Cruise Report: HEINCKE 153

Compiled and edited by Ellen Damm and Andreas Mackensen (co-chief scientists)

August 22 – September 21, 2001

Methane Supersaturation on the Continental Shelf off Spitsbergen: Sources, Modification in the Marine Carbon Cycle, and Documentation in the Stable Isotopic Composition of Biogenic Carbonates

Methane is an important greenhouse gas as well as an important component of the global carbon cycle. The present marine carbon cycle may be directly influenced by fossil methane released from the sediment into the deep water if the discharge by a subsurface source exceeds the microbial methane uptake capacity of the sediment and the water-sediment interface. However the rates of methane released from ocean gas vents, the possible role of these large methane sources in the present carbon cycle and their impact on the methane budget of the atmosphere are not well understood and virtually unknown. During cruise ARK-XVI of RV "Polarstern" in summer 2000 on the continental shelf off western Spitsbergen, a methane plume was detected in the water column. Although the concentration decreased with decreasing water depth, at the majority of stations, water was supersaturated with respect to the atmospheric methane level, and thus indicated that this shelf region acts as a source for atmospheric methane. However, the ultimate sources for the observed methane anomalies in the water column are still unknown. To further investigate these methane anomalies and their possible sources off Spitsbergen and their impact on the marine inorganic carbon system and their documentation in the stable carbon isotopic composition of calcitic benthic foraminifera, an ambitious scientific water and sediment sampling program was planned and successfully carried out during RV "Heincke" cruise 153 to Westspitsbergen in late summer 2001.

Objectives

The project was carried out as an interdisciplinary research approach and covered the compartments of main importance for the behavior of methane in this particular regional setting: sediments, sediment/water interface and the water column. The research was focused on the Barents Sea shelf (near Bear Island), the Storfjord (Eastspitsbergen) and the Westspitsbergen shelf and slope (down to 1400 m water depth) between 76° N and 79° N. Mainly isotopic, inorganic geochemical, microbiological, micropaleontological and sedimentological methods, as well as *in situ* sea-floor observation technology were used (ROV). Micropalaeontological studies, including stable isotope studies provide information on the effects of methane with respect to the sedimentary organic carbon cycle and the fauna in recent and past times. Microbial and geochemical studies of the sediment water interface allow characterizing and quantifying the effects of microbial turnover and the related transfer of fossil organic carbon into the recent organic carbon cycle. Furthermore geochemical studies allow characterizing the methane source. Physical and chemical studies of the seawater influenced by methane escapements allow determining and establishing for the recognition, distinction and tracing of vent activity in the marine environment. The stable carbon isotopic signature of methane will be determined in order to distinguish between methane released from different submarine sources and to estimate isotopic fractionation processes in the marine environment.

The investigations contribute to a better understanding of:

The potential sources of the detected methane in the water column

The transportation of methane from out of the fjords via the shelf down the continental slope

The different pathways of methane in the hydrosphere and in the sediments

The role of Spitsbergen shelf and fjords as a sink or source for atmospheric methane,

The incorporation of fossil methane into the recent marine carbon cycle.

Itinerary

RV “Heincke” left Bremerhaven on August 22, 2001 at 20.00 hours, onboard 12 crewmembers and 8 scientists. After a transit of 2000 nm she arrived on August 27, 2001 at Tromsø harbor, where two Norwegian scientists were picked up (see table 1 for list of participants). Due to engine trouble the ship had to stay the whole day in Tromsø to wait for an engineer who finally decided that “Heincke” had to steam with just two engines instead of three from now on. After a short transit heading to the north, the first station was occupied east of Bear Island. Work was started on August 29, early in the morning. The station work focused on hydrographic and geochemical measurements, water and sediment sampling, observation of the macro-benthic communities and of distribution patterns of sediment types. Water sampling as well as temperature and conductivity measurements have been performed with a Carousel water sampler equipped with 24 bottles of 12 Liters each connected to a CTD-probe, whereas sediment surface samples were obtained with the aid of a Multiple Corer equipped with 12 tubes of 6 cm diameter each. Depending on the sediment type, occasionally a small box corer of 200 cm^2 box surface was deployed. Shipboard activities on stations, including the gear deployed are given in more detail in the station list attached (Table 2).

Favorable weather conditions between August 29 and September 14 allowed fully completing of the planned hydrographic, geochemical, sedimentological and micropaleontological sampling program on 54 stations arranged on 7 sections (Fig. 1). The sections are designed such that they roughly run more or less perpendicular to the continental margin and the direction of flow of the main oceanographic currents, beginning close to Bear

Island in the east of Spitsbergen, then continuing off Westspitsbergen from Hornsund Fjord in the south, via Van Mijenfjord, Isfjord including Prince Karls Foreland Sundet, and finally terminating at the Kongsford in the north. During the afternoon of September 11, station work was interrupted for a short visit of the village Ny Ålesund and the Koldewey station of the Alfred Wegener Institute. The shipboard scientific party and two crew members were heartily welcomed by the head of the Koldewey station, who had organized a guided tour thru the most interesting laboratories and scientific equipment. Work at sea was finished on September 14 when "Heincke" arrived in Longyearbyen where 7 scientists disembarked at 14:00 hours local time. At 16:00 hours RV "Heincke" left the port of Longyearbyen heading Bremerhaven, her port of registry, where she eventually arrived on September 21.

Physical oceanography

Ulrich Hoge and Gereon Budeus

CTD-work has been performed with a Seabird 911+, connected to a Carousel water sampler equipped with 24 bottles 12 Liters each. Temperature (S/N 2929) and conductivity (S/N 2470) sensors have been calibrated directly before the cruise. Digiquartz pressure S/N is 51197. One additional channel has been used for a Wet-labs C-star 25 cm transmissiometer. All equipment worked without problems.

Data have been processed on PC and work station, with the SBE proprietary routines datcnv, split (only down cast is considered as valid measurements), celltm, loopedit and binavg (into 1 dbar bins) applied to the original measurement parameters, and subsequent conversion into standard hydro-graphic parameters on the work station. Note that we include IPTS68 in the final data files in order to allow for easy further calculations, although the sensors are calibrated according to ITS90.

The overall situation on the transect is characterized by the contrast between two main water masses, i.e. the Atlantic Water (AW) and the fresher water masses on the Svalbard shelf. On most transects a clear front between these two is apparent, with complex interleaving structures in temperature and salinity resulting from an opposition of waters with similar densities but different other properties. The fresh waters can stem from a variety of sources such as the Barents Shelf, land runoff and ice melt.

A particulary important observation is the occurance of very dense and cold bottom waters on the landward end of the transect into the Storfjord. These waters seem to be trapped by a sill and must have been formed locally in winter. Their density greatly exceeds that of the deep waters in the nearby Greenland Basin. Therefore, it is a clear candidate for vigorous shelf water plumes and should be interpreted in connection with the observed ocean floor structures on the bottom slope.

