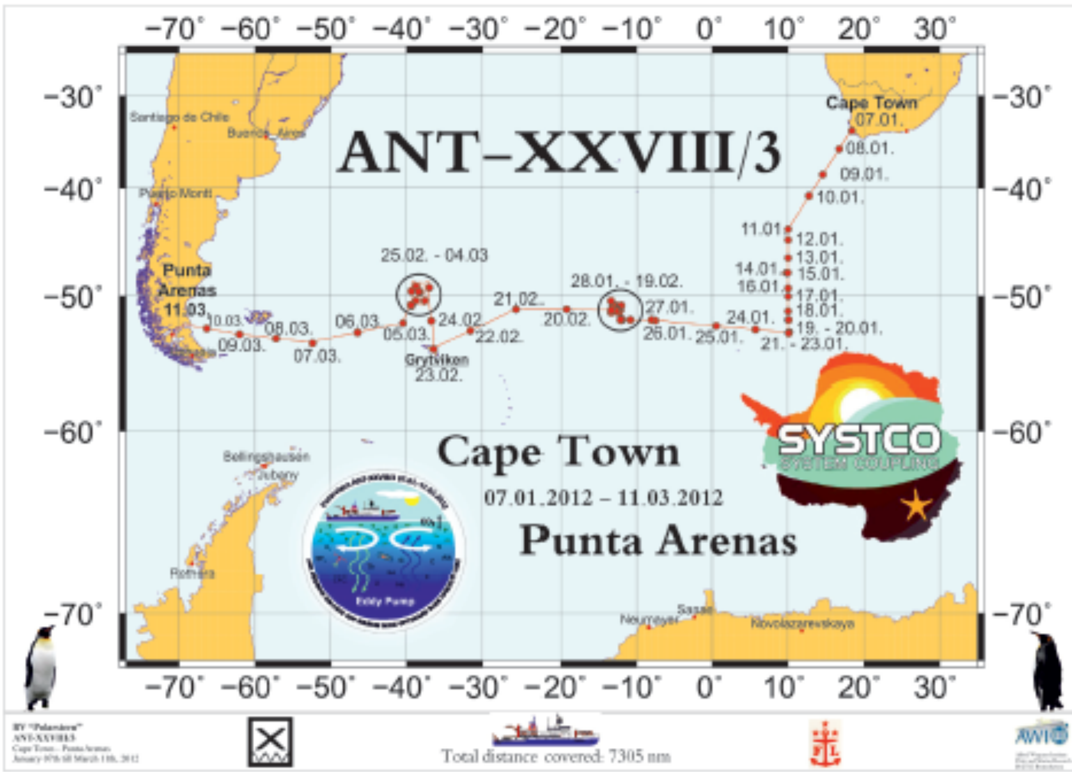
CRUISE REPORT: A12

(Updated MAY 2019)



Highlights

Cruise Summary Information

Section Designation	A12
Expedition designation (ExpoCodes)	06AQ20120107
Chief Scientists	Dieter Wolf-Gladrow / AWI
Dates	2012 JAN 07/2012 MAR 11
Ship	RV *POLARSTERN*
Ports of call	Cape Town - Punta Arenas
Geographic Boundaries	40° 29' 24" S 39° 24' 36" W 12° 45' 36" E 53° 30' 0" S
Stations	106
Floats and drifters deployed	4 MetOcean SVP-Iridium drifters deployed, 10 autonomous profiling floats deployed
Moorings deployed or recovered	1 1-year mooring was deployed 1 mooring with sediment traps deployed

Contact Information:
Dieter Wolf-Gladrow
Alfred-Wegener-INstitut / Helmholtz-Zentrum für Polar- kund Meeresforschung
Dieter.Wolf-Gladrow@awi.de

Report assembled by Jerry Kappa, UCSD/SIO

Links to Select Topics

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

Berichte
zur Polar- und Meeresforschung

661
2013

Reports on Polar and Marine Research

The Expedition of the Research Vessel "Polarstern" to the Antarctic in 2012 (ANT-XXVIII/3)

Edited by
Dieter Wolf-Gladrow
with contributions of the participants

HELMHOLTZ
GEMEINSCHAFT

Alfred-Wegener-Institut
Helmholtz-Zentrum für Polar-
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* Anschrift / Address
Alfred-Wegener-Institut
Helmholtz-Zentrum für Polar-
und Meeresforschung
D-27570 Bremerhaven
Germany
www.awi.de

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Assistant editor:
Birgit Chiaventone

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ANT-XXVIII/3

7 January 2012 - 11 March 2012

Cape Town - Punta Arenas

Chief scientist
Dieter Wolf-Gladrow

Coordinator
Eberhard Fahrbach

Contents

APPENDIX

1. ZUSAMMENFASSUNG UND FAHRTVERLAUF

Dieter Wolf-Gladrow AWI

Am 7. Januar 2012 lief *Polarstern* von Kapstadt zur Antarktisreise **ANT-XXVIII/3** aus. Ziel war es, Untersuchungen in verschiedenen biogeographischen Provinzen des Südpolarmeeres durchzuführen. Dazu wurden zahlreiche hydrographische Stationen entlang eines Schnittes und innerhalb von zwei flächenhaften Messrastern durchgeführt. Zunächst führte der Kurs nach Südwesten bis 44°S und 10°O. Entlang 10°O wurde ein Schnitt mit hydrographischen Stationen bis 53°S durchgeführt wobei die Subantarktisfront, die Antarktische Polarfront und die Südliche Polarfront überquert wurden. Auf dem Schnitt fand bei 52°S die erste große Benthosstation statt. Danach führte der Kurs über Stationen bei 52°S, 8°W und 52°S, 12°W in das Gebiet um 51°12'S, 12°40'W, in dem über mehr als zwei Wochen hinweg ein Raster von Stationen abgearbeitet wurde. Nach einem halbtägigen Besuch in Grytviken (Südgeorgien) – verbunden mit einem Besuch der Station des British Antarctic Survey – führte der Kurs in den Nordwesten von Südgeorgien. In der Region um 50°S, 38°W wurde ein Gitter mit 30 Stationen im Abstand von 24 Seemeilen beprobt. Anschließend wurde im Zentrum eines zyklonalen mesoskaligen Wirbels bei 49°40'S, 38°16'W und knapp 5.000 m Wassertiefe eine detailierte Beprobung der Wassersäule mit allen dafür zur Verfügung stehenden Geräten durchgeführt. Für die Benthosbeprobung in dieser biogeographischen Provinz wurde eine Station an der Südwestecke des zuvor untersuchten Gitters bei 50°48'S, 39°24'W ausgewählt; die dortige Wassertiefe von 4.100 m ermöglicht Vergleiche mit vorherigen Benthosstationen. Während der gesamten Reise erfolgten ozeanographische und chemische Messungen sowie Untersuchungen des Planktons und der Tiefseefauna.

Das Ziel der Forschungen im Rahmen des Projekts `**Eddy-Pump**´ bestand in der Untersuchung der physikalischen, chemischen und biologischen Prozesse, die die Kohlenstoffpumpen in verschiedenen biogeographischen Provinzen des Südpolarmeeres beeinflussen. Die physikalische Kohlenstoffpumpe wird im wesentlichen durch großräumigen Auftrieb von Tiefenwasser und Vermischungsprozesse in mesoskaligen Eddies getrieben, wodurch gleichzeitig das Phytoplankton in der Licht durchfluteten Oberflächenschicht mit Nährstoffen versorgt und somit die Grundlage für die Primärproduktion geschaffen wird. Ausgehend von der Primärproduktion treiben vielfältige Wechselwirkungen zwischen Pflanzen und Tieren im Nahrungsnetz die biologische Kohlenstoffpumpe, den Export organischen Materials in die tiefen Wasserschichten oder bis ins Sediment. Neben den physikalischen Zustandsvariablen und den Strömungen wurden Makronährstoffe (PO_4, NO_3, H_4SiO_4), Eisen, CO_2-Fugazität, gelöster anorganischer Kohlenstoff (DIC), Gesamtalkalinität (TA), transiente Spurenstoffe (FCKWs) und Isotope (He, Th, U) gemessen bzw. Proben genommen. Die biologische Beprobung umfasste u. a. Chlorophyll-*a*, partikulären organischen Kohlenstoff (POC), biogenes Silikat (BSi), gelöstes organisches Material (DOM), Primärproduktion, zahlreiche

Fänge mit verschiedenen Netzen (Handnetz, Multinetz,RMT) zur Bestimmung der Artenzusammensetzung des Phyto- und Zooplanktons und den Einsatz von treibenden Sinkstofffallen. Eine Verankerung mit zwei Sinkstofffallen wurde nordwestlich von Südgeorgien ausgebracht.

Ziel der Forschungen im Rahmen von **SYSTCO II** (SYSTem COupling in the deep Southern Ocean II) war die Untersuchung von Kopplungsprozessen, bzw. der Frage nach der Veränderung der Phytoplanktonblüte durch die Wassersäule, von der Meeresoberfläche über das Zoo- und Mesoplankton bis in die abyssale Tiefsee. Diese Arbeiten wurden in enger Zusammenarbeit mit den Kollegen des Eddy Pump Projektes durchgeführt und umfassten Untersuchungen (a) der Diversität, Verteilung und Häufigkeit von benthischen Tiefseeorganismen und deren Beziehung zur biologischen Produktivität in und zum Export von organischem Material aus der euphotischen Zone, (b) der Ökologie der Tiefseefauna und (c) der Erhaltung von DNS in der Wassersäule und in Tiefseesedimenten und das Potenzial von DNS zur Rekonstruktion der eukaryotischen Diversität heute und in der geologischen Vergangenheit. Zum Einsatz kamen Multicorer, Epibenthoschlitten und Agassiz-Trawls.

Die beiden Forschungsprojekte ergänzten sich und daher fanden die Probennahmen in denselben biogeographischen Provinzen und teilweise sogar auf gemeinsamen Stationen statt. Die Stationsarbeiten waren am 7. März abgeschlossen und *Polarstern* lief nach Punta Arenas, Chile, wo die Reise am 11. März 2012 endete.

