debris - 0-24cm: biogenic silty sand with coral debris (< 10cm) of Stylaster and Lophelia - 24-29cm: watery layer

Penetration : 29 cm
Core compaction : 1 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-25

12-08-03, GMT: 11:40
Lat.: 55° 30.11 N / Lon.: -15° 48.69 W
Waterdepth: 690 m.

LITHOLOGY	COLOUR	DESCRIPTION



10YR 8/2
light grey

10YR 8/2
light grey

Surface: (first attempt failed, second attempt tilted surface)
Fossil/living faunal content:
- cm-sized coral (mainly Madrepora, solitary corals)/shell debris and echinoid spines
- small living Madrepora colony
- brittle stars
- soft sponges
- bryozoa
- hydroids
- cidaris

Sediment surface:
Biogenic silt-very coarse sand

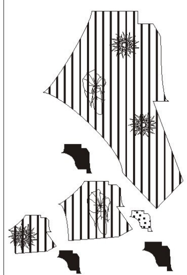
Downcore:
- <u>0-11cm:</u> biogenic silt- very coarse sand with lenses of mm-sized coral debris, living worm
- <u>11-15cm:</u> layer of large coral debris
- <u>11-23cm:</u> biogenic silt_medium sand with biogenic debris, much finer than first section
- <u>18cm:</u> pebble (11cm)

Penetration : 23 cm
Core compaction : 0.5 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-26

12-08-03, GMT: 14:41
Lat.: 55° 30.41 N / Lon.: -15° 48.70 W
Waterdepth: 800 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (first/second attempt failed, due to rocks)
Fossil/living faunal content:

First attempt: 7 (metamorphic) pebbles (< 13cm) covered with sponges and anemones

depth (cm): 0, 5, 10, 15, 20, 25, 30

Sediment surface:

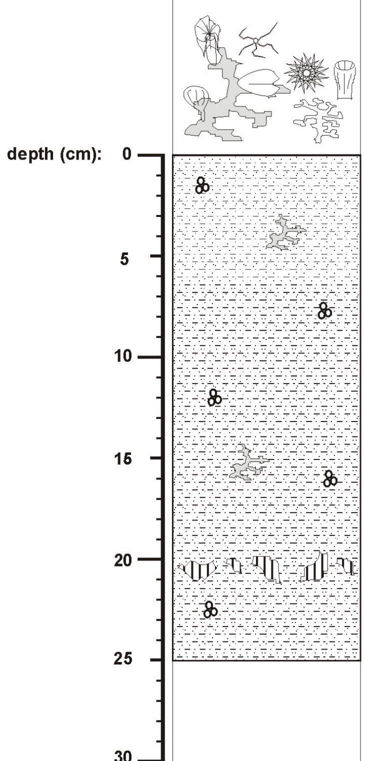
Downcore:

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-28

14-08-03, GMT: 10:45
Lat.: 55° 25.90 N / Lon.: -16°06.84 W
Waterdepth: 825 m.

LITHOLOGY	COLOUR	DESCRIPTION



2.5Y 6/2 greyish yellow

Surface: (tilted more than 90°, because of irregular seabed))

Fossil/living faunal content:

- dm-sized coral debris
- living branches of Madrepora, Stylaster
- solitary corals
- brittle stars
- sponges
- anemones
- pecten
- bivalves
- Barbatia

2.5Y 7/2 greyish yellow

Sediment surface:
Biogenic silt-very coarse sand

Downcore:

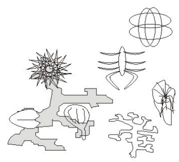
- 0-~25cm: biogenic silt-sand with cm-sized coral debris
- 20cm: layer with metamorphic pebbles (cm-sized)

Penetration : ~25 cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-29

14-08-03, GMT: 15:11
Lat.: 55° 26.15 N / Lon.: -16° 06.96 W
Waterdepth: 749 m.

LITHOLOGY	COLOUR	DESCRIPTION



depth (cm): 0 5 10 15 20 25 30

Surface: (first attempt, barrel not closed properly, second attempt did not trip, third attempt core almost empty, scrape off)

Fossil/living faunal content:

First attempt:
- coral debris and living colony of Madrepora
- sponges

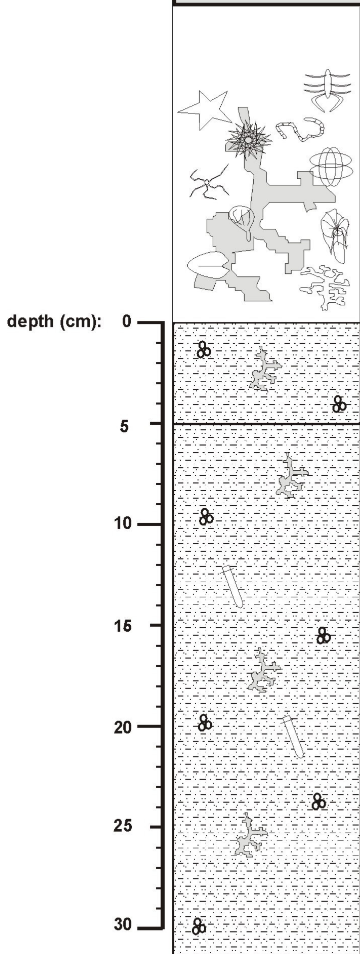
Third attempt:
- coral debris of Madrepora and Lopehlia
- living branch of Madrepora and Stylaster
- hydrozoa
- anemones
- sponges
- shrimps
- bryozoa
- Barbatia and other bivalves
- Eunice

Sediment surface:

Downcore:

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin **BOXCORE M2003-30**		
15-08-03, GMT: 8:29 **Lat.: 55° 26.43 N / Lon.: -16° 06.90 W** **Waterdepth: 676 m.**		
LITHOLOGY	COLOUR	DESCRIPTION