Sources and pathways of methane anomalies in the water column

Ellen Damm and Ingrid Vöge

Objectives. The main goals of the expedition were to record methane anomalies in the water column of the Spitsbergen fjords and shelf region, to identify the methane sources and to determine the spatial extension of the methane plumes in relation to different ocean currents. An additional goal was to distinguish between fossil methane incorporated into the water column by gas vents at the seafloor and methane enrichments induced by *in situ* production that is linked to phytoplankton blooms in the euphotic zone. In the onshore laboratories the released methane from the different sources will be investigated for its carbon isotopic signature in order to quantify the modification of fossil methane and its incorporation in the present marine methane and carbon pool. In summary, the main pathways of methane in the water column, i.e. methane oxidation, dilution and mixing with the background signal, as well as transport of methane by dense brine waters, will be quantified.

Work at sea. Water samples were taken at 51 stations of 7 transects, positioned close to Bear Island, in the Storjord (Eastspitsbergen) in the fjords of Westspitsbergen and at the Westspitsbergen shelf and slope down to 1000m water depth (Fig. 1). All water samples were collected in Niskin bottles mounted on a rosette sampler from water depths of 1000 m up to the surface (4m). Methane concentrations were measured on board ship. Immediately after recovery, the dissolved gases were extracted in 1 litre water samples and analysed for methane by a gas chromatograph equipped with a flame ionization detector (FID). Gas samples were stored for investigations of the carbon isotopic signature of methane to be carried out onshore. Detected gas vents or groundwater discharge were traced by additional geochemical parameters, such as radionuclides (see below), helium and rare earth elements.

Water samples for measurements of methane oxidation rates were performed by adding a $^3H\text{-}CH_4$ tracer to the fresh water samples. Samples were incubated about four days in the dark near *in situ* temperature. After this time incubation was stopped by adding formalin and stored for analysis onshore.

Water samples for dimethyl sulfide (DMS) and dimethyl sulfoniopropionate (DMSP) analyses were collected from water depths of 200 m up to the surface. Fresh water samples for DMS measurements were filtered through a GF/F (glass fiber) filter. The filtrate was immediately collected in 120ml glass vials containing 300 υl of 2M sulfuric acid, and the vials with screw top PTFE/silcone septa were stored cool to decrease loss of volatile components. Samples of 2litre fresh water for DMSP (dissolved and particular) analyses were filtered through a GF/F (glass fiber) filter. The filter was immediately put in 25ml glass vials containing 8 ml 1 M NaOH, closed by screw top PTFE/silcon septa. The vials were then shaken vigorously for 30 seconds and stored in the refrigerator for analyses onshore.

Preliminary results. The surface water of all fjord and shelf stations was supersaturated with respect to atmospheric methane. Deeper in the water column, the methane concentrations were up to two orders of magnitude higher than the normal background concentration level. These supersaturations of methane are induced either by *in situ* production of methane in the euphotic zone or by methane injections from bottom sources. Both types of profiles can be distinguished by the trend of the methane gradient in the water column. The first type mentioned exhibits highest methane concentration levels between 25 and 50 m water depth and decreasing concentrations in deeper water masses. In contrast, profiles with injections from bottom sources are reversed, with enriched methane concentrations near the sea floor decreasing with decreasing water depths. However both types of methane anomalies contribute to the supersaturations in the surface water and indicate that this shelf region and the fjords act as source for atmospheric methane. After determining the carbon isotopic signature of the methane onshore, a more detailed and qunatitative discremination between the different sources of methane will allow for establishing the methane budget in the water column. Typical background concentrations were found at stations on the slope in water depth greater than 1000 m. This measured background level corresponds to a typical threshold level and clearly indicates that methane consumption virtually had ceased due to the isolation of deep water masses from the surface ocean.

Stable isotopic composition of dissolved inorganic carbon and water in the water column and sediment pore water

Andreas Mackensen and Maren Thomas

To follow the fate of the stable carbon isotopic composition of dissolved inorganic carbon in relation to varying methane concentrations from the surface water, where primary production usually enriches $\delta^{13}C_{DIC}$ values, down through the water column onto the surface sediment, where decay and benthic respiration depletes the values, and finally the documentation in biogenic benthic calcareous test, we carried out an intensive water sampling program. Immediately after recovery, all of the water samples taken for carbon analyses were poisoned with a saturated solution of $HgCl_2$, sealed with wax and kept cool until on-shore for determination of the $\delta^{13}C$ of the total dissolved inorganic carbon. Samples for $\delta^{18}O$ determination were not poisoned but otherwise treated the same way.

To determine the stable isotopic composition in the water column, we drew 100 ml water each from 12 l Niskin sampling bottles at all hydrographic CTD stations from water depths chosen in dependence on the local hydrography, but usually in intervals between 20 and 100 m (Fig. 1, Table 2). To determine the stable isotopic composition of the bottom water directly overlying the sediment, i. e. from the sediment/water interface, we drew 100 ml water each from one of the cores of the multiple corer. These samples are of particular importance, since they were taken to figure out by comparison with the deepest CTD samples and the pore water samples from the sediment (see below), whether the bottom water is polluted by pore water dissolved gases during sampling, and how the water column in the multiple corer tube integrates the gradients within the benthic nepheloid layer and above it.

At all sites where soft sediment was recovered with a Multiple Corer, we cut one sediment sub-core into 1-cm-thick slices. The sediment slices then were sealed in bottles and kept frozen until final treatment for pore water retraction and stable carbon isotope measurements onshore.

Naturally occurring radionuclides as water mass tracers

Claudia Hanfland and Ingrid Vöge

Background. Radionuclides of the naturally occurring decay chains find a wealth of applications as tracers in oceanographic processes on time scales from hours and days to years. For a better understanding of water mass movement on the west-side of Spitsbergen, the natural activities of ^{222}Rn, ^{226}Ra and ^{228}Ra have been determined on selected stations.
^{222}Rn is produced in the seafloor as well as in the water column by decay of its progenitor ^{226}Ra. While water masses in the interior ocean are in secular equilibrium with regard to the pair ^{226}Ra-^{222}Rn, bottom waters show an excess of ^{222}Rn over ^{226}Ra due to preferential radon escape from sediments into pore water and the water column. The distribution of this ^{222}Rn excess ($^{222}Rn_{xs}$) yields valuable information about vertical mixing rates in the sea. ^{222}Rn is also naturally enriched in groundwater with factors 3-4 orders of magnitude higher than in coastal waters. It can therefore be used as a tracer for groundwater seepage into coastal seawater

bodies.