SUMMARY AND ITINERARY

On January 7, 2012 *Polarstern* left Capetown for the Antarctic cruise **ANT-XXVIII/3**. Major objectives were investigations in different biogeographic provinces of the Southern Ocean. Numerous hydrographic stations were carried out along a transect and within two grids. The route led southwest until 44°S and 10°E. A transect with hydrographic stations was conducted along 10°E until 53°S crossing the Subantactic Front, the Antarctic Polar Front and the Southern Polar Front. During the transect the first large benthos station took place at 52°S. Passing stations at 52°S, 8°W and 52°S, 12°W the route led to the region around 51°12'S, 12°40'W where we sampled a grid of stations for more than 2 weeks. After a half-day visit at Grytviken (South Georgia) – combined with a visit at the station of the British Antarctic Survey – we steamed to the northwest of South Georgia. In the region around 50°S, 38°W a grid of 30 stations at intervals of 24 nautical miles was carried out. In the centre of a cyclonic mesoscale eddy at 49°40'S, 38°16'W a detailed sampling of the water column was performed in 5000 m water depth using all devices available. For the benthos sampling in this biogeographic province we chose a station at the southwest corner of the grid at 50°48'W, 39°24'W. The local water depth of 4,100 m allows comparisons with prior benthos stations. During the whole cruise oceanographic and chemical measurements as well as investigations of the plankton and the deep-sea fauna were carried out.

The objective of the studies in the framework of the project „**Eddy Pump**" was the investigation of the physical, chemical and biological processes having an impact on the carbon pumps in different biogeographical provinces of the Southern Ocean.

The physical carbon pump is mainly driven by large-scale upwelling of deep-sea water and mixing processes in meso-scale eddies, simultaneously providing nutrients to the phytoplankton in the euphotic zone and thus establishing a basis for primary production. Based on the primary production, diverse interactions between plants and animals in the food web drive the biological carbon pump, the export of organic material to deeper water layers or to the sediment. In addition to the physical state variables and the circulation, macro nutrients (PO_4, NO_3, H_4SiO_4), iron, CO_2 fugacity, dissolved inorganic carbon (DIC), total alkalinity (TA), transient tracers (CFCs) and isotopes (He, Th, U) were measured or sampled, respectively. The biological sampling comprised a.o. chlorophyll-a, particulate organic carbon (POC), biogenic silica (BSi), dissolved organic material (DOM), primary production, numerous catches with different nets (hand net, multi-net, RMT) for determination of the species composition of the phytoplankton and zooplankton, and the deployment of drifting sediment traps. A mooring with two sediment traps was deployed northwest of South Georgia.

The objective of the studies in the framework of **SYSTCO II** (SYSTem Coupling in the deep Southern Ocean II) was the investigation of coupling processes, questions of changes in the phytoplankton bloom throughout the water column, from the sea surface via zooplankton and mesoplankton to the abyssal sea. These studies were carried out in close cooperation with the colleagues of the Eddy Pump Project and comprised investigations of a) diversity, distribution of abundance of benthic deep-sea organisms and their impact on the biological productivity in and on the export of organic material from the euphotic zone, b) the ecology of the deep-sea fauna and c) the conservation of DNA in the water column and in deep-sea sediments and the potential of DNA to reconstruct the eukaryotic diversity today and in the geological past. Multicorer, epibenthic sledge and Aggasiz-Trawl were used for sampling.

As the two research projects were complementary the sampling took place in the same biogeographic provinces and partly even at joint stations. The station work was finished at March 7 and *Polarstern* sailed to Punta Arenas, Chile, where the cruise ended on March 11, 2012.

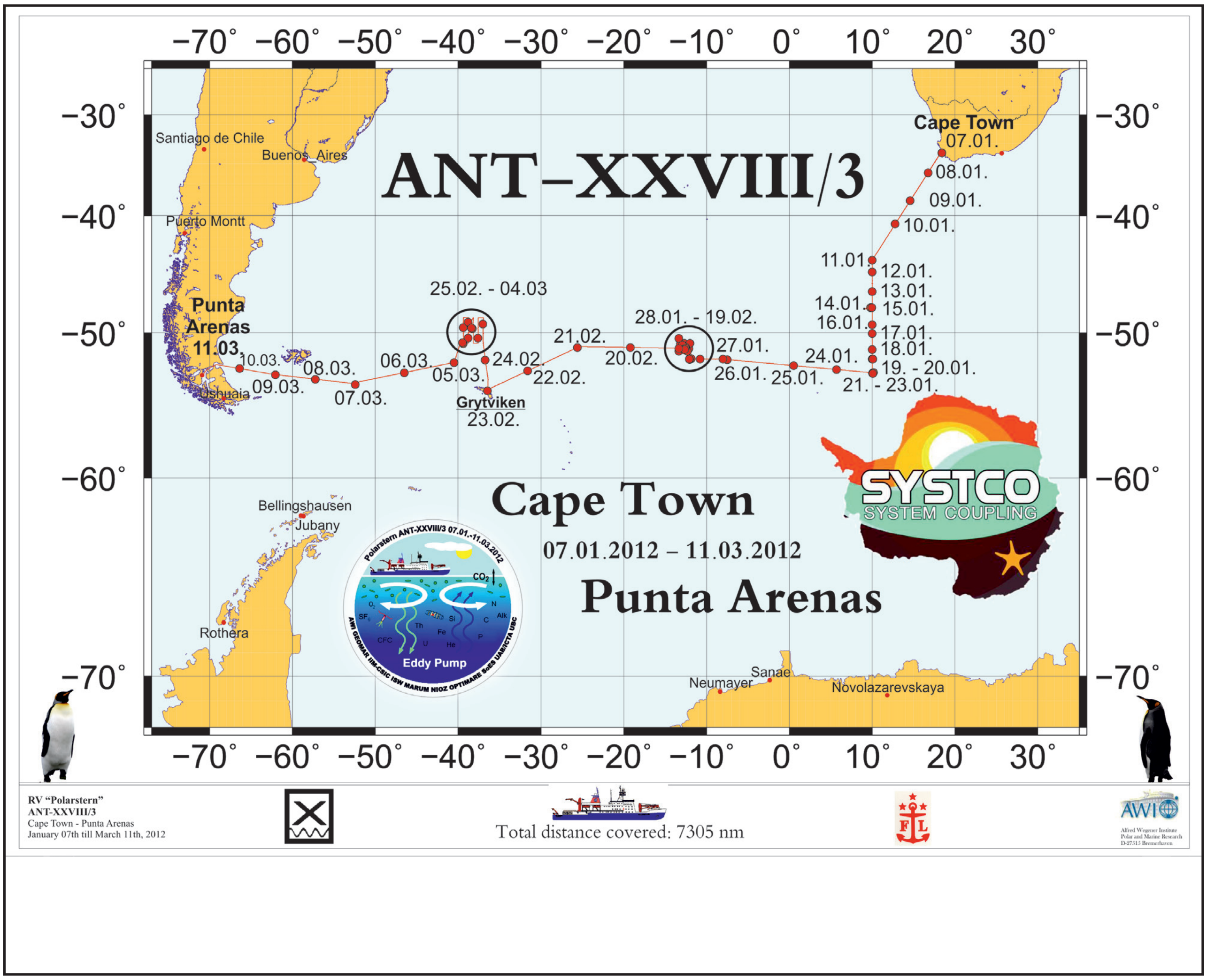


Abb. 1: Fahrtverlauf Polarstern-Expedition ANT-XXVIII/3

Fig. 1: Cruise track Polarstern-expedition ANT-XXVIII/3

2. WEATHER CONDITIONS

Max Miller, Klaus Buldt DWD

On January 7, 2012 (6:00 pm), RV *Polarstern* left Cape Town for the campaign ANT-XXVIII/3. Just at that moment the south-easterly wind called "Cape Doctor" increased to around 8 Bft but just off the harbour (in the lee of the mountains) the wind abated abruptly down to 3 Bft. A short time later the wind increased just as fast up to 8 Bft again. Along with this we observed a swell of 2 to 3 m. As expected wind and swell decreased as we departed from the continent.

On Jan. 8, RV *Polarstern* crossed a ridge of the subtropical high and on Jan. 9 a first cold front passed our course. As we were located only at the edge of the low the wind hardly reached 6 Bft. During the next days the west wind zone remained quite moderate so that 8 Bft was measured only for short periods.

On Jan. 14, the first storm approached. Westerly wind of 10 Bft and a swell of 7 m forced an interruption of scientific work for half a day. From Jan. 15, onward a rapid change of lows and ridges dominated the following days.

A new strong low with storm around 9 Bft reached us on Jan. 24. As scientific work at 53°S 10°E had just been finished the upcoming wind slowed down our progress to west. But steaming into the following ridge we could nearly make up the loss of time.

In the afternoon of Jan. 26, we reached the next research area at 52°S 08°W, where we stayed for 24 hours. The continuation of our way west was affected by another storm with temporary 10 Bft. In the evening of Jan. 28, we reached the position 52°S 12°W and the storm had mostly subsided. For the next three weeks RV *Polarstern* stayed in this area. During the first days there was a rapid change of secondary lows and ridges and therefore the wind veered from northwest to southwest and back but did not exceed 7 Bft. However, on Feb. 7 a storm developed and for short times wind force 10 was observed. For some days we still had stormy conditions with westerly wind around 8 Bft. But the swell did not exceed 4 m due to the relatively short forcing by the wind. Until the end of work at this area we measured a mean wind of 6 to 7 Bft and temporarily 9 Bft with a maximum swell of 3 m.

On Feb. 19, we headed for the next area at 51°S 30°W. There we came under the influence of a ridge and on Feb. 20, the wind (around 5 Bft) veered to east – a rare event during this expedition. But on Feb. 21, the well known westerly wind was present again and increased up to 7 with 8 Bft in times.