2.5Y 5/3
yellowish
brown

10Y 6/1
grey

Surface: (slightly tilted, coral debris besides barrel)

Fossil/living faunal content:

- 99% coral debris of Madrepora, Lophelia (24cm high)
- some living coral branches of Stylaster, Lophelia
- anemones
- soft/glass sponges
- brittle stars
- hydrozoa
- lobster
- Gorgonian
- Barbatia, bivalves and brachiopods
- Eunice

Sediment surface:

Biogenic silt-medium sand

Downcore:

- 0-5cm: Biogenic silt-medium sand with coral debris
- 5-31cm: biogenic silt-fine sand with coral debris (< 10cm) and burrows

Penetration : 31 cm

Core compaction : 0 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-31

15-08-03, GMT: 14:36
Lat.: 55° 25.30 N / Lon.: -16° 12.34 W
Waterdepth: 846 m.

LITHOLOGY	COLOUR	DESCRIPTION

Surface:
~500 sediment grains, because of very hard seabottom, also seen during video recording

depth (cm): 0 5 10 15 20 25 30

Sediment surface:

Downcore:

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-32

15-08-03, GMT: 17:08
Lat.: 55° 31.22 N / Lon.: -16° 21.97 W
Waterdepth: 569 m.

LITHOLOGY	COLOUR	DESCRIPTION

Surface:
Failed, due to hard surface

depth (cm): 0

5

Sediment surface:

10

15

20

Downcore:

25

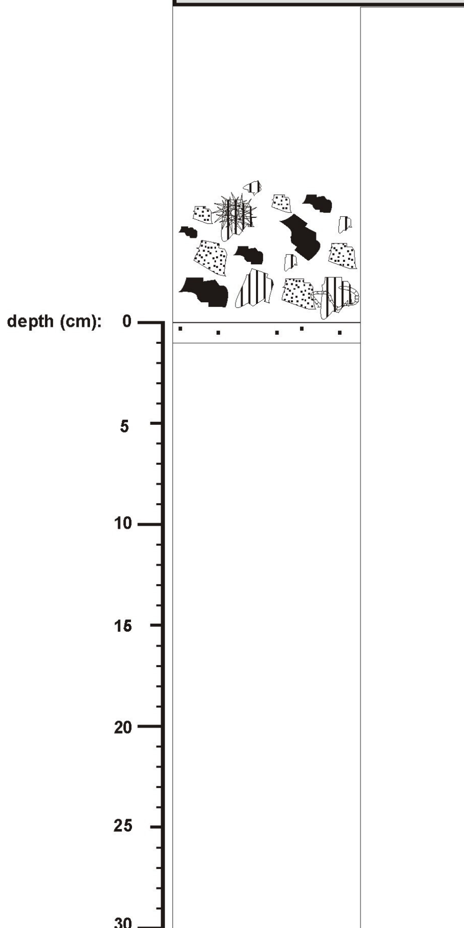
30

Penetration : cm
Core compaction : cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-34

16-08-03, GMT: 9:26
Lat.: 55° 25.36 N / Lon.: -16° 20.64 W
Waterdepth: 810 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (barrel damaged)

Fossil/living faunal content:

- 15 pebbles (< 10cm)
- sponges
- tube worms

Sediment surface:

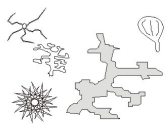
Fine-very coarse sand, mainly lithic

Penetration : 1 cm

Pelagia CRUISE European North Atlantic Margin BOXCORE M2003-35

16-08-03, GMT: 11:42
Lat.: 55° 25.15 N / Lon.: -16°22.32 W
Waterdepth: 734 m.

LITHOLOGY	COLOUR	DESCRIPTION



Surface: (failed, scrape off)
Fossil/living faunal content:
- branch of dead Lophelia (10cm), Madrepora
- living Madrepora (3cm)
- brittle stars
- brachiopod
- sponges

depth (cm): 0, 5, 10, 15, 20, 25, 30

Sediment surface:
2mm of biogenic foram sand with some lithic grains

Penetration : 2 mm

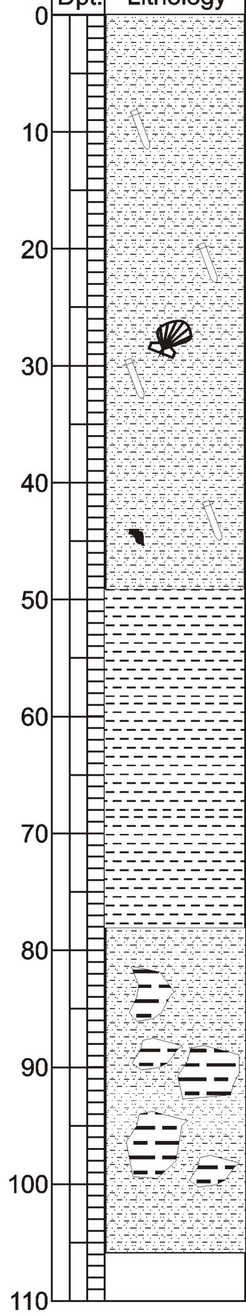
Appendix VII, Logs of pistoncores

Legend M2003 Bx and Pc

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 106 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 1	

Dpt. | Lithology | Colour | Description | Smpl.