^{226}Ra is measured for the determination of the amount of ^{222}Rn that is supported by its progenitor in the water column. It nevertheless is a tracer for ocean circulation on its own with a distribution similar to the major nutrients.

^{228}Ra is used as a tracer for prolonged contact of water masses with continental shelf areas. It is a daughter product of ^{232}Th, which is common in most sediment types but nearly absent in sea- water due to its particle reactive behaviour. In contrast, radium is soluble in water and can accumulate to high activities over fine-grained sediment. According to its half-life of 5,8 years, the activity of ^{228}Ra will decrease with distance from the source and is extremely low in the open ocean. Measurements of ^{228}Ra on sections across the Spitsbergen shelf into deeper waters should yield information to what extent shelf water is advected away from its continental source.

Work at sea

^{222}Rn

Sampling for ^{222}Rn was done on two to four depths per station starting above the ground with a CTD rosette. On deck, about 20 l per depth were hermetically drawn into pre-evacuated plastic containers and purged with helium for one hour. The ^{222}Rn was frozen in a charcoal trap cooled to –70°C. Subsequent heating to 550°C and renewed purging with helium transferred the radon into scintillation counting cells. The cells were set aside for 4 hours before counting to allow the establishment of a secular equilibrium between ^{222}Rn and its short-lived daughters. Counting was done on board with photo-multiplier tubes.

^{226}Ra and 228Ra

After the radon had been stripped out of the water, the samples were weighed to determine the sample size. Even in rough seas, this is accurate to at least 100g which equals an error of 0.5% for 20 kg. A pre-weighed aliquot (100 ml) of a $BaCl_2$-solution that had been prepared before the cruise was added under constant stirring to every 20 l water sample to precipitate radium as $Ba(Ra)SO_4$, making use of the natural sulfate content in sea water. After at least one hour of further mixing on the magnetic stirrer, the crystals were recovered by decantation and centrifugation and washed several times to remove any interfering ions.

At home, the dried and weighed precipitates will be filled in plastic tubes, sealed and set aside for about three weeks to allow the short-lived daughters ^{214}Pb and ^{214}Bi to grow into equilibrium with their parent ^{226}Ra. After establishment of a secular equilibrium, the sample will be counted by γ-spectrometry. Both ^{226}Ra and ^{228}Ra can be measured on the $BaSO_4$, provided that the latter is present in sufficiently high concentrations.

Preliminary results for $^{222}Rn_{xs}$. Note that the following results are very preliminary as various corrections have still to be made. In the following, two characteristic vertical profiles of ^{222}Rn will be presented. The approximate ^{226}Ra activities have been taken from "Transient Tracers in the Ocean". Station 1278 is a typical profile of ^{222}Rn with excess activity close to the sediment surface that is gradually decreasing, reaching equilibrium with ^{226}Ra at intermediate water depths (indicated by approximately zero excess-avtivity).

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The preliminary results do not show any hint on significant groundwater input. However, the activities measured directly above the seafloor varied by a factor of 20. Highest concentrations of more than 60dpm/100L were found in the shallow regions of Storfjord (e.g., Sta. 1244). Enhanced activities up to 20dpm/100L were also found in the vicinity of (ancient) coal mining areas.

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Biodiversity of mega-epibenthic assemblages and methane seeps

Julian Gutt and Werner Dimmler

Background. Most benthic communities are, in contrast to plankton and nekton, characterised by a high proportion of sedentary animals which are unable to escape or drift away if environmental conditions change significantly. As a consequence, benthic patterns do not only reflect the actual conditions but also a long-term development of environmental parameters. Events of any kind of disturbance may still be visible even if a significant impact was effective only for a short period and happened long ago. Such destructive processes are followed by a recolonization with successional stages which may differ considerably in their structure and functioning from communities close to a hypothetical equilibrium. At an ecological level a resulting coexistence of different assemblages can lead to an increased between-habitat diversity or species turn over if larger areas are considered.

Objectives. With this background the following objectives were addressed in the context of the investigations on a possible relationship between methane seeps and the structure of macrobenthic assemblages:

- Can methane seeps directly be observed or are direct effects visible?
- Is the benthic macrofauna affected in its structure and species composition by high methane concentrations in the water column close to the sea-floor?
- To which degree is a spatial variability of benthic "background"-assemblages visible which can be explained by other environmenal parameters or biological processes?

Work at sea. The ROV was deployed successfully at 25 stations. The video observations comprised a total of approximately 24 hours which represent roughly estimated a distance of 21 kilometres or an area of $8200m^2$ assuming an average width of the video transect of 0.4cm. The exact area observed at each station will be calculated based on the minute-wise ships GPS positions recorded during the ROV operations. In addition a total of 2300 photographs have been taken which are usually used for a best possible identification of species.

Preliminary results. A first look at the videos showed that methane itself can not directly be observed. However, in one area west of Svalbard patches of a white-blueish layer on the subsurface and side and not on top of pebbles might indicate microbial growth which profits from methane sources. This interpretation seems to be especially likely because in the same area extremely high methane concentrations were measued in the water column. The megafauna was absent in these patches having an extent of less than $1m^2$. Whether the megafauna in the surrounding area is anyhow affected in its composition and diversity can not be stated before final detailed results are available. In addition, the visualisation of various biogenic holes in soft sediments in the fjords stimulated a discussion whether intense bioturbation might make possible a diffusion of methane through an oxygen containing sediment surface layer which normally prohibits its penetration into the water column.

A few general ecological conclusions can be drawn. Soft bottom epibenthic assemblages differ considerably in their composition from those on hard substrata but they do not seem to perform a lower biodiversity. The assemblages also do not follow consequently the general tendency that soft sediment assemblages are dominated by deposit feeders including infauna species whilst in areas where gravel indicates a high bottom near current filter feeders are most abundant. E.g. at stations around Bjørnøya soft corals, sponges and sea anemones were abundant whilst mobile species such as shrimps, brittle stars, and sea urchins reached high densities not only at soft bottom stations but also in gravel fields. Only inside the fjords filter feeders were rare at all stations. The megabenthic animal with the maybe highest local abundance was a compound ascidian living on boulders at station 1264 in the Van Mijenfjorden.

The direct observations also contributed to several sedimentological conclusions. For small scale canyons being approximately 1m deep and 1m wide observed at the slope of the Barents Sea (stn 1243) and in the

Kongsfjordrenna (stn 1289) two different explanations were discussed: 1. Otter trawls may generally create such structures and fishing effort seems to be high in this area indicated by many trawlers which operated in this area during our investigations. On the other hand corresponding scars in the sediment should be straight and not as irrregular as those we observed. 2. Dense brine waters formed during winter sea ice formation on the Barents Sea shelf may have winnowed the sediment and created such structures at the sea-floor. However, we do not know whether the outflow of deep water from the shelf of the Barents Sea and the fjord is intense and spatially concentrated enough. Brush shaped animals to be identified with the help of specialists at home were more abundant inside the canyons than outside. The observation of a high abundance of poorly rounded and unsorted stones and pebbles on a deeper sill in Forlandsundet (stn 1269) may answer the question of the western extent of glaciation during the last Glacial Maximum. So far controverse hypotheses were discussed due to poor true results from that area. Quite regular wave-like structures of the sea-floor at the slope west of Svalbard seem to be formed by internal waves. Large boulders and stones were found on the aprox. 0.5m high and approx. 1.5m wide elevations, whilst the depressions were dominated by softer sediments.