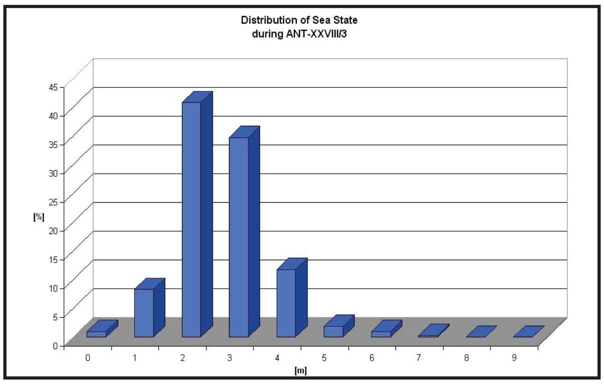
Due to good conditions for a visit of South Georgia we made a detour on our way to a further research area (around 50°S 37°W). After the visit we observed typical "April weather" at the western edge of a low: south-westerly wind of 6 to 7 Bft and a rapid change of sunny spells and snow showers. Later on a high at the

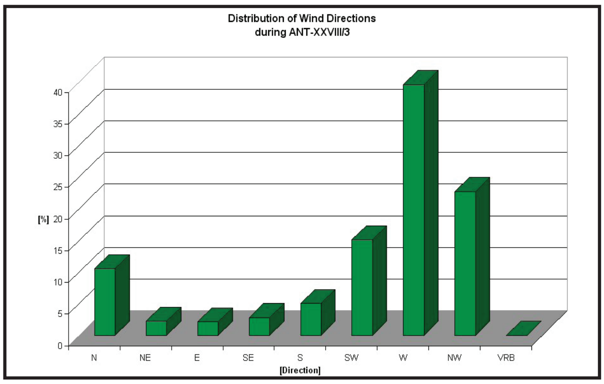
Falklands moved east and caused abating wind. However, a new storm followed soon. The wind increased and on Feb. 27, we measured 8 Bft and a swell of 4 m was observed. On Feb. 29 another high approached from the west and became the dominant feature with less wind and plenty of sunshine.

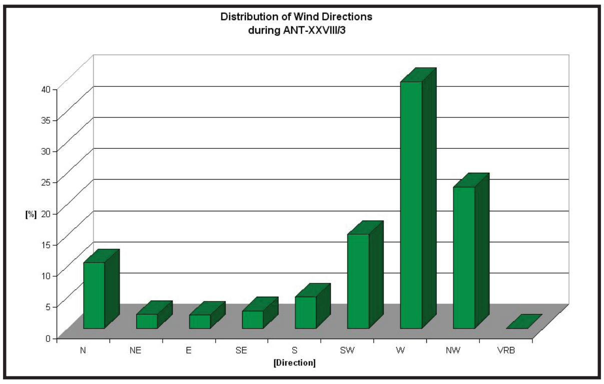
On Monday morning (Mar. 5) the final part of the expedition to Punta Arenas started under foggy conditions. North-westerly wind led warmer and moist air into our area which in connection with cold water caused the fog. The visibility improved with an approaching frontal zone and the wind increased up to 7 Bft. We stopped at 53°40'S 52°W for some hours for a last scientific research. Over the last miles to Punta Arenas the westerly wind increased only for short times up to 8 Bft and the swell didn't exceed 3 m.

On Saturday (Mar. 10) we sailed into the eastern entrance of the Strait of Magellan and on Sunday morning, March 11 2012 *Polarstern* reached Punta Arenas on schedule at temporarily fresh wind from east.

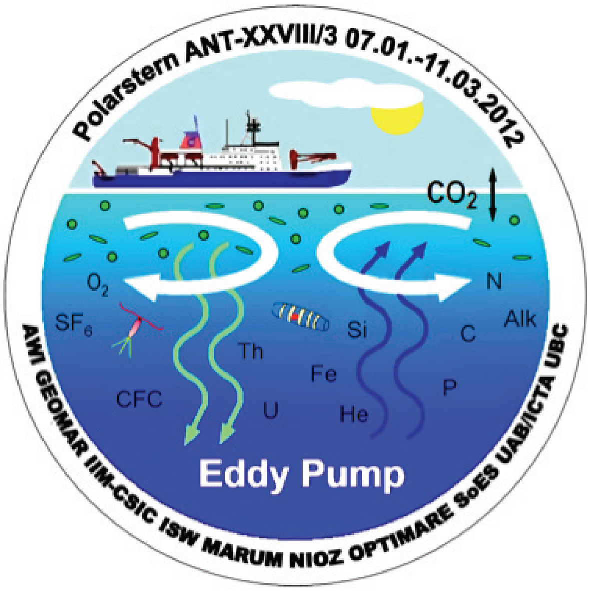
For further statistics see the following figures.







EDDY PUMP



A multi-disciplinary project to study processes which exert a control on the physical and biological pumps of carbon in the Southern Ocean

Introduction

The Southern Ocean is critically involved in the machinery driving earth's climate. Its major feature is the broad ring of cold water - the Antarctic Circumpolar Current (ACC) - which encircles Antarctica and connects all the other oceans. Thus it plays a major role in the global heat and freshwater transports and ocean-wide cycles of biogenic elements and harbours a series of unique and distinct ecosystems. Due to the upwelling of deep-water masses from all ocean basins in the Antarctic Divergence, there is a high supply of natural CO_2 as well as of macronutrients, and surface nutrient concentrations are the highest worldwide in the open ocean. Despite the supply of macronutrients, phytoplankton concentration is generally low, limited either by lack of the trace nutrient iron, insufficient light due to deep wind-mixed layers or grazing by zooplankton, or by a combination of those causes.

While the important role of the Southern Ocean in the global carbon cycle is undisputed, controversially debated is whether it will change from a CO_2 sink to a source with changing climate. The magnitude and even the direction of such change depends on shifts of the delicate balance between the physical carbon pump, associated with the meridional overturning circulation, and the biological pump, fuelled by the uptake of CO_2 through photosynthesis of the phytoplankton near the sea surface and the subsequent sedimentation of organic particles. A complex interaction of physical, chemical and biological processes thus regulates, whether the Southern Ocean will attenuate or amplify greenhouse-gas driven changes of climate.

In order to identify those processes and their coupling we concentrated on the band of latitudes between 50°S and 60°S where the upwelled deep-water masses interact with the atmosphere before they are ultimately subducted at the Sub-Antarctic Front. To enable the effect of circulation and mixing on the carbon pumps during a significant part of the growth season to be revealed, the process studies were preferentially conducted within eddies, which were tracked starting before and during the cruise using satellite remote sensing of sea surface high anomalies and ocean colour. These study sites were also selected so that they would represent different biogeographic provinces presumed to replace each other zonally along the ACC in the Atlantic sector. Due to ship-time constraints and actual satellite information, the sites were – in slight deviation from the original planning – chosen to represent

1. the central ACC with its regular separation in different frontal jets (investigated by a meridional transect along 10°E),

2. a transient months-long lasting large-scale bloom that occurred west of 10°W adjacent to chlorophyll-poor waters to the east, and

3. the region in the wake of South Georgia, which regularly features a dense bloom presumably dominated by diatoms of the taxon *Chaetoceros*, known to be a carbon sinker, that contrasts to the presumed dominance of the diatom species *Fragilariopsis kerguelensis*, a known silicon sinker, in the open ACC.

Taking into account the complexity of the Southern Ocean marine climate and ecosystem and of the interaction of the various physical, chemical and biological processes, Eddy Pump was designed to integrate the different relevant disciplines and to exploit their synergy potential by focussing on a common goal. The wide spectrum of disciplines and approaches involved includes:

- Physical Oceanography (site selection using remote and *in-situ* data; atmospheric forcing, stratification, vertical mixing and their influence on the critical light depth for phytoplankton growth; mesoscale dynamics of frontal meanders and eddies, upwelling and subduction; advection of water masses and of dissolved and particulate substances)
- Marine Chemistry (air-sea fluxes of CO_2; dissolved inorganic and organic carbon; oxygen; macro and micro nutrients such as Fe; He-based estimates of deepwater upwelling; transient tracer distributions revealing the ventilation of the intermediate and deep ocean layers)
- Biological Oceanography (phytoplankton: spatial and temporal changes in concentration, species composition, primary production, particulate organic carbon, biogenic silica; growth response to variations in micro and macro nutrients, ambient CO_2 and acidity; zooplankton: spatial and temporal changes in concentration, species composition, feeding rates and fecal pellet production, trophic interaction and food-web structures)

- Marine Geochemistry (radio-isotope-based estimates of export production, quantification of fluxes of particulate organic matter (POM))
- Satellite Remote Sensing of Ocean Colour (phytoplankton pigment concentrations; solar irradiance balance).

The specific objectives of the various disciplines, their work conducted and the obtained preliminary results are described in detail in separate paragraphs following below.

Data Management

Data collected for physical oceanography as described in chapters 3.1.2 through 3.1.5 will be copied to the data centre WDC-MARE/PANGAEA (http://www.pangaea.de/) after post-cruise calibration and validation. Within two years of the end of the cruise the data deposited at PANGAEA will be made available to the international scientific community and the general public.

The complete meta-data have been submitted to the DOD at the end of the cruise included in the Cruise Summary Report.

3. PHYSICAL OCEANOGRAPHY

Volker Strass[1], Matthew Donnelly[2], Rainer Graupner[3], Matthias Krüger[4], Harry Leach[2], Hartmut Prandke[5], Hendrik Sander[3]

[1]AWI
[2]SoES
[3]OPTIMARE
[4]IfM-GEOMAR
[5]ISW Wassermesstechnik

Objectives

The oceanographic measurements carried out within the framework of EddyPump were aimed at three objectives.

Objective 1: Identify, within the envisaged three different biogeographic regimes, suitable sites for carrying out the planned multidisciplinary observational efforts.

The measurements aimed at this site identification were mainly made by use of a vessel-mounted acoustic Doppler current profiler (VM-ADCP) and a CTD (Conductivity Temperature Depth sonde). The *in-situ* measurements obtained from this instrument package were used for validation of a-priori information about the geostrophic eddy flow field derived from sea surface height anomalies, which were remotely sensed by satellite-mounted altimeters and made publically available through the internet (http://argo.colorado.edu/~realtime/gsfc_global-real-time_ssh/) and validation of maps of the sea surface chlorophyll concentration, produced from satellite ocean colour data by A. Bracher and T. Dinter, AWI PHYTOOPTICS Group.