Colour

7.5Y 4/2 greyish olive

5Y 4/1 grey

10Y 4/2 olive grey

Description

Unit I: (0-49cm)
Slightly silty clay with burrows

- 14-16cm: darker layer
- 29cm: carbonate shell/foram
- 42-46cm: darker spotted layer
- 46cm: small pebble (1cm)

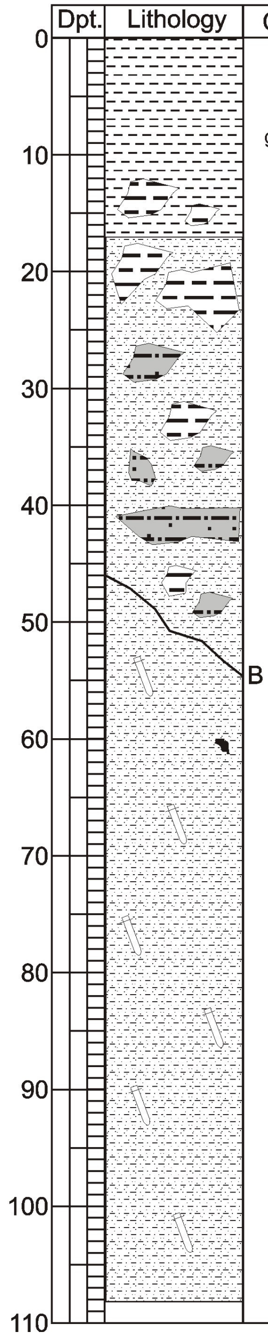
Unit II: (49-78cm)
Very stiff and hard clay, can not be cut with the string, rough surface

Unit III: (78-106cm)
Silty clay with rounded and angular clay pebbles (< 5cm), dark greenish grey (7.5GY 4/1)

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 108 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 2	

Dpt.	Lithology	Colour	Description	Smpl.



Colour:

5G 5/1
greenish
grey

5Y 4/1
grey

Description:

Unit I: (0-17cm)
Compacted clay

- 10-17cm: two angular clay pebbles (2cm/4cm)

Unit II: (17-46cm)
Mixed layer of lenses of compacted clay (greenish grey 5G 5/1) and organic rich silt lenses (smell of H_2S, olive black 5Y 3/1)) in a matrix of silty clay (grey 5Y 4/1)

Unit III: (46-108cm)
Silty clay with burrows

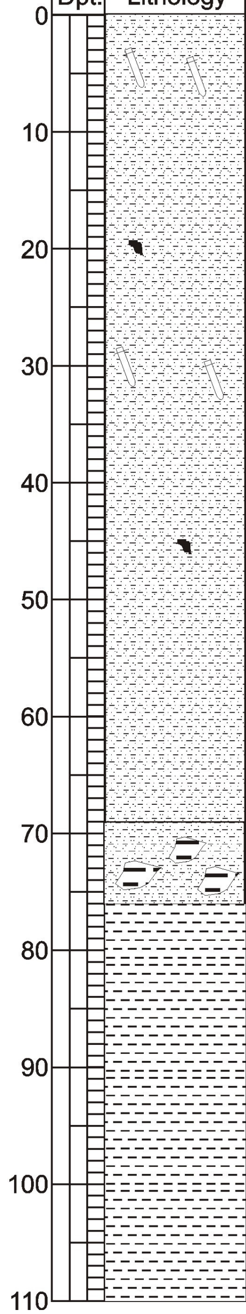
- 60cm pebble (0.5cm)
- 84-88cm: mottled zone

Boundary:
irregular rounded boundary

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 110 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 3	

Dpt.	Lithology	Colour	Description	Smpl.



Colour:

5Y 4/3
dark olive

2.5GY 5/1
olive grey

Description:

Unit I: (0-69cm)
Silty clay

- 3-7cm/31-36cm: burrows, defined by different color
- 20cm: small pebble (<0.5cm)
- 47cm: pebble (1cm)

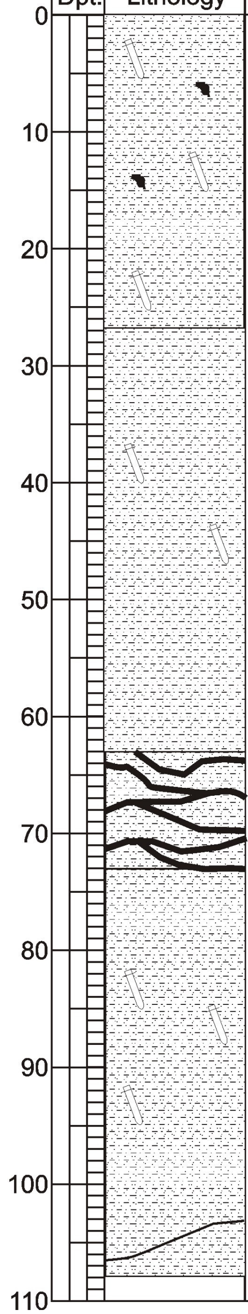
Unit II: (69-76cm)
Transition zone between unit I and II consisting of lenses of green clay (burrows?) in a matrix of silty clay

Unit III: (76-110cm)
Compacted stiff clay with some darker spots

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 108.5 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 4	

Dpt.	Lithology	Colour	Description	Smpl.



Colour:

7.5Y 4/1
grey

10Y 4/1
grey

2.5Y 4/1
yellowish
grey

10Y 4/1
grey

Description:

Unit I: (0-27cm)
Compacted layer of silty clay with greenish burrows

- pebble (< 1cm, 7 and 14cm depth)

Unit II: (27-63cm)
Silty clay, more watery layer

- 38-47cm: burrows

Unit III: (63-73cm)
Alternation of irregular/non parallel coarse and less coarse layers (+/- 0.5cm) and grains of dark minerals (mm-sized)
color: combination of grey (10Y 4/1) and yellowish grey (2.5Y 4/1)