Sediments and organic carbon cycling

Jochen Knies and Kari Liese Rørvik

Objectives

(1) Modern environmental processes and controlling factors for the carbon cycle in high-accumulation coastal areas. Mapping of the modern environment and active environmental processes are a necessity in order to understand the recent carbon cycle and give implications for the paleoclimatic record. Sedimentological, micropaleontological, and geochemical proxies analysed in surface sediments will comprise most environmental factors controlling the influence of the sedimentary regime on the West Spitsbergen shelf today.

(2) Reconstruction of paleo-climatic changes in a high sensible arctic ecosystem. High northern latitudes are highly sensitive to anthropogenic-induced climate changes. The paleoenvironmental reconstruction during the last ~2000 years along the West Spitsbergen coast may already elucidate possible consequences of global warming for high sensible arctic ecosystems. Furthermore, the data possibly allow to reconstruct the effects of the last distinct global cool – warm climatic cycle for high latitude coastal environments, i.e. The Medieval warmth – Little ice age oscillations.

(3) Concentration and isotope composition of methane in sediments. Thermogenic or biogenic sources for supersaturating in ocean waters and climatic implications? Sources and potential reasons for the methane

enrichment in the water column on the West Spitsbergen shelf have to be found. The isotopic signature and concentration of free gas compounds in the sediments may give insights into possible natural gas reservoirs on the West Spitsbergen shelf and try to predict their role for future climate changes in high northern latitudes. Initial analyses will be conducted during this upcoming project.

Work at sea and available material**.** During operation onboard of “FS Heincke” sediment samples were recovered at approximately 50 stations. Starting activities north of Bjørnøya (74° N) multicorer (MUC) and boxcorer (BC) were used on several sections (see appendix) recovering sediment records from water depths between 40 and 1400 mbsf. Concerning task 1, undisturbed surface samples were taken on almost every stations (except the shelf sections west off Hornsund). Samples were immediately frozen, particularly for organo-geochemical purposes. Paleo-climatic reconstruction of the last ~2000 years will be conducted on the multicores recovered from fjord and through transects, e.g. in the Storfjorden, the van Mijenfjorden, and the Isfjorden (task 2). One core was sliced onboard every centimeter and an archive core was immediately frozen after recovery. Selected samples from the base of the multi cores were taken onboard, flushed with nitrogen, sealed, and stored at –20 °C in order to analyse the headspace and the occluded gas compounds as well as their isotopic composition (task 3). The studies will last approximately 2 years including a synthesis and/or publication phase. A project proposal including financial support for one PhD and one MSc. student is currently under consideration.

Calcareous microfossil assemblages and their stable isotopic composition as methane proxy

Andreas Mackensen and Maren Thomas

To quantitatively figure out whether and how benthic foraminifera and other meiofaunal organisms respond to the release of methane into the pore and bottom water, both in terms of faunal composition and stable carbon isotopic composition of their tests, we carried out a detailed sampling program of the uppermost 15 cm of the surface sediments at the vast majority of occupied sites, i.e on 50 stations. After sampling the water, sediment was extruded out of usually four of the 6-cm-multiple corer tubes, cut into 1-cm-thick slices, stained with Rose Bengal, and stored separately prior to determining their benthic foraminiferal content and stable isotope measurments onshore.

Technical description Radioactivity

Ingrid Vöge

Während der Fahrt He153 wurden Proben zur Methanoxidationsrate genommen. Im Rahmen dieser Tätigkeit war ich als Strahlenschutzbeauftragte vom 22.8.010 bis zum 21.9.01 verantwortlich. Es wurden auf folgenden Stationen 20mL Proben genommen: 1239-1251; 1253-1255; 1257; 1260; 1263-1270; 1274-1275; 1277-1278; 1281; 1291; 1292.

Diese Proben wurden mit 50 µL tritiumgeimpfter Methanlösung, die eine Aktivität von 2,5µCi beinhaltet, versetzt. Nach viertägiger Inkubation wurden diese mit 200µL Formalin vergiftet.

Vor und nach der Bearbeitung der Proben wurde ein Wischtest an relevanten Stellen im Labor durchgeführt. Dieser Test ergab folgende Ergebnisse:

Probe	dpm vorher	dpm nachher
Blindwert	13.15	10.33
Tisch	13.72	21.20
Kühlschrank	13.55	15.84
Kühlschranktürgriff	9.17	13.10
Tür	14.26	16.39
Fußboden	23.16	19.80
Flaschen	14.31	16.06
Tüte	25.83	15.96
Wanne	9.86	16.65

Es wurde keine Kontamination im Labor hinterlassen.

Überschüssige Probenlösung wurde mit Hilfe von Spritzen aufgefangen und in einem dafür vorgesehenen Gefäß gesammelt. Sämtliche Verbrauchsmaterialien, die während des Umganges mit der radioaktiven Lösung verwendet wurden, wurden gesondert gesammelt. Die Lösung und Materialien wurden am AWI entsorgt.

List of Participants:

Dr. Ellen Damm, AWI (co-chief scientist, Methane measurements in the water column)

Werner Dimmler, AWI (technician ROV)

PD Dr. Julian Gutt, AWI (ROV, benthic communities)

Dipl.-Geol. Claudia Hanfland, AWI (radionuclide measurements)

Dipl.-Ing. Ulrich Hoge, AWI (technician oceanography)