Objective 2: Monitor the motion of water masses though the study sites. The primary instruments used for that purpose were surface drifters (SVP drifters) drogued at mid-depth of the mixed layer.

Objective 3: Provide a detailed description of the physical environment of the phytoplankton and zooplankton at the experimental site, and to provide the basic measurements needed for estimating fluxes of particulate and dissolved, inorganic and organic matter.

Numerous casts of a CTD sonde, attached to a rosette water sampler, were done for hydrographic profiling from the surface to intermediate and occasionally full ocean depths. The CTD rosette sampler also was the major tool for supplying the various scientific disciplines on board with water samples. By performing – at some sites repeated - CTD surveys it was possible to map the three-dimensional distribution of those variables and their change in time.

Measurements of currents by the vessel-mounted acoustic Doppler current profiler (VM-ADCP) were continuously made throughout the cruise and processed aboard to monitor the three-dimensional velocity field in the upper few hundred meters.

A pair of lowered acoustic Doppler current profilers (L-ADCP) attached to the CTD rosette frame was used to record velocity profiles from the sea surface down to the sea floor at deep CTD stations.

A tethered free-falling microstructure probe (MSS) was employed for profiling small-scale turbulent motions down to 300 m depth. From these data the vertical distributions of turbulence parameters like overturning scales and energy dissipation rates can be determined and subsequently the vertical diffusivity estimated. The so-determined vertical diffusivity is essential for calculation of the diffusive fluxes of dissolved substances, needed to estimate the budgets of nutrients and carbon.

Autonomous floats provided by cooperating institutions were deployed at several locations along the cruise track and will allow monitor the larger-scale thermohaline water mass properties and circulation in the upper 2,000 m for up to some years beyond the end of the voyage.

3.1. Physical Oceanography: Measurements at hydrographic stations

Volker Strass[1], Matthew Donnelly[2], Rainer Graupner[3], Matthias Krüger[4], Harry Leach[2], Hartmut Prandke[5], Hendrik Sander[3]

[1]AWI
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Work at sea

Vertical profiles of the variables of state, of temperature, salinity and density, were derived from measurements made by lowering a CTD (Conductivity, Temperature and Depth) sonde at hydrographic stations. The CTD used was of type Sea-Bird Electronics SBE 911plus, supplemented by an oxygen sensor type SBE 43 and additional instruments such as an altimeter (Benthos PSA-916) to measure the distance to the sea floor, a transmissiometer type Wet Labs C-Star (660 nm wavelength) to measure the attenuation of light, which in the open ocean is indicative of the concentration of particulate organic carbon (POC), and a chlorophyll-sensitive fluorometer (WET Labs ECO FL). The temperature and conductivity sensors (two pairs of sensors) were calibrated at the factory prior to the cruise. They were sent to the manufacturer after the cruise for re-calibration. The CTD data, as well as the data taken by the additional sensors and instruments, at present are thus to be considered preliminary, subject to a later correction for possible temporal drifts and to calibration in absolute units. The accuracy of the preliminary CTD temperature and salinity measurements is estimated better than 0.01°C and 0.01, respectively.

The CTD was mounted with a multi-bottle water sampler type Sea-Bird SBE 32 Carousel holding 22 12-liter bottles. (Whereas the SBE 32 Carousel nominally can carry 24 12-liter bottles, 2 of those bottle places were occupied by the L-ADCP frame.) Salinity derived from the CTD measurements will later be re-calibrated by comparison to salinity samples taken from the water bottles, which were analyzed by use of an Optimare Precision Salinometer (OPS) to an accuracy generally better than 0.001 units on the practical salinity scale, adjusted to IAPSO Standard Seawater. The water bottles also served to supply several other working groups on board with samples. Water samples have, for instance, been taken to be analyzed for the concentrations of oxygen, of the plant nutrients nitrate, phosphate and silicate, of dissolved inorganic carbon and alkalinity, of particulate organic carbon (POC) and of phytoplankton pigments such as chlorophyll, of isotopes of Helium, Thorium and Uranium, and of transient anthropogenic tracers such as CFCs and SF6. The bottle data of oxygen, POC and chlorophyll will, once finally analyzed, be also used for the calibration of the respective CTD sensors and instruments.

Several technical problems with the CTD system encountered during the cruise made necessary change partly the configuration. The CTD sonde (SBE 911plus) had to be changed (done on 01 Jan. 2012) in order to reduce the noise of the oxygen sensor to an acceptable normal level. Since the altimeter hardly delivered any useful data at distances larger than 10 m above the sea floor it was dismounted and replaced by a bottom contact weight. It is possible that the malfunction of the altimeter resulted from acoustic interference with the L-ADCP.

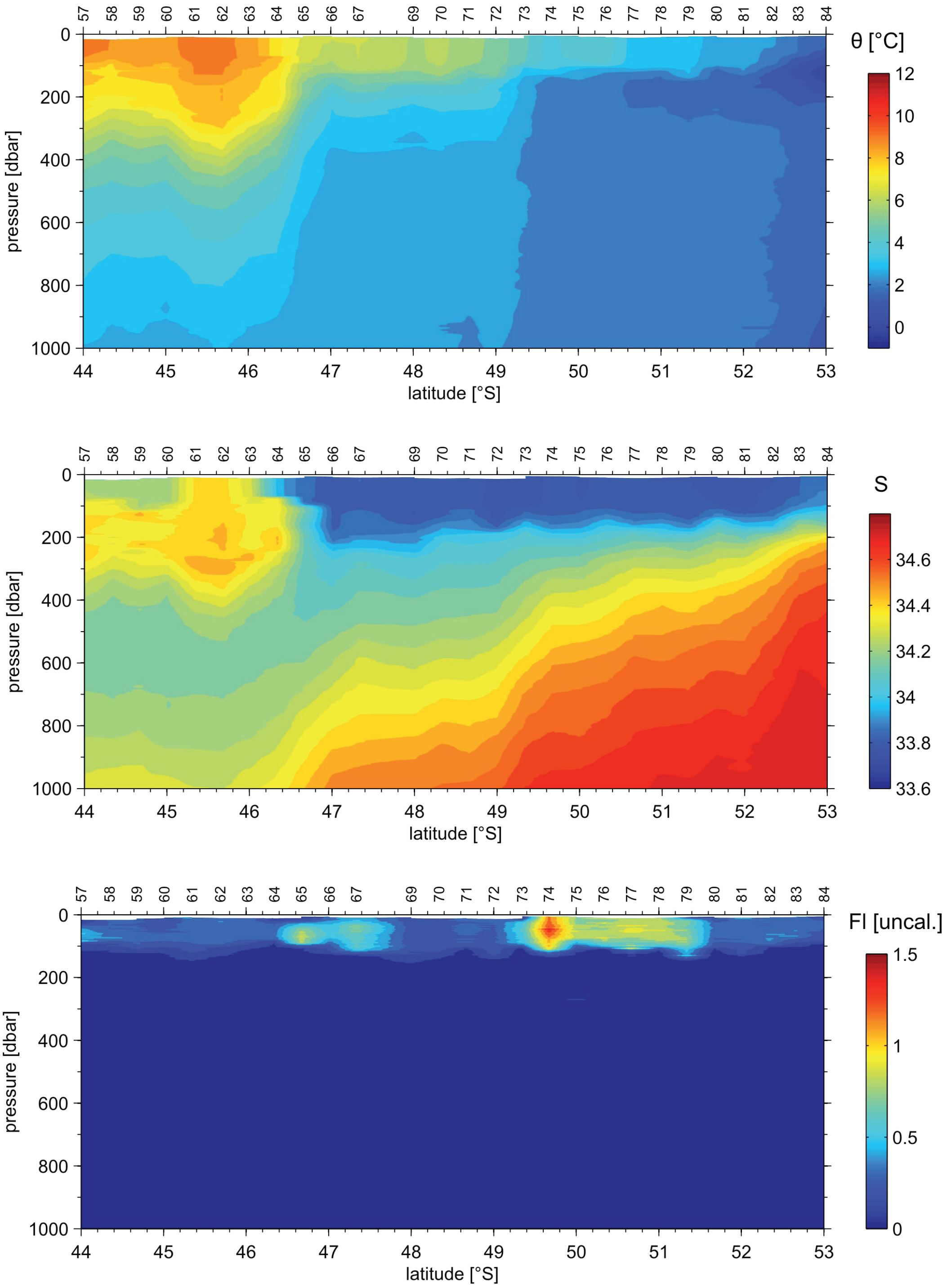

Fig. 3.1.1: Vertical distributions between the sea surface and 1,000 m depth of potential temperature (top), salinity (middle) and chlorophyll fluorescence (bottom) along the 10°E transect from 44°S to 53°S. The strong horizontal gradients of temperature and salinity at intermediate depth centered at 47°S, 49°20'S and 52°20'S are related to the Subantarctic Front, the Antarctic Polar Front and the Southern Polar Front, respectively. The warm and saline surface-intensified feature between 45°S and 46°S reveals an anticyclone of subtropical origin.

Preliminary results

In total, 164 CTD casts were done during EddyPump. The first 45 of these were performed at hydrographic stations aligned along the 10°E meridian. The majority of the other casts were spread over two CTD station grids, one termed Eddy1 station grid (see Table 3.1.1.1) centred around 51°12' S, 12°40' W within a large-scale open-ocean phytoplankton bloom and the other located to the north off South Georgia (see Table 3.1.1.2). The remaining CTD casts were done at Station PS79/85 (52°S, 8°W) located in a chlorophyll-poor open-ocean region and at St. PS79/86 (52°S, 12°W) to provide water column data in support of later interpretation of benthic samples taken there in the framework of the SYSTCO-II project.