Unit IV: (73-105cm)
Silty clay

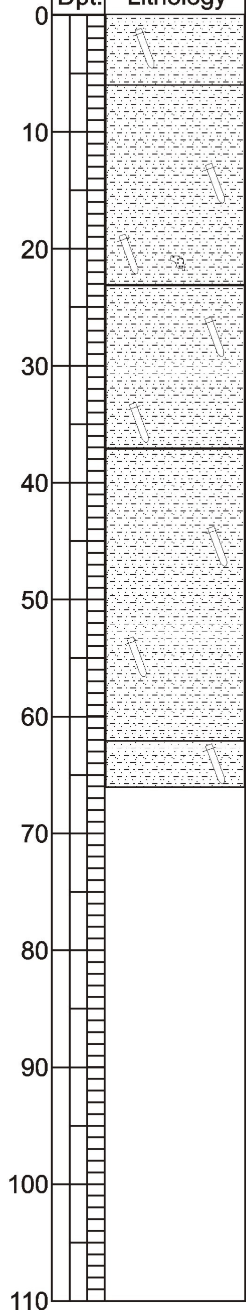
- 87-92cm: burrows
- 95cm: cm-sized burrow

Unit V: (105-108cm)
Sandy silty clay, upper boundary at an angle

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 66 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 5	

Dpt. | Lithology | Colour | Description | Smpl.



Colour:

- 2.5Y 4/2 dark greyish yellow
- 5Y 4/1 grey
- 2.5Y 4/2 dark greyish yellow
- 5Y 4/1 grey
- 7.5Y 4/2 greyish olive

Description:

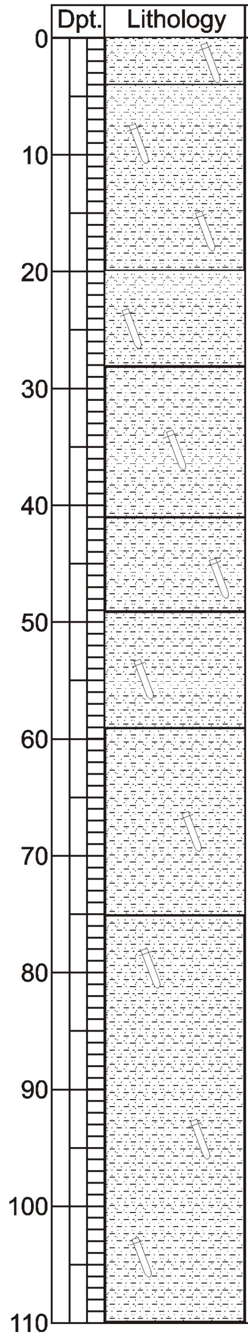
One unit: (0-66cm)
Fine sandy silty clay with burrows trough the whole core filled with more sandy sediment or defined by color difference

- 0-6cm: light colored more sandy layer
- 6-23cm: dark less sandy layer, small dropstone of quartzite (0.5cm, 22cm depth)
- 23-37cm: light layer, more sandy
- 37-62cm: dark, less sandy
- 62-66cm: dark layer

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 109 cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 6	

Dpt. | Lithology | Colour | Description | Smpl.



Colour:

- 2.5Y 5/1 yellowish grey
- 2.5GY 4/1 dark olive grey
- 2.5Y 5/1 yellowish grey
- 2.5GY 4/1 dark olive grey
- 2.5Y 5/1 yellowish grey
- 2.5GY 4/1 dark olive grey
- 2.5Y 5/1 yellowish grey
- 2.5GY 4/1 dark olive grey

Description:

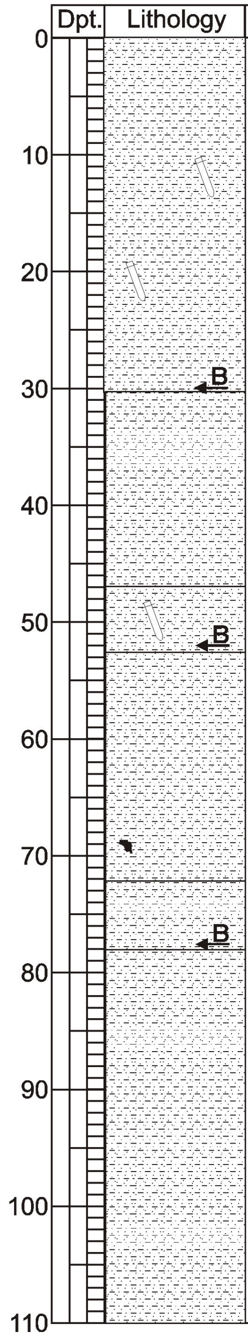
One unit: (0-110cm)
Fine sandy silty clay with trough the whole section burrows filled with more sandy silty clay or marked by colour differences

- 0-4cm: light
- 4-20cm: dark
- 20-28cm: light
- 28-41cm: dark
- 41-49cm: light
- 49-59cm: dark
- 59-75cm: light
- 75-109cm: dark

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 110cm
Station: M2003-04 (62.°40.74’/-1°.08.36’)	
Box core:	
Piston core: # 7	

Dpt. | Lithology | Colour | Description | Smpl.