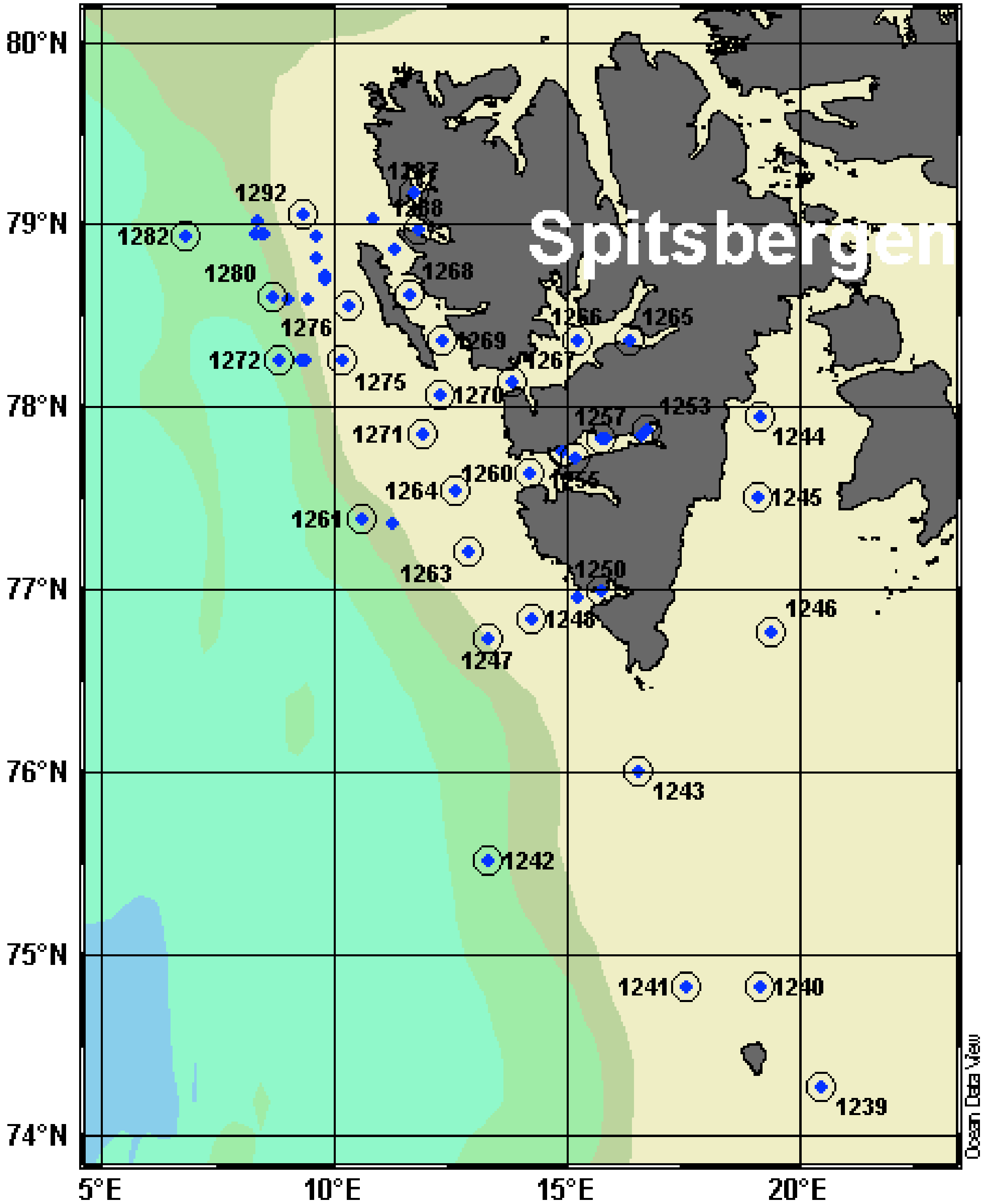
Dr. Jochen Knies, NGU Trondheim, Norway (sediment investigations)

PD Dr. Andreas Mackensen, AWI (co-chief scientist, stable isotopes, foraminifera)

MSc Kari Lise Rørvik, Univ. Tromsø, Norway (sediment investigations, diatoms)

Maren Thomas, AWI (technician geology)

Ingrid Vöge, AWI (technician geochemistry)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Ocean Data View

Leg	Station	Section	Date	Latitude		Longitude		Latitude	Longetude	Water Depth	Gear	Bottle Depth	CH4/Con	CH4 Oxid.
				°N	min	°E	min	dec	dec	m	Recovery	m	Bottle #	Bottle #
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	bottom	2	2
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	175	6	6
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	150	8	8
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	125	12	10
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD		14	14
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	75	17	
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	50	19	20
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	25	21	
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182.4	CTD	surface	23	
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	178	MUC/12			
											Recovery: 20cm			
Hei153	1239	1	29.08.01	74	26	20	50	74.43	20.83	182	ROV			
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	bottom	2	
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	80	4	
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	60	6	1
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	40	8	5
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	30	10	7
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	20	12	9
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	10	14	13
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	91	CTD	surface	16	15
Hei153	1240	1	29.08.01	74	49	19	10	74.82	19.17	94	Box core			
											Recovery: 3cm			
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	bottom	2	2
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	250	6	6
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	200	9	9
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	150	11	10
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	100	12	12
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	75	15	
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	50	17	17
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	25	19	
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	300	CTD	surface	21	

Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	297	MUC/12			
											Recovery: 28cm			
Hei153	1241	1	29.08.01	74	49	17	34	74.82	17.57	298	ROV			
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	bottom	1	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	1000	3	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	800	5	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	600	7	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	500	9	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	400	11	
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	200	13	14
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	100	15	16
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	75	17	18
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	50	19	20
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	25	21	22
Hei153	1242	2	30.08.01	75	30	13	20	75.50	13.33	1306	CTD	surface	23	24
Hei153	1242	2	31.08.05	75	30	13	20	75.50	13.33	1297	MUC/12			
											Recovery: 33cm			
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	bottom	2	2
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	300	5	5
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	250	8	8
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	200	11	10
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	100	13	13
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	75	15	
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	50	17	18
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	25	19	
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	336	CTD	surface	21	
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	332.9	MUC/12			
											Recovery: 19cm			
Hei153	1243	2	30.08.01	76	0	16	34	76.00	16.57	335	ROV			
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	bottom	2	2
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	75	4	5
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	65	7	7
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	50	10	10

Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	25	14	14
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	90	CTD	surface	16	15
Hei153	1244	2	01.09.05	77	56	19	9	77.93	19.15	96	MUC/12			
											Recovery: 21cm			
Hei153	1244	2	31.08.01	77	56	19	9	77.93	19.15	91	ROV			
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	bottom	2	2
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	150	5	5
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	130	8	8
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	120	11	10
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	100	13	12
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	75	15	15
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	50	17	
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	25	19	
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	CTD	surface	21	
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	180	MUC/12			
											Recovery: 31cm			
Hei153	1245	2	31.08.01	77	30	19	7	77.50	19.12	178	ROV			
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	bottom	1	2
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	130	3	
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	120	5	
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	100	7	8
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	75	9	10
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	50	11	12
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	40	13	
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	30	15	16
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	20	17	
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	147	CTD	surface	19	18
Hei153	1246	2	31.08.01	76	46	19	25	76.77	19.42	153	MUC/11			
											Recovery: 24cm			
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	bottom	2	2
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	375	5	5
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	325	8	8
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	300	10	10
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	250	14	14

Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	200	16	16
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	150	18	
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	100	20	
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	75	21	
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	50	22	
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	25	23	
Hei153	1247	3	01.09.01	76	43	13	18	76.72	13.30	431	CTD	surface	24	
Hei153	1247	3	02.09.05	76	43	13	18	76.72	13.30	409	MUC			
											dropstone			
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	64	CTD	bottom	1	2
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	64	CTD	45	3	4
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	64	CTD	35	5	6
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	64	CTD	25	7	8
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	64	CTD	surface	9	10
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	67	Box core			
Hei153	1248	3	01.09.01	76	50	14	14	76.83	14.23	63	ROV			
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	bottom	2	2
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	125	5	
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	100	8	8
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	75	11	11
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	50	13	14
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	25	15	16
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD	surface	17	18
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	CTD			
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	156	MUC/12			
											Recovery: 32cm			
Hei153	1249	3	01.09.01	76	56	15	15	76.93	15.25	154	ROV			
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	bottom	1	2
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	200	3	4
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	150	5	6
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	100	7	8
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	75	9	10
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	50	11	
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	25	13	
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	CTD	surface	15	16

Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	228	MUC/12			
											Recovery: 30cm			
Hei153	1250	3	01.09.01	76	59	15	45	76.98	15.75	230	ROV			
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	bottom	1	2
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	90	3	4
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	75	5	6
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	50	7	8
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	30	9	10
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	15	11	
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	110	CTD	surface	13	14
Hei153	1251	4	02.09.01	77	45	14	55	77.75	14.92	115	MUC/11			
											Recovery: 35cm			
Hei153	1252	4	02.09.01	77	49	15	51	77.82	15.85	44	CTD			
Hei153	1253	4	02.09.01	77	52	16	44	77.87	16.73	20.5	CTD	bottom	4	4
Hei153	1253	4	02.09.01	77	52	16	44	77.87	16.73	20.5	CTD	12	5	5
Hei153	1253	4	02.09.01	77	52	16	44	77.87	16.73	20.5	CTD	10		
Hei153	1253	4	02.09.01	77	52	16	44	77.87	16.73	20.5	CTD	5	11	11
Hei153	1254	4	02.09.01	77	50	16	35	77.83	16.58	70	CTD	bottom	1	2
Hei153	1254	4	02.09.01	77	50	16	35	77.83	16.58	70	CTD	50	3	4
Hei153	1254	4	02.09.01	77	50	16	35	77.83	16.58	70	CTD	25	5	6
Hei153	1254	4	02.09.01	77	50	16	35	77.83	16.58	70	CTD	surface	7	8
Hei153	1254	4	02.09.01	77	50	16	35	77.83	16.58	76	MUC/10			
											Recovery: 38cm			
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	77	CTD	bottom	2	2
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	77	CTD	65	5	5
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	77	CTD	55	8	8
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	77	CTD	30	11	11
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	77	CTD	surface	13	14
Hei153	1255	4	02.09.01	77	43	15	10	77.72	15.17	83	MUC/12			
											Recovery: 29cm			

Hei153	1256	4	03.09.01	77	49	15	49	77.82	15.82	47	ROV			
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	51	CTD	bottom	2	2
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	51	CTD	41	5	4
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	51	CTD	30	6	8
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	51	CTD	15	11	14
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	51	CTD	surface	13	16
Hei153	1257	4	03.09.01	77	49	15	45	77.82	15.75	50	ROV			
Hei153	1258	4	04.09.05	77	49	15	45	77.82	15.75	43	MUC/9 Recovery: 35cm			
Hei153	1258	4	03.09.01	77	49	15	45	77.82	15.75	34	ROV.			
Hei153	1259	4	03.09.01	77	49	15	45	77.82	15.75	47	ROV			
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	bottom	2	2
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	120	5	5
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	100	7	8
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	75	10	10
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	50	14	14
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	25	15	
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	164	CTD	surface	17	18
Hei153	1260	4	03.09.01	77	38	14	12	77.63	14.20	162	MUC/8 Recovery: 32cm			
Hei153	1261	4	04.09.01	77	23	10	35	77.38	10.58	1320	CTD	bottom	2	
Hei153	1261	4	04.09.01	77	23	10	35	77.38	10.58	1320	CTD	1100	4	
Hei153	1261	4	04.09.01	77	23	10	35	77.38	10.58	1320	CTD	900	6	
Hei153	1261	4	04.09.01	77	23	10	35	77.38	10.58	1320	CTD	700	15	
Hei153	1261	4	04.09.01	77	23	10	35	77.39	10.58	1320	CTD	500	16	
Hei153	1261	4	04.09.01	77	23	10	35	77.39	10.58	1320	CTD	300	18	
Hei153	1261	4	04.09.01	77	23	10	35	77.39	10.58	1320	CTD	100	20	
Hei153	1261	4	04.09.01	77	23	10	35	77.39	10.58	1320	CTD	50	22	
Hei153	1261	4	04.09.01	77	23	10	35	77.39	10.58	1320	CTD	surface	24	

Hei153	1261	4	05.09.05	77	23	10	35	77.39	10.58	1291	MUC/7			
											Recovery: 35cm			
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	500	1	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	400	3	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	300	5	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	200	7	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	100	9	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	75	11	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	50	13	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	25	15	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	605	CTD	surface	17	
Hei153	1262	4	04.09.01	77	21	11	16	77.35	11.27	603	MUC/6			
											Recovery: 22cm			
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	bottom	1	2
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	150	3	4
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	100	5	6
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	75	7	8
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	50	9	10
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	198	CTD	surface	11	12
Hei153	1263	4	04.09.01	77	12	12	55	77.20	12.92	196	MUC/7			
											Recovery: 12cm			
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	CTD	bottom	4	4
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	CTD	75	8	8
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	CTD	50	10	10
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	CTD	25	12	12
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	CTD	surface	14	14
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	103	Box core			
											Recovery: 5cm			
Hei153	1264	4	04.09.01	77	32	12	36	77.53	12.60	104	ROV			
Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	89	CTD	bottom	2	2
Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	89	CTD	50	5	5
Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	89	CTD	25	7	8

Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	89	CTD	surface	9	10
Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	87	MUC/11			
											Recovery: 38cm			
Hei153	1265	5	05.09.01	78	22	16	22	78.37	16.37	89	ROV			
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	bottom	2	1
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	200	4	3
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	180	6	6
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	135	9	9
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	100	12	11
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	75	14	13
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	50	16	
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	25	18	
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	265	CTD	surface	20	
Hei153	1266	5	05.09.01	78	21	15	15	78.35	15.25	256	MUC/12			
											Recovery: 36cm			
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	bottom	2	2
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	350	5	4
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	300	7	7
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	250	9	10
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	200	11	12
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	120	14	14
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	50	17	
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	421	CTD	surface	19	
Hei153	1267	5	05.09.01	78	8	13	49	78.13	13.82	416	MUC/11			
											Recovery: 26cm			
Hei153	1268	5	06.09.01	78	37	11	38	78.62	11.63	103	CTD	bottom	2	2
Hei153	1268	5	06.09.01	78	37	11	38	78.62	11.63	103	CTD	75	5	5
Hei153	1268	5	06.09.01	78	37	11	38	78.62	11.63	103	CTD	50	7	8
Hei153	1268	5	06.09.01	78	37	11	38	78.62	11.63	103	CTD	25	9	10
Hei153	1268	5	06.09.01	78	37	11	38	78.62	11.63	103	CTD	surface	11	12
Hei153	1268	5	07.09.05	78	37	11	38	78.62	11.63	102	MUC/8			
											Recovery: 18cm			

Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	bottom	2	2
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	140	5	5
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	115	7	8
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	100	10	10
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	75	13	12
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	50	15	14
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	25	17	16
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	170	CTD	surface	19	18
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	169	MUC/6			
											Recovery: 8cm			
Hei153	1269	5	06.09.01	78	22	12	19	78.37	12.32	171	ROV			
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	bottom	2	2
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	200	5	5
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	150	8	8
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	100	11	11
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	75	13	14
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	50	15	16
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	25	17	18
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	255	CTD	surface	19	20
Hei153	1270	5	06.09.01	78	4	12	18	78.07	12.30	259	MUC/12			
											Recovery: 30cm			
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	52	CTD	bottom	2	
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	52	CTD	35	6	
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	52	CTD	16	10	
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	52	CTD	surface	12	
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	54	Box core			
											Recovery: 5cm			
Hei153	1271	4	06.09.01	77	51	11	54	77.85	11.90	57	ROV			
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	bottom	2	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	1200	4	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	1000	6	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	800	8	

Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	600	10	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	500	12	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	400	14	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	200	16	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	100	18	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	50	20	
Hei153	1272	5	07.09.01	78	15	8	49	78.25	8.82	1400	CTD	surface	22	
Hei153	1272	5	08.09.05	78	15	8	49	78.25	8.82	1400	MUC/12			
											Recovery: 32cm			
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	bottom	1	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	500	3	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	400	5	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	300	7	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	200	9	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	100	11	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	50	13	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	CTD	surface	15	
Hei153	1273	5	07.09.01	78	15	9	18	78.25	9.30	600	MUC/10			
											Recovery: 30cm			
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	bottom	2	
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	350	5	
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	300	7	
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	250	9	
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	200	12	12
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	100	15	15
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	75	17	18
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	50	19	20
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	25	21	22
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	403	CTD	surface	23	24
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	430	Box core			
											Recovery: 5cm			
Hei153	1274	5	07.09.01	78	15	9	23	78.25	9.38	404	ROV			
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	bottom	2	2

Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	250	6	6
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	200	9	10
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	150	14	14
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	100	17	16
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	75	19	
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	50	21	22
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	CTD	surface	23	
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	MUC/5			
											Recovery: 5cm			
Hei153	1275	5	07.09.01	78	15	10	10	78.25	10.17	297	ROV			
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	110	CTD	bottom	2	
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	110	CTD	75	5	
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	110	CTD	50	7	
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	110	CTD	35	10	
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	110	CTD	surface	12	
Hei153	1276	6	09.09.05	78	33	10	19	78.55	10.32	131	Box core			
											Recovery: 9cm			
Hei153	1276	6	08.09.01	78	33	10	19	78.55	10.32	109	ROV			
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	bottom	1	1
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	375	5	5
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	325	7	7
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	250	11	11
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	200	13	13
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	175	17	17
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	150	19	
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	100	21	
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	50	22	
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	CTD	surface	23	
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	404	MUC/4			
											Recovery: 8cm			
Hei153	1277	6	08.09.01	78	35	9	25	78.58	9.42	403	ROV			
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	bottom	2	
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	500	5	
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	400	8	

Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	300	11	
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	200	13	14
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	100	15	16
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	75	17	18
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	50	19	20
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	25	21	22
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	610	CTD	surface	23	24
Hei153	1278	6	08.09.01	78	35	9	1	78.58	9.02	601	MUC/5			
											Recovery: 10cm			
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	bottom		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	1100		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	1000		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	900		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	800		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	700		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	600		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	500		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	400		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	300		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	200		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	100		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1201	CTD	surface		
Hei153	1279	6	09.09.01	78	61	7	82	79.02	8.37	1203	MUC/7			
											Recovery: 38cm			
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	bottom	2	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	700	5	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	600	8	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	500	11	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	400	13	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	300	15	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	200	17	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	100	19	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	50	21	
Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	802	CTD	surface	23	

Hei153	1280	6	09.09.01	78	36	8	41	78.60	8.68	787	MUC/8			
											Recovery: 17cm			
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	CTD	bottom	2	2
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	CTD	80	5	5
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	CTD	50	8	8
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	CTD	25	10	10
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	CTD	surface	12	12
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	Box core			
											Recovery: 12cm			
Hei153	1281	6	09.09.01	78	42	9	49	78.70	9.82	106	ROV			
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	bottom		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	1300		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	1200		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	1100		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	1000		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	900		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	800		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	700		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	600		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	500		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	400		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	300		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	200		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	100		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	50		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	CTD	surface		
Hei153	1282	7	10.09.01	78	56	6	49	78.93	6.82	1400	MUC/11			
											Recovery: 36cm			
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	bottom	1	
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	750	3	
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	700	5	
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	600	7	
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	500	9	

Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	400	11
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	300	13
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	200	15
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	100	17
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	50	19
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	810	CTD	surface	21
Hei153	1283	7	10.09.01	78	57	8	18	78.95	8.30	812	Box core		
											Recovery: 12cm		
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	bottom	2
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	500	5
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	400	8
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	300	11
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	200	14
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	100	16
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	50	18
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	593	CTD	surface	20
Hei153	1284	7	10.09.01	78	57	8	26	78.95	8.43	604	MUC/7		
											Recovery: 26cm		
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	bottom	4
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	75	7
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	50	11
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	37	13
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	25	15
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	93	CTD	surface	17
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	91	Box core		
											Recovery: 12cm		
Hei153	1285	6	10.09.01	78	49	9	36	78.82	9.60	91	ROV		
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	bottom	2
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	125	5
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	100	8
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	75	10
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	50	12
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	25	14

Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	157	CTD	surface	16
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	159	MUC/9		
											Recovery: 11cm		
Hei153	1286	7	11.09.01	78	52	11	19	78.87	11.32	156	ROV		
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	bottom	1
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	300	3
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	250	5
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	200	7
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	150	9
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	100	11
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	50	13
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	25	15
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	365	CTD	surface	17
Hei153	1287	7	11.09.01	79	10	11	45	79.17	11.75	364	MUC/12		
											Recovery: 42cm		
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	bottom	2
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	250	6
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	200	9
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	150	11
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	100	15
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	75	17
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	50	19
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	25	21
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	305	CTD	surface	23
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	308	MUC/9		
											Recovery: 32cm		
Hei153	1288	7	11.09.01	78	58	11	48	78.97	11.80	304	AGT		
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	bottom	2
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	250	5
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	200	8
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	150	11
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	100	13
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	50	15
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	320	CTD	surface	17

Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	319	MUC/12			
											Recovery: 30cm			
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	319	AGT			
Hei153	1289	7	12.09.01	79	2	10	49	79.03	10.82	319	ROV			
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	bottom	2	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	200	5	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	150	8	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	100	10	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	50	12	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	CTD	surface	14	
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	MUC/10			
											Recovery: 10cm			
Hei153	1290	7	12.09.01	78	56	9	36	78.93	9.60	250	AGT			
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	bottom	1	1
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	350	4	4
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	300	7	7
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	250	9	9
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	200	13	13
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	150	15	
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	100	17	
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	50	19	
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	392	CTD	surface	21	
Hei153	1291	7	12.09.01	78	57	8	31	78.95	8.52	401	MUC			
											no recovery			
Hei153	1292	7	11.09.01	79	3	9	20	79.05	9.33	79	CTD	bottom	2	2
Hei153	1292	7	12.09.01	79	3	9	20	79.05	9.33	80	CTD	65	5	5
Hei153	1292	7	12.09.01	79	3	9	20	79.05	9.33	80	CTD	50	8	8
Hei153	1292	7	12.09.01	79	3	9	20	79.05	9.33	80	CTD	25	13	13
Hei153	1292	7	12.09.01	79	3	9	20	79.05	9.33	80	CTD	surface	15	15
Hei153	1292	7	12.09.01	79	3	9	20	79.05	9.33	80	MUC/10			
											Recovery: 10cm			
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	bottom		
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	90		

Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	80
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	70
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	60
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	50
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	40
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	20
Hei153	1293	6	13.09.01	78	43	9	50	78.72	9.83	101	CTD	surface

St.Isotope Bottle #	DMS/DMSP Bottle #	REE Bottle #	Helium Bottle #	Radium Bottle #
2	2			1+3
6				4+5
8				7+9
12				
14	14			13+15
17	18			
19	20			
21	22			
23	24			
2				
4				
6	1			
8	5			
10	7			
12	9			
14	13			
16	15			
2				1+3
6				4+5
9	9			7+8
11				
12	12			13+14
15	16			
17	18			
19	20			
21	22			

1		
3		
5		
7		
9		
11		
13	14	
15	16	
17	18	
19	20	
21	22	
23	24	

2		1+3
5		4+6
8		7+9
11	10	
13	13	12+14
15	16	
17	18	
19	20	
21	22	

2	2	1+3
4	5	
7	7	6+8
10	10	9+11

14	14	12+13
16	15	

2	2	1+3
5		4+6
8		7+9
10		
12	12	
15	15	14+16
18	18	
20	20	
22	22	

1	2
3	
5	
7	8
9	10
11	12
13	
15	16
17	
19	20

2		1+3
5		4+6
8		7+9
11		
14		12+13

15	
17	16
19	20
21	21
22	22
23	23
24	24

1	2
3	4
5	6
7	8
9	10

2	2	1+3
5		4+6
8	8	7+9
11	11	10+12
13	14	
15	16	
17	18	

1	
3	4
5	
7	8
9	10
11	12
13	14
15	16

1	
3	4
5	6
7	8
9	10
11	12
13	14

4	4	1+3
5	5	
11		7+8
	11	10+12

1	2
3	4
5	6
7	8

2	1+2
5	4+6
8	7+9
11	10+12
13	

2	2	1+3
5	4	
6	8	7+9
11	14	10+12
13	16	

2	2	1+3
5		4+6
7	8	
10	10	9+11
14	14	12+13
15	16	
17	18	

1		
3		
5		
15		7+8+9+10+ 11+12+13+14
17		
19		
21		
22		
23		

1	
3	
5	
7	8
9	10
11	12
13	14
15	16
17	18

1	2
3	4
5	6
7	8
9	10
11	12

4	4	4	1+3
8	8	8	5+7
9	10		
11	12		
13	14		

2	1+3
5	4+6
7	

9

2		
4	3	
6		5+7
9		8+10
12	11	
14	13	
16	15	
18	17	
20	19	

2		1+3
5		
7		6+8
9		
11		
14		13+15
17		
19		

2	2	1+3
5	5	4+6
7	8	
9	10	
11	12	

2	2		1+3
5			4+6
7			
10	10		9+11
13	12		
15	14		
17	16		
19	18		

2			1+3
5	5		3+6
8			7+9
11	11		10+12
13	14		
15	16		
17	18		
19	20		

2		2	1+3
6		4	5+7
10		9	
12			

1
3
5
7

9
11
13
15
17
19
21

2
4
6
8
10
12
14
16

2		1+3
5		
7		6+8
9		
12	12	11+13
15	15	14+16
17	18	
19	20	
21	22	
23	24	

2		1+3

6		5+7
9		
14		13+15
17		
19		18+20
21		
23		

2	2	1+3
5	5	4+6
7	7	
10		9+11
12		

3	2	
4	6	
9	8	
10	12	
15	14	
16		
19		
20		
22		
24		

2		1+3
5		4+6
8		7+9

11		10+12
13	14	
15	16	
17	18	
19	20	
21	22	
23	27	

1
2
3
4
5
6
7
8
9
10
11
12
13

2	1+3
5	4+6
8	7+9
11	10+12
14	
16	
18	
20	
22	
24	

2	2	1+3
5	5	4+6
8	8	7+9
10	10	
12		

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

2
4
6
8
10

12
14
16
18
20
22

2	1+3
5	4+6
8	7+9
11	10+12
13	
15	
17	
19	

4	2	1+3
7	5	6+8
10	9	
13		12+14
16		
18		

2	1+3
5	4+6
8	7+9
11	
13	
15	

17

2
4
6
8
10
12
14
16
18

2		1+3
6		5+7
9	9	8+10
13	11	
14	15	
17	17	16+18
20	19	
22	21	
24	23	

2	1+3
5	4+6
8	7+9
11	
13	
15	
17	

2	2	1+3
5	5	4+6
8	8	7+9
11	10	
13	12	
14	14	

2	3
6	5
8	
10	
12	
14	
16	
18	
20	

2	2	2	3+4
7		6	
8	10		9+11
14			
17	16		

1	1
2	2

3	3
4	4
5	5
6	6
7	7
8	8
9	9