Tab. 3.1.1: ANT-XXVIII/3 EddyPump: Eddy1 Station Grid during PS79

	A	B	C	D	E	
8	*daytrip* Sts: **132** He	*daytrip* Sts: **131** He	-	-	-	50°12' S
7	*daytrip* Sts: **133** He	*daytrip* Sts: **130** He	-	-	-	50°24' S
6	*daytrip* Sts: **134** He	*daytrip* Sts: **129** He, Th	-	-	-	50°36' S
5	*Corner northwest* Sts: **108**	*Grid out* Sts: **109**	*North out* Sts: **93, 116** Th	*Grid out* Sts: **117**	*Corner northeast* Sts: **126**	50°48' S
4	*Grid out* Sts: **107**	*Grid in* Sts: **110**	*North in* Sts: **92, 115** He	*Grid in* Sts: **137** Sts: **118**	*Grid in* Sts: **125**	51°00' S
3	*West out* Sts: **106** He, Th	*West in* Sts: **111**	*Core* Sts: **91, 98, 114, 128, 136,140** He, Th	*East in* Sts: **96, 119** He, Th	*East out* Sts: **95, 124** Th	51°12' S
2	*Grid out* Sts: **105**	*Grid in* Sts: **112**	*South in* Sts: **101**	*Grid in* Sts: **120**	*Grid in* Sts: **123**	51°24' S
1	*Corner southwest* Sts: **104**	*Grid out* Sts: **103**	*South out* Sts: **102** He, Th	*Grid out* Sts: **121**	*Corner southeast* Sts: **122**	51°36' S
	13°20' W	13°00' W	12°40' W	12°20' W	12°00' W	

*An additional Lagrangian Station, no. PS79/**137**, was located rows 4-5 / columns D-E, following the track of the buoy deployed earlier at the core.*

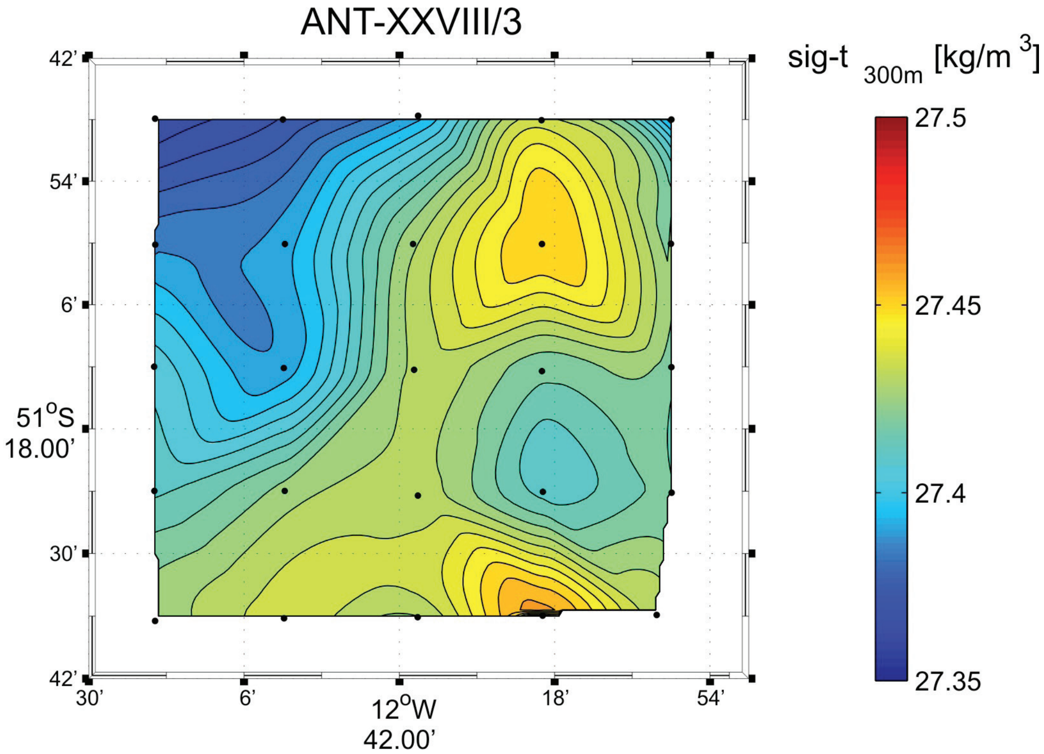

Fig. 3.1.2: Horizontal distribution of density σ_t at 300 m depth in the Eddy1 grid, based on CTD stations 98, 101 – 112 and 115 - 126 for synopticity reasons. The density contours also imply the geostrophic flow field, with streamlines running parallel to the density contours and the flow direction oriented in a way that the light water is located to the left (southern hemisphere). The flow speeds measured by the VM-ADCP (Section o.3) in the mapped area however were rather low and hardly exceeded 30 cm s^{-1}.

Tab. 3.1.2: ANT-XXVIII/3 EddyPump: South Georgia Basin Station Grid

	G	H	I	J	K	
6	*APF meander* Sts: **167**	*APF meander* Sts: **168**	*APF meander* Sts: **171** He	*High Chl Filament* Sts: **150**	*High Chl Filament* Sts: **149**	48°48' S
5	*Low Chl Filament* Sts: **166**	*Low Chl Filament* Sts: **169**	*Low Chl Filament* Sts: **172**	*Low Chl Filament* Sts: **151**	*Moderate Chl* Sts: **148**	49°12' S
4	*Moderate Chl* Sts: **165** He, Th	*NW in* Sts: **170** Th	*North in* Sts: **173** He, Th	*NE in* Sts: **152** Th	*Anticyclone Core* Sts: **147** He, Th	49°36' S

	G	H	I	J	K	
3	*Blue West* Sts: **164**	*West in* Sts: **159**	*Cyclone Core* Sts: **158**	*East in* Sts: **153**	*Anticyc. Protrusion* Sts: **146**	50°00' S
2	*Blue West* Sts: **163**	*SW in* Sts: **160**	*South in* Sts: **157** He	*SE in* Sts: **154**	*Anticyc. Protrusion* Sts: **145**	50°24' S
1	*Max. Chl* Sts: **162, 175**	*Max. Chl* Sts: **161**	*Max. Chl* Sts: **156**	*SE rim* Sts: **155**	*Anticyc. Protrusion* Sts: **144**	50°48' S
	39°24' W	38°48' W	38°12' W	37°36' W	37°00' W	

*Final Core Station PS79/**174** located rows 3-4 / columns H-I.*

3.2 Physical Oceanography: Helium sampling for assessment of upwelling

Matthew Donnelly[1], Volker Strass[2]
not on board:
Oliver Huhn[2], Monika Rhein[2]

[1]SoES
[2]IUP Univ. Bremen
[3]AWI

Work at sea

During ANT-XXVIII/3 a total of 305 helium samples were obtained out of a potential 306 sample tubes: one tube was found to be corroded. Of the 305 samples taken, 8 tubes are potentially compromised owing to the shearing of bolts or the detachment of the plastic tube whilst closing the bottom bolts; however all of these samples are sealed and therefore available for analysis. A further 4 samples may have been compromised by initially unknown interference with other samplers of the Niskin bottles. Due to the demand for water from the Niskin bottles, helium sampling at some stations was undertaken across two casts.

Preliminary results

The helium sampling was primarily focused on two eddy regions. Two stations were surveyed on the approach to the first eddy in high and low chlorophyll areas. At the first eddy a 5-station star survey was conducted, followed by an intensive 6 station north-western extension of the survey grid. The centre of the star was surveyed twice. In addition, the final station at the first eddy region was also surveyed. At the second eddy region north of South Georgia, there was another 5 station star survey. The stations at which helium samples were taken are indicated in Tables 3.1.1 and 3.1.2.

The samples taken will be used to calculate helium isotope disequilibria. Variations in the ratio of ^3He, which is introduced into the deep ocean by hydrothermal activities, and ^4He allow estimation of deepwater upwelling rates and of the entrainment in the mixed layer. It is expected that the so-determined upwelling and entrainment rates, which will be analyzed in combination with the microstructure turbulence measurements described below in Section 3.5, will significantly contribute to constrain estimates of exchange rates between deep water and mixed-layer water mass properties in the Atlantic sector of the ACC.

3.3 Physical Oceanography: En-route measurements of currents and backscatter strength with the vessel-mounted acoustic doppler current profiler (VM-ADCP)

Volker Strass[1], Hendrik Sander[2]

[1]AWI
[2]OPTIMARE

Work at sea

Vertical profiles of ocean currents down to 335 m depth were measured with a Vessel Mounted Acoustic Doppler Current Profiler (type 'Ocean Surveyor'; manufacture of RDI, 150 kHz nominal frequency) nearly continuously when outside territorial waters. The transducer was installed 11 m below the water line in the ship's keel behind an acoustically transparent plastic window for ice protection. Echoes reflected by particles moving relative to the ADCP return with a change in frequency. The ADCP measures this change, the so-called Doppler shift, as a function of depth to obtain water velocity at a maximum of 128 depth levels. The instrument settings for this cruise were chosen to give a vertical resolution of current measurements of 4 m in 80 depth bins and a temporal resolution of 2 min for short time averages.

Determination of the velocity components in geographical coordinates, however, requires that the attitude of the ADCP transducer head, its tilt, heading and motion is also known. Heading, roll and pitch data are read by the ADCP deck-unit from the ship's gyro platforms. The ship's velocity was calculated from position fixes obtained from the Global Positioning System (GPS) or Differential GPS if available, and was taken over from the ship's navigation system. A timeout error of the navigation data interface resulted in a data gap of several hours during 03. Feb. 2012.

Accuracy of the ADCP velocities mainly depends on the quality of the position fixes and the ship's heading data. Further errors stem from a misalignment of the transducer with the ship's centre-line and a constant angular offset between the transducer and the GPS antenna array, and a velocity scale factor. The ADCP data calibration and processing was done by using the CODAS3 software package (developed by E. Firing and colleagues, SOEST, Hawaii).