Colour

2.5Y 5/1 yellowish grey

5Y 4/2 greyish olive

2.5Y 5/1 yellowish grey

5Y 4/2 greyish olive

2.5Y 5/1 yellowish grey

5Y 4/2 greyish olive

Description

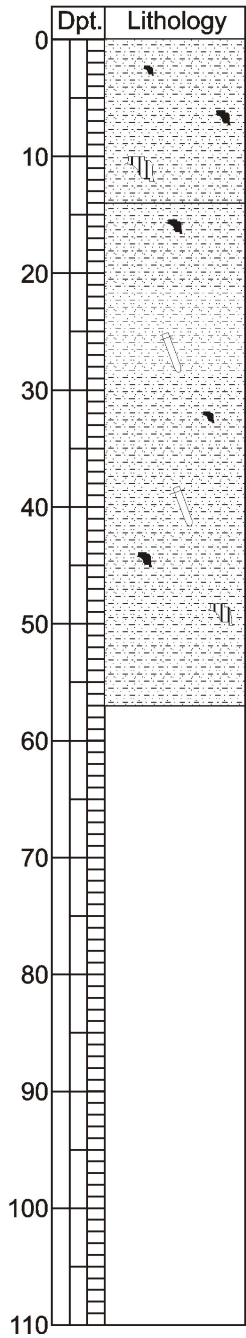
One unit: (0-110cm)
Fine sandy silty clay

- 0-30.5cm: relatively compact sediment with burrows filled with fine -medium sand (12cm) or open (23cm)
- 30.5-47cm: watery layer
- 47-52.5cm: compacted layer with burrows filled with water
- 52.5-72cm: watery layer with a small pebble (1cm-69cm depth)
- 72-78cm: compacted layer
- 78-110cm: watery layer

boundary: B
Boundaries of +/- 0.5cm of slightly more sandy sediment (colour: 5Y 4/1, grey)

CORE DESCRIPTION PELAGIA/M2003-04

Described by: Henk, Irene, Ana, Furu	
Date: 30-07-2003	Length: 57cm
Station: M2003-04 (62.°40.74'/-1°.08.36')	
Box core:	
Piston core: # 8	

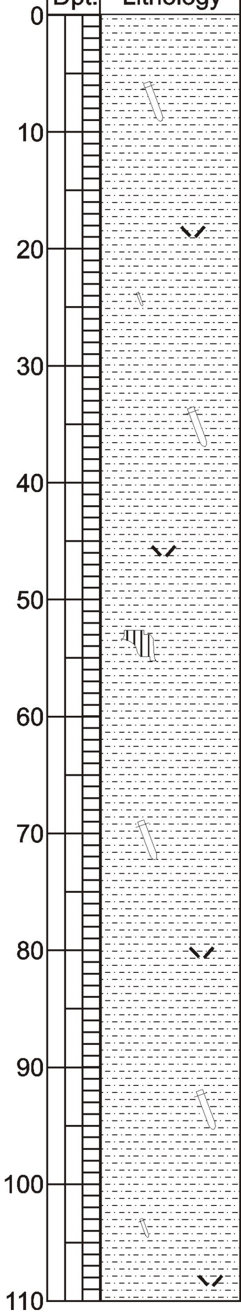


Colour	Description	Smpl.
2.5Y 4/4 olive brown	***Unit I:*** (0-14cm) Silty clay with some fine-medium sand grains - small pebbles (<1 cm) - 11cm: metamorphic pebble (3.5cm)	
2.5Y 5/3 yellowish brown	***Unit II:*** (14-57cm) Silty clay with some fine-medium sand grains downcore sediment becomes more watery - small pebbles (<1 cm) - burrows filled with soft sediment - 50cm: metamorphic pebble (2cm) *Boundary:* gradual change from wet to more compacted sediment	

CORE DESCRIPTION PELAGIA/M2003-06

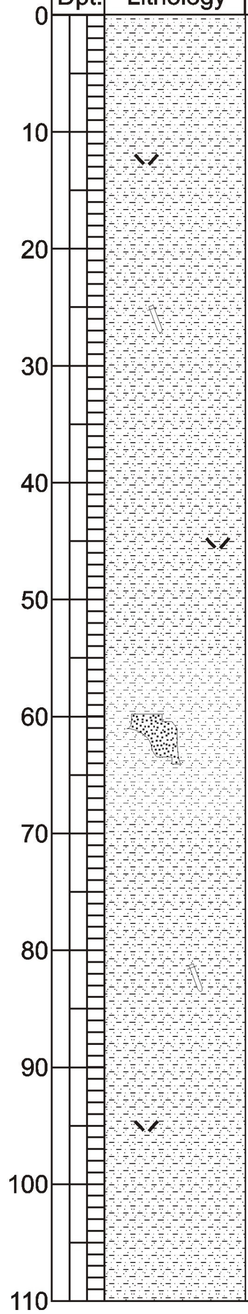
Described by: Henk, Irene, Furu	
Date: 3-08-2003	Length: 110 cm
Station: M2003-06 (62°38.59'/-1°18.96')	
Box core:	
Piston core: # 1	

Dpt.	Lithology	Colour	Description	Smpl.
		7.5Y 4/1 grey	**One unit::** (0-110cm) Slightly silty clay with mm-sized biogenic carbonate debris and burrows - 54cm: metamorphic pebble (2.5cm)	



CORE DESCRIPTION PELAGIA/M2003-06

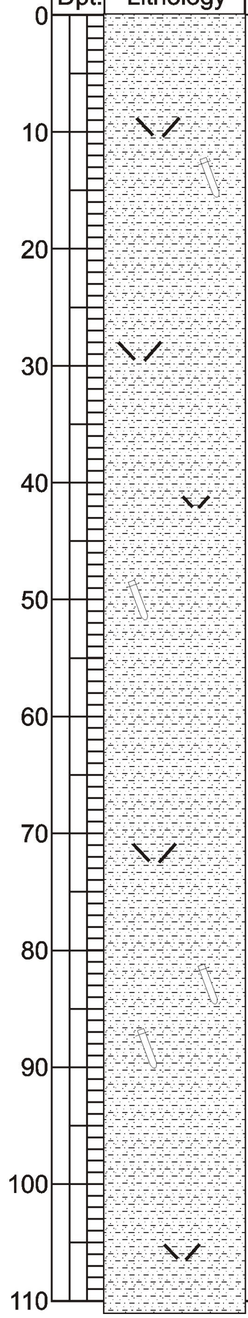
Described by: Henk, Irene, Furu
Date: 3-08-2003 Length: 110 cm
Station: M2003-06 (62°38.59'/-1°18.96')
Box core:
Piston core: # 2