The ADCP also recorded the echo intensity, or backscatter strength, which can be analyzed in order to provide an estimate of zooplankton abundance. This estimate will be compared with the zooplankton abundance data derived from net catches.

Preliminary results

Horizontal current speeds measured by the VM-ADCP around 150 m depth ranged between 30 and 50 cm/s at the major fronts crossed along 10°E, typical for those jets. Currents within the Eddy1 Station Grid were found to be rather slow, generally not exceeding 20 cm/s, and temporally variable. Very high speeds of up to 130 cm/s were measured at the northern edge of the South Georgia Basin.

3.4 Physical Oceanography: Ocean-deep current profiles measured by a lowered acoustic doppler current profiler (L-ADCP)

Volker Strass[1], Matthew Donnelly[2], Harry Leach[2], Hendrik Sander[3]

[1]AWI
[2]SoES
[3]OPTIMARE

Work at sea

Current velocities over the full water column from the sea surface to the ocean floor were recorded with a lowered acoustic Doppler current profiler (L-ADCP), consisting of an upward/downward looking pair of RDI *Workhorse Sentinels* 300 kHz attached to the CTD rosette frame. While the L-ADCP was mounted on the CTD-rosette for the duration of the cruise, it was not activated for all casts, in particular not for many of those casts which extended to only 500 m or less. The L-ADCP dataset includes a mixture of full depth, 3,000 m, 1,500 m, 1,000 m and 500 m casts. A total of 109 useable L-ADCP profiles were obtained, although processing of the L-ADCP is still ongoing at the time of writing and the total number of successful casts is subject to change. During processing of the L-ADCP data it was discovered that the PC used for the data retrieval had unfortunately been set at some earlier date to UTC + 2hr. The L-ADCP data time-stamp was therefore offset by 2 hours from all other measurements on board which are referenced to UTC. For the data processing the IFM-GEOMAR/LDEO Matlab LADCP-Processing system, maintained by Gerd Krahmann and generously made publically available through http://tech.groups.yahoo.com/group/ladcp/, was employed.

Preliminary results

Of the 32 profiles which have been successfully processed to date, the range of the depth-mean u and v components is as follows:

u_{min} = -11 cms^{-1} u_{max} = 25 cms^{-1} v_{min} = -28 cms^{-1} v_{max} = 51 cms^{-1}

However, so far only the position data have been taken into account in the processing, but not yet the CTD and VM-ADCP records.

3.5 Physical Oceanography: Microstructure turbulence measurements

Hartmut Prandke[1], Matthias Krüger[2], Volker Strass[3]

[1]ISW Wassermesstechnik
[2]IfM-GEOMAR
[3]AWI

Work at sea

Turbulence measurements have been carried out at selected stations within the framework of the Eddy Pump programme. For the microstructure measurements the microstructure profiler MSS90L (long version, serial No. MSS10, owned by ISW) was used. The MSS profiler is produced by Sea & Sun Technology GmbH in co-operation with ISW Wassermesstechnik.

The MSS profiler is a free-falling tethered instrument for simultaneous microstructure and precision measurements of physical parameters in marine and limnic waters.

It is equipped with microstructure shear sensors (for turbulence measurements), a microstructure temperature sensor, standard CTD sensors, a Seapoint turbidity sensor, and housekeeping sensors (acceleration, tilt of the instrument). The sampling rate for all sensors is 1,024 samples per second, the resolution is 16 bit. The data are transmitted via electrical cable to an on board unit and further to a data acquisition PC.

The MSS was balanced with negative buoyancy which gave it a sinking velocity of about 0.75 m/s. The MSS was operated using a special winch (SWM1000). Disturbing effects caused by cable tension (vibrations) and the ship's movement are excluded by a slack in the cable. The winch was placed at the aft of the ship (port side). During the MSS measurements, the ship was going with a speed between 0.5 and 1 knot in the water against the wind and waves. Thus, the ship was actively moving away from the sinking profiler.

The raw data from the MSS Profiler were transmitted via a RS 485 data link to the on board unit of the measuring system. For the data acquisition, on-line display, and storage of the data on a notebook the Standard Data Acquisition software SDA (*Sea & Sun Technology GmbH)* was used. The data are stored in the MRD (Microstructure Raw Data) format at hard disk. Quick-look data processing has been carried out after each station using the data processing software MSSpro (*ISW Wassermesstechnik*).

Preliminary results

The aim of the measurements was to study vertical mixing due to small scale turbulence and stratification in the top layer and the intermediate cold winter water. This required an operation of the profiler from the surface to approx. 300 m depth. With respect to the intermittence of marine turbulence, a burst sampling strategy was applied. At each station a burst of 5 profiles was taken.

During ANT-XXVIII/3 microstructure measurements have been carried out at 31 stations. In total, 156 profiles were measured in a depth range between approx. 10 and 350 m. A MSS station overview is given in the Table 3.5.1 below.

Tab. 3.5.1: MSS Stations during PS79

Station/ MSS cast	Date	MSS Nr.	Latitude (begin of station)	Longitude (begin of station)
085/05	26.01.2012	1 - 6	52° 0.08'S	7° 59.98'W
086/03	29.01.2012	7 - 11	51° 59.76'S	11° 59.35'W
091/08	03.02.2012	12 -16	51° 13.22'S	12° 40.79'W
092/02	04.02.2012	17 -21	51° 00.20'S	12° 38.22'W
093/03	04.02.2012	22 -26	50° 47.88'S	12°39.63'W
095/02	05.02.2012	27 - 31	51° 11.52'S	11° 69.93'W
096/02	05.02.2012	32 - 36	51° 12.09'S	12° 19.83'W

Station/ MSS cast	Date	MSS Nr.	Latitude (begin of station)	Longitude (begin of station)
098/08	06.02.2012	37 - 41	51° 12.18'S	12° 39.80'W
101/03	06.02.2012	42 - 46	51° 24.76'S	12° 37.97'W
102/02	07.02.2012	47 - 51	51° 36.55'S	12° 38.51'W
104/02	07.02.2012	52 - 56	51° 36.40'S	13° 19.15'W
106/03	07.02.2012	57 - 61	51° 12.01'S	13° 19.46'W
111/03	08.02.1012	62 - 66	51° 11.89'S	12° 59.98'W
114/08	09.02.2012	67 - 71	51° 11.83'S	12° 40.28'W
115/03	09.02.2012	72 - 76	50° 59.88'S	12° 39.68'W
116/03	09.02.2012	77 - 81	50° 47.02'S	12° 38.57'W
119/02	10.02.2012	82 - 86	51° 12.52'S	12° 19.89'W
122/04	10.02.2012	87 - 91	51° 36.35'S	12° 00.68'W
124/02	11.02.2012	92 - 96	51° 12.01'S	12° 00.37'W
126/03	11.02.2012	97 - 101	50° 48.10'S	12° 00.19'W
128/06	12.02.2012	102 - 106	51° 12,14'S	12° 38.92'W
136/09	14.02.2012	107 - 111	51° 12.15'S	12° 39.15'W
137/09	15.02.2012	112 - 116	51° 02.10'S	12° 10.67'W
139/11	16.02.2012	117 - 121	50° 59.99'S	12° 59.88'W
140/06	16.02.2012	122 - 126	51° 12.51'S	12° 39.18'W
165/02	28.02.2012	127 - 131	49° 32.76'S	39° 22.29'W
174/04	1.03.2012	132 - 136	49° 39.73'S	38° 16.15'W
174/12	2.03.2012	137 - 141	49° 37,28'S	38° 19.54'W
174/16	2.03.2012	142 - 146	49° 36.86'S	38° 21.39'W
174/21	2.03.2012	147 - 151	49° 35.83'S	38° 22.86'W
174/24	2.03.2012	152 - 156	49° 33.26'S	38° 25.02'W

3.6 Physical Oceanography: Tracking the drift of mixed-layer waters by use of drogued surface buoys

Volker Strass[1], Rainer Graupner[2]

[1]AWI
[2]OPTIMARE

Work at sea

In order to track the drift of the near-surface waters through our main study sites a total of 4 MetOcean SVP-Iridium drifters were deployed. These consist of a spherical surface buoy of 40 cm diameter, equipped with GPS (Global Positioning System) receiver and Iridium satellite data transmitter, which is tethered to a 5.3 m long and 60 cm diameter wide drogue of holey sock style centred at 15 m depth. This setup assures that the drift of the surface buoy is determined by the flow at roughly mid-depth of the mixed layer.

Preliminary results

The deployment dates and positions are given in Table 3.6.1. The position data of the drifters were received by JouBeh Technologies Inc. and provided at their WebSite, from where they were copied on board via *Polarstern's* internet connection.