Dpt.	Lithology	Colour	Description	Smpl.
0–110		5Y 4/1 grey	**One unit:** (0-110cm) Compact slightly sandy silty clay with some mm-sized biogenic fragments, minor amount of mm-sized pebbles and minor mottling, likely burrows throughout core - 60cm: quartzite pebble (3cm)	

CORE DESCRIPTION PELAGIA/M2003-06

Described by: Henk, Irene, Aurora, Furu	
Date: 3-08-2003	Length: 111 cm
Station: M2003-06 (62°38.59'/-1°18.96')	
Box core:	
Piston core: # 3	

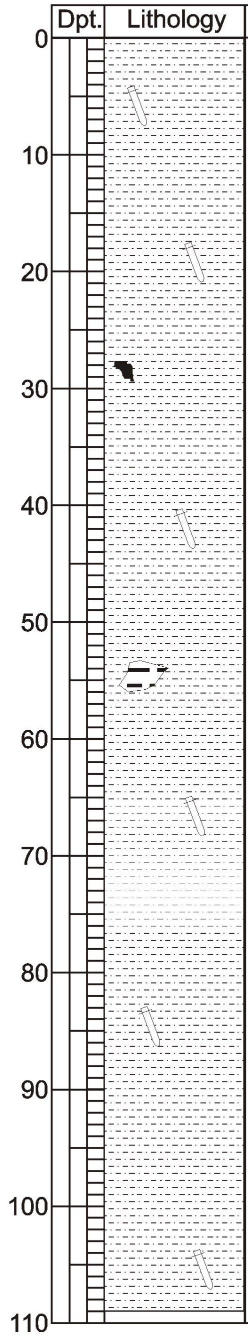
Dpt.	Lithology	Colour	Description	Smpl.
0–110		7.5Y 4/1 grey … 5Y 4/1 grey	**One unit:** (0-111cm) Slightly sandy silty clay getting more compacted downcore Troughout section mm-sized biogenic carbonate debris and cm-sized burrows (colour changes)	



CORE DESCRIPTION PELAGIA/M2003-06

Described by: Henk, Irene, Aurora, Furu	
Date: 3-08-2003	Length: 109 cm
Station: M2003-06 (62°38.59'/-1°18.96')	
Box core:	
Piston core: # 4	

Dpt.	Lithology	Colour	Description	Smpl.



Colour:

2.5Y 5/2 dark greyish olive

5Y 4/1 grey

Description:

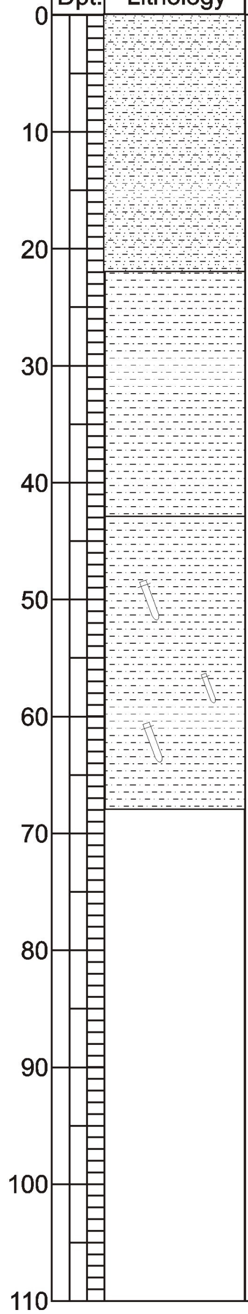
One unit: (0-109cm)
Silty clay with some burrows

- 0-41cm: water rich layer
- 29cm: pebble (< 1cm)
- 55cm: angular silty clay pebble (2cm), dark greenish grey (7.5GY 4/1)

CORE DESCRIPTION PELAGIA/M2003-06

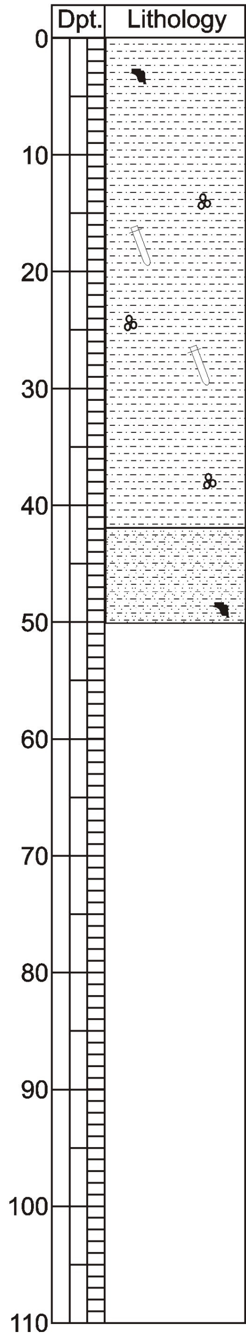
Described by: Henk, Irene, Aurora, Furu	
Date: 3-08-2003	Length: 68 cm
Station: M2003-06 (62°38.59'/-1°18.96')	
Box core:	
Piston core: # 5	

Dpt.	Lithology	Colour	Description	Smpl.
0–22		2.5Y 4/1 yellowish grey	**One unit:** (0-68cm) Silty clay - 0-22cm: water rich layer with some 1mm grains (Fe-oxide/quartz) - 22-43cm: water rich layer - 43-68cm: more compacted layer with burrows	
22–43		2.5Y 4/1 yellowish grey		
43–68		2.5Y 4/2 dark greyish yellow		