Tab. 3.6.1: Deployments of drogued surface drifters

Name	Inst. ID	IMEI	Date (yyyy/ mm/dd)	Time (UTC)	Lat. S	Lon. W	Transmis. interval
Buoy1	D02613	3002 3401 0672 650	2012/01/31	15:05	51°59.05'	12°00.06'	20 min
Buoy2	D026HZ	3002 3401 0775 110	2012/02/05	20:03	51°12.36'	12°39.62'	20 min
Buoy3	D0278X	3002 3401 0778 530	2012/03/01	14:11	49°39.32'	38°17.21'	20 min
Buoy4	D0253P	3002 3401 0870 150	2012/02/27	04:04	49°59.91'	38°13.09'	1 h

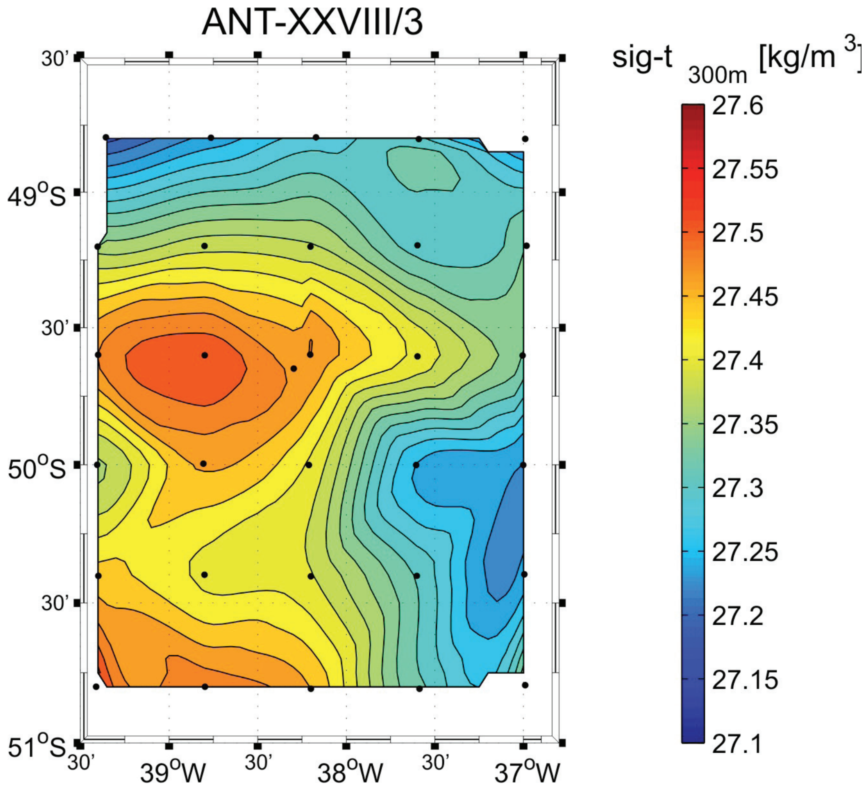

Fig. 3.6.1: Horizontal distribution of density σ_t at 300 m depth in the station grid north of South Georgia. The density contours also imply the geostrophic flow field, with streamlines running parallel to the density contours and the flow direction oriented in a way that the light water is located to the left. The flow speeds measured by the VM-ADCP (Section 3.3) in the northwest corner of the mapped area exceeded 100 cm s^{-1}.

4. SAMOC: SOUTH ATLANTIC MERIDIONAL OVERTURNING CIRCULATION AND CLIMATE - MULTIANNUAL OBSERVATIONS BY PROFILING FLOATS

Volker Strass[1], Rainer Graupner[2]
not on board:
Sabrina Speich[3], N. Lebreton[4],
H. Giese[5], M. Stawarz[5]

[1]AWI
[2]OPTIMARE
[3]LPO
[4]SHOM
[5]BSH

Objectives

For monitoring changes of water mass properties and ocean currents beyond the end of the survey, 10 autonomous profiling floats were deployed during the voyage. Fostering inter-institutional and international cooperation, six of these floats of type Apex were provided by the Bundesanstalt für Seeschiffahrt und Hydrographie (BSH), Hamburg, and four floats of type ARVOR were provided by the Laboratoire de Physique des Océans (LPO), CNRS-IFREMER-IRD-UBO, Brest, France. The deployment times and positions are given in Table 4.1.

Work at sea

The general mission parameters of these floats, which are equipped with CTD sensors, are to record one vertical profile between 2,000 m and the surface every 10 days, transmit the data and float positions via satellite, and while resting between profiling dates drift with the flow at the parking depth of 1,500 m. Depending on battery capacity and energy usage, and unforeseeable incidents, a float's mission can last for several years.

Preliminary results

The data collected by these floats will contribute to the international Argo programme, aimed at obtaining a continuous global coverage of *in-situ* CTD data from a target number of a total of 3,000 floats deployed in the world ocean at any time.

Tab. 4.1: Float deployments

Type	Inst. ID	Date (yyyy/ mm/dd)	Time (UTC)	Latitude S	Longi tude W	Accompanying CTD Profile
Apex	5920	2012/01/26	23:40	51°59.95'	08°00.07'	PS79/85-09
Apex	5921	2012/01/29	22:11	52°00.04'	12°00.24'	PS79/86-06
Apex	5922	2012/02/13	08:41	50°11.75'	13°20.05'	PS79/132-01
Apex	5923	2012/02/13	14:53	50°36.07'	13°19.87'	PS79/134-01
Apex	5924	2012/02/25	01:06	50°23.61'	36°59.92'	PS79/145-01

Type	Inst. ID	Date (yyyy/ mm/dd)	Time (UTC)	Latitude S	Longi tude W	Accompanying CTD Profile
Apex	5925	2012/02/27	04:00	49°59.98'	38°13.10'	PS79/158-01
ARVOR	OIN-10-AR-01	2012/02/15	09:05	50°59.99'	12°08.69'	PS79/137-10
ARVOR	OIN-10-AR-03	2012/02/17	10:03	51°11.39'	12°39.76'	PS79/140-07
ARVOR	OIN-10-AR-05	2012/02/28	07:35	49°59.92'	39°24.07'	PS79/164-01
ARVOR	OIN-08-AR-07	2012/02/29	23:44	48°47.76'	38°08.77'	PS79/171-01

Data management

The float data are directly transmitted to the Argo data system, through which they are made freely available at real-time. The ARVOR data in addition will constitute a major contribution to the international programme SAMOC (South Atlantic Meridional Overturning Circulation) coordinated by S. Speich.

5. CARBON DIOXIDE, NUTRIENTS, DISSOLVED OXYGEN AND TRANSIENT TRACERS DYNAMICS DURING "EDDY PUMP"

5.1 Carbon dioxide, dissolved inorganic carbon and total alkalinity

Elizabeth Jones[1], Lesley Salt[1], Judith Hauck[2]
not on board: Mario Hoppema[2], Hein J.W. de Baar[1]

[1]NIOZ
[2]AWI

Objectives

The oceans and the climate system appear to be changing in many different aspects. The increasing westerlies in the Southern Ocean are recent exponents of this phenomenon. This may have consequences for the uptake of CO_2 by the ocean. In the Southern Ocean, a decrease of the CO_2 sink was suggested due to enhanced upwelling of deep waters. Northward eddy transport across the Antarctic Circumpolar Current may or may not be counteracting this. We propose to investigate the carbon budget of eddies and the role of eddies in the equatorward transport of carbon. CO_2 measurements within and across different eddies will be conducted, as well as transient tracers, which will be utilized to describe the physical characteristics of eddies, and to calculate anthropogenic CO_2. Data from ANT-XXVIII/3 will inform on the role of eddies on the distribution of CO_2, nutrients and oxygen within these dynamic hydrographic regimes. Our data will explore this further in combination with data from previous cruises on board RV *Polarstern*.

Specific objectives of the proposed research include:

(1) Investigate the role of eddies in the transport of inorganic carbon in two or three different biogeochemical regimes of the ACC.
(2) Describe the chemical characteristics (CO_2, nutrients, oxygen) of the wider region.
(3) Determine the air-sea exchange of CO_2 in eddies as compared to that in the regions surrounding them and estimate the role of eddies in the source/sink function of the Southern Ocean; exact CO_2 fluxes will be calculated using detailed results of the mixed layer and mixing layer depths as determined using CFC-12 and SF_6 data and by the physical oceanography group.
(4) Compute vertical transport of carbon using results from the transient tracers and the physical oceanographers (vertical diffusivity), but also using the chemical (CO_2, oxygen, nutrients) balance of the surface layer.
(5) Determine a carbon budget of eddies based on inorganic carbon data, but also compare this with results from other investigators concentrating on specific carbon fluxes (e.g., export production with ^{234}Thorium depletion).
(6) Calculate anthropogenic CO_2 in and around eddies using transient tracers ratio.

Work at sea

In all survey regions and hydrographic transects, water samples were taken from the CTD rosette sampler at depths all through the water column, but with a bias towards the upper layers. Total CO_2 (TCO_2; also known as DIC) and total alkalinity was determined in discrete water samples taken from the rosette sampler. Both TCO_2 and total alkalinity are measured together with a VINDTA instrument (MARIANDA, Kiel), which combines the two measurements. The accuracy is set by internationally recognized and widely used certified reference material (CRM) obtained from Prof. A. Dickson at Scripps (USA). TCO_2 is the sum of all dissolved inorganic carbon species and is determined by a precise coulometric method. For every coulometric cell that was used in the coulometer, at least two CRMs were measured in duplicate at the beginning and the end of the analyses. The alkalinity measurements were made by potentiometric titration with a strong acid (HCl) as a titrant. The acid consumption up to the second endpoint is equivalent to the titration alkalinity. The system uses a highly precise Metrohm Titrino for adding acid, a pH electrode and a reference electrode. In addition to the CRMs, some sample bottles were measured on both VINDTAs to check the internal consistency of the data. The measurement temperature for both TCO_2 and total alkalinity was 25°C. Measurements of the water were carried out immediately after sampling. Generally, this means that the samples did not have to be stored for longer than 12 hours. In a very few cases, the time before measuring was somewhat longer, and then the samples were stored in the dark.

Preliminary results

A total of 110 stations were sampled for the CO_2 system with about 2,000 analyses. In addition, surface water partial pressure of CO_2 (pCO_2) was collected from the ship's seawater supply continuously during the cruise (Fig. 5.1.1). Sea surface *p*CO2 is obtained with a General Oceanics system with an infrared analyser (LiCOR), both for seawater using a water-air equilibrator and for the atmosphere, the air being pumped from the crow's nest.