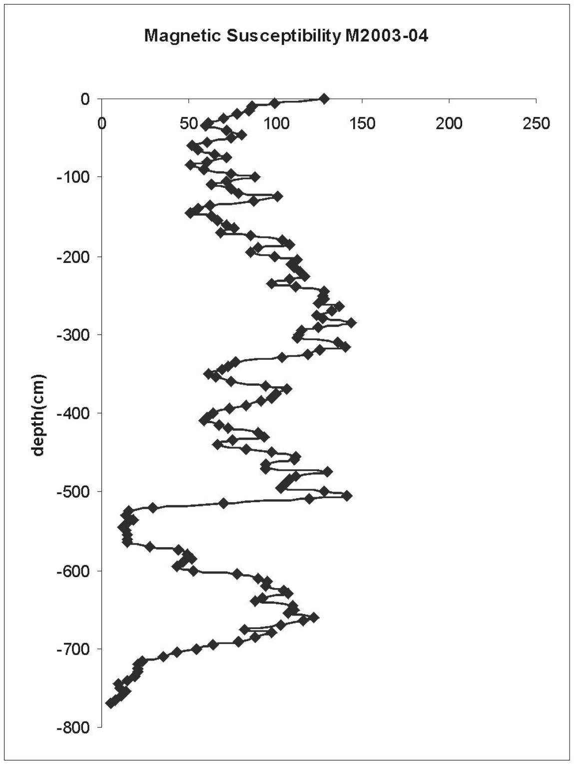


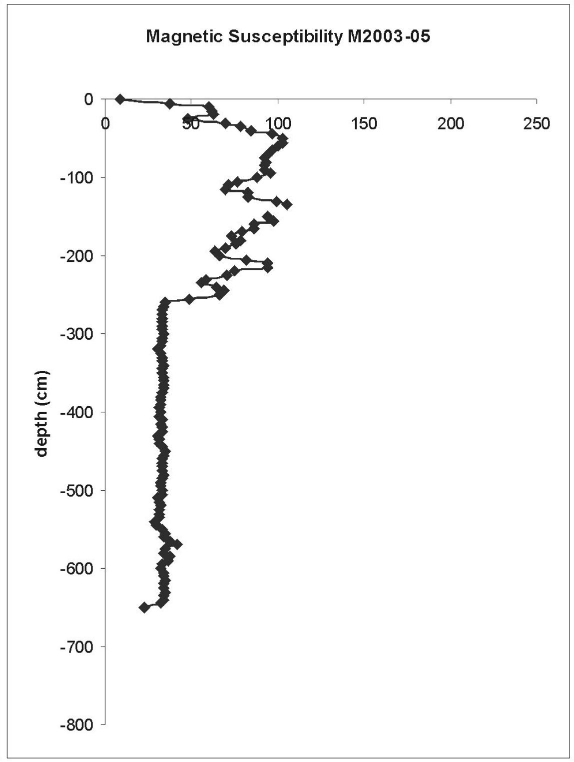
CORE DESCRIPTION PELAGIA/M2003-06

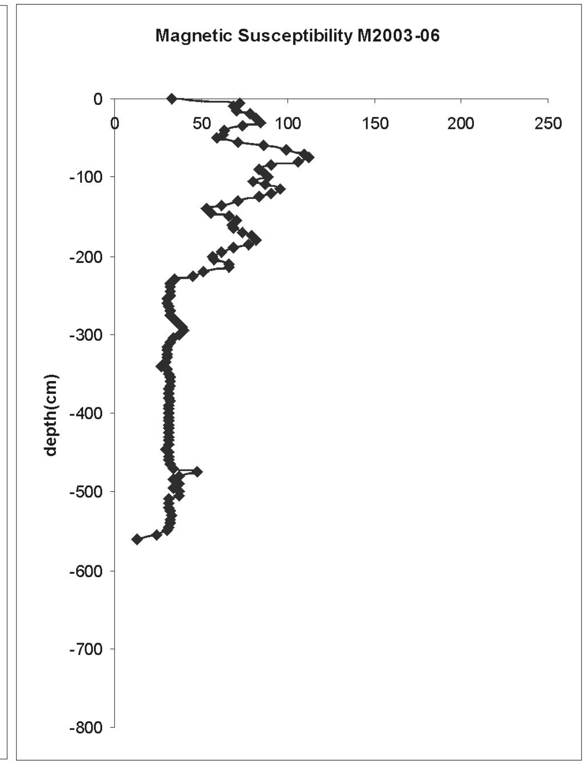
Described by: Henk, Irene, Aurora, Furu	
Date: 3-08-2003	Length: 50 cm
Station: M2003-06 (62°38.59'/-1°18.96')	
Box core:	
Piston core: # 6	

Dpt.	Lithology	Colour	Description	Smpl.
		2.5Y 4/4 olive brown ↓ 2.5Y 4/3 olive brown 5Y 4/2 greyish olive	**Unit I:** (0-42cm) Slightly silty clay with foraminifera, dark minerals and burrows - 3cm: pebble (<1 cm) - 0-15cm: water rich layer **Unit II:** (0-50cm) Silty clay with some 1mm grains (fe-oxide + quartz) - 49cm: pebble (<1 cm)	

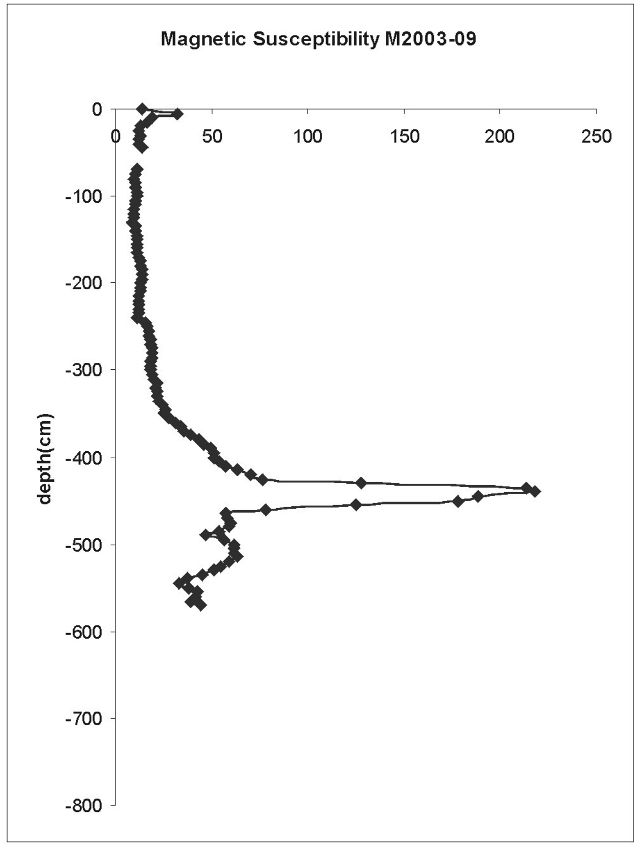
Appendix VIII, Magnetic susceptibility



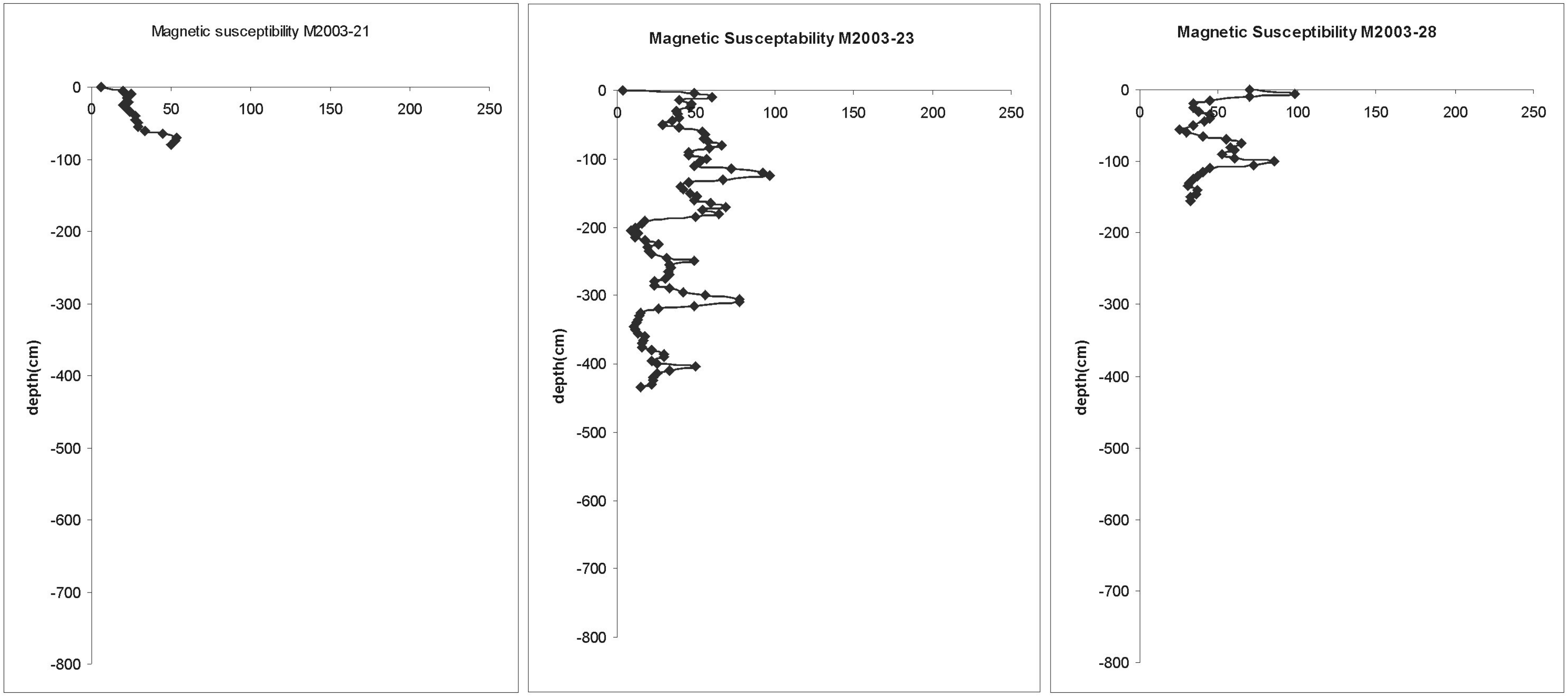




Magnetic susceptibility of piston cores taken in the Faeroe-Shetland Channel. Note the similarity in susceptibility pattern of cores 5 (taken out side the mound area) and 6 taken in the central depression of a mound). Core 4 was taken on top of a mound.



Magnetic susceptibility of piston core 9 taken at Feni Drift.



Magnetic susceptibility of piston cores taken on the mounds on the flank of Rockall Bank.

Appendix IX, List of watersamples

Watersamples taken for isotopic (δ18O and δ13C) analysis

Boxcores
Station M2003-04 BX
Station M2003-11 BX
Station M2003-12 BX
Station M2003-14 BX
Station M2003-16 BX
Station M2003-18 BX
Station M2003-19 BX
Station M2003-20 BX
Station M2003-21 BX
Station M2003-22 BX
Station M2003-23 BX
Station M2003-24 BX
Station M2003-25 BX
Station M2003-26 BX
Station M2003-28 BX
Station M2003-29 BX
Station M2003-34 BX
Station M2003-35 BX

CTD
Station M2003-10 CTD
Station M2003-13 CTD
Station M2003-27A CTD
Station M2003-27D CTD