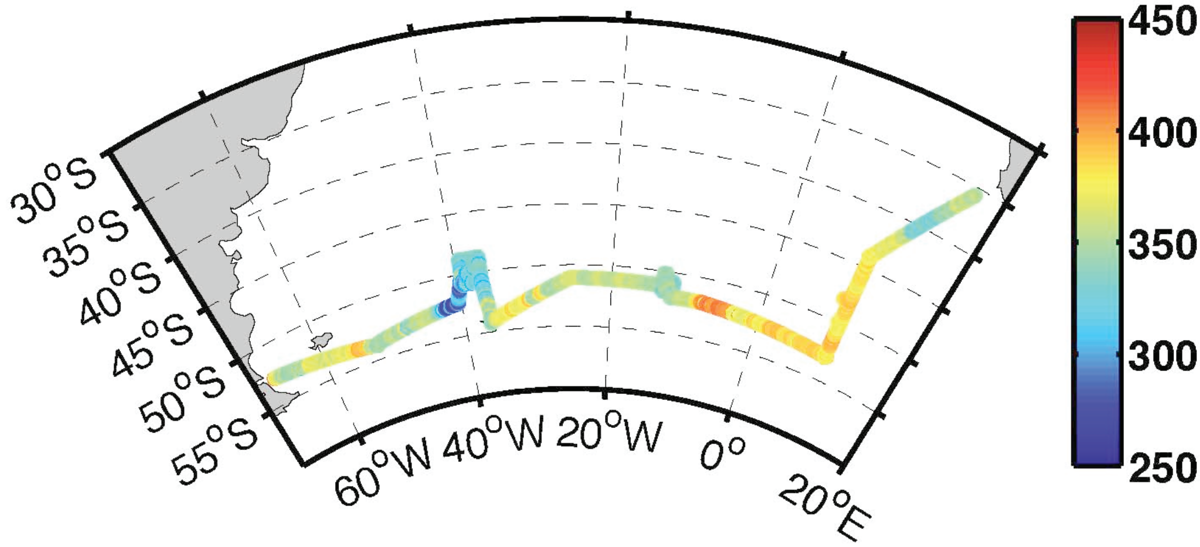

Fig. 5.1.1: Sea surface CO_2 (parts per million, ppm) along the ANT-XXVIII/3 cruise track

Data management

The TCO_2, alkalinity and pCO_2 data will be largely processed after the cruise. The final data will be submitted to data centers, as has been done with all data of previous cruises with *Polarstern*. The usual data center for carbon research is the Carbon Dioxide Information and Analysis Center (CDIAC; Boulder, USA) together with CCHDO. In the past, data have also been transferred to Pangaea, and they should be published within two years after the end of the cruise.

Other variables that are essential to biogeochemical studies involving the CO_2 system are oxygen and major nutrients.

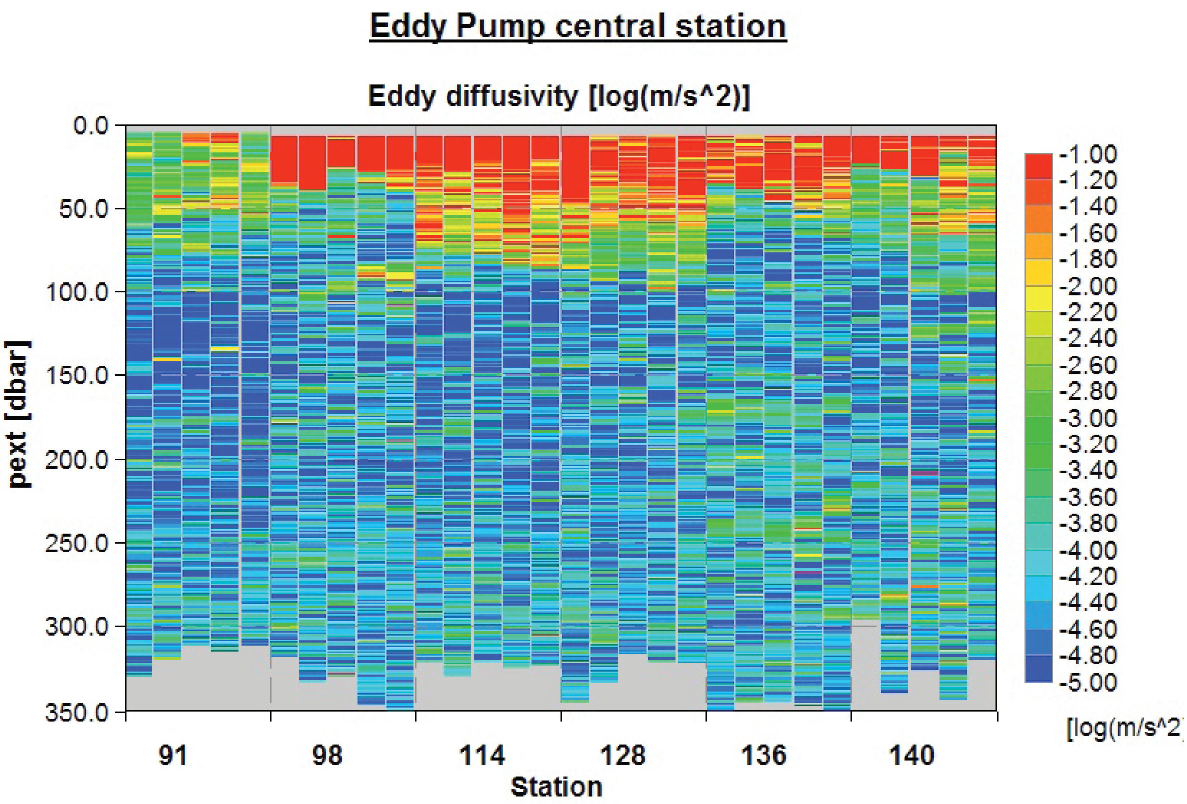

Fig. 5.1.2: Vertical distribution of the vertical diffusivity preliminarily derived from the MSS measurements at the indicated stations

5.2 Macronutrients

Sharyn Crayford[1],
not on board
Hein J.W. de Baar[1], Mario Hoppema[2]

[1]RNISR
[2]AWI

Objectives

See paragraph 5.1.

Work at sea

Sample water was obtained from the rosette sampler from all depths. All samples were collected in 125 ml polypropylene bottles directly after the trace gases, oxygen and TCO sampling. In the lab container the nutrient samples were transferred into 5 ml polyethylene vials, covered with parafilm against evaporation, and placed in the sampler after rinsing three times. All analyses were done within 15 hours on the auto-analyzer, a Technicon TRAACS 800 Auto-analyzer. Calibration standards were diluted from stock solutions of the different nutrients in 0.2 µm filtered low nutrient seawater (LNSW) and were freshly prepared every day. The LNSW is surface seawater depleted of most nutrients; it is also used as baseline water for the analysis between the samples. Each run of the system had a correlation coefficient of at least 0.9999 for 10 calibration points, but typical 1.0000 for linear chemistry. The samples were measured from the lowest to the highest concentration in order to keep carry-over effects as small as possible, i.e. from surface to deep waters. Prior to analysis, all samples and standards were brought to lab temperature of 22°C in about two hours; concentrations were recorded in µmol per liter at this temperature. During every run a daily freshly diluted mixed nutrient standard, containing silicate, phosphate and nitrate (a so-called nutrient cocktail), was measured in triplicate. Additionally, a natural sterilized Reference Material Nutrient Sample (JRM Kanso, Japan) containing known concentrations of silicate, phosphate, nitrate and nitrite in Pacific Ocean water, was analyzed in triplicate every 2 weeks in a run. The cocktail and the JRM were both used to monitor the performance of the analyzer. Finally, the nutrient cocktail (referred to in the results as ANTCOCK98x100) was used to adjust all data to the level of the known concentrations of the cocktail by means of a correction factor. The final data set is thus referenced to the same cocktail values, which makes data comparable and consistent. From every station the deepest sample bottle was sub-sampled for nutrients in duplicate, the duplicate sample-vials were all stored dark at 4°C, and measured again in the next run with the upcoming stations, this being for statistical purposes. More than 2,200 samples were analyzed for phosphate, silicate, nitrate and nitrite in total, of which 1,807 at CTD stations. Some 474 samples were analyzed in support of the biological work of Trimborn et al. (this volume).

Preliminary results

Analytical methods

Phosphate reacts with ammonium molybdate at pH 1.0, and potassium antimonyltartrate is used as an inhibitor. The yellow phosphate-molybdenum complex is reduced by ascorbic acid and measured at 880 nm (Riley & Murphy, 1962). **Silicate** reacts with ammonium molybdate to a yellow complex, after reduction with ascorbic acid; the obtained blue silica-molybdenum complex is measured at 800 nm. Oxalic acid is added to prevent formation of the blue phosphate-molybdenum (Strickland & Parsons, 1968).

Nitrate plus nitrite (NO_3+NO_2) is mixed with an imidazol buffer at pH 7.5 and reduced by a copperized cadmium column to nitrite. The nitrite is diazotated with sulphanylamide and naphtylethylene-diamine to a pink colored complex and measured at 550 nm. Nitrate is calculated by subtracting the nitrite value of the nitrite channel from the 'NO_3+NO_2' value. (Grasshoff et al, 1983) **Nitrite** is diazotated with sulphanylamide and naphtylethylene-diamine to a pink colored complex and measured at 550 nm. (Grasshoff et al., 1983)

Calibration and standards

Nutrient primary stock standards were prepared at the NIOZ. Phosphate: by weighing potassium dihydrogen phosphate into a calibrated volumetric PP flask to 1 mM PO_4. Silicate: by weighing Na_2SiF_6 into a calibrated volumetric PP flask to 19.99 mM Si. Nitrate: weighing Potassium nitrate into a calibrated volumetric PP flask set to 10 mM NO_3. Nitrite: weighing sodium nitrite into a calibrated volumetric PP flask set to 0.5 mM NO_2.

All standards were stored at room temperature in a 100 % humidified box. The calibration standards were prepared daily by diluting the separate stock standards, using three electronic pipettes, into four 100ml PP volumetric flasks (calibrated at the NIOZ) filled with low nutrient seawater LNSW. The blank values of the LNSW were measured onboard and added to the calibration values to get the absolute nutrient values. Our standards are regularly monitored by participating in inter-calibration exercises from ICES and Quasimeme and even more recently from the RMNS exercise organised by Michio Aoyama MRI/Japan.

Method detection limits

The method detection limits was calculated using the standard deviation of ten samples containing 2 % of the highest standard used for the calibration curve and multiplied with the student's value for n=10, thus being 2.81. (M.D.L = Std Dev of 10 samples x 2.81), M.D.L.(µM/l) Used measuring ranges µM/l:

PO_4 0.007 3.51

Si 0.057 159.21

NO_3+NO_2 0.025 45.51

NO_2 0.003 0.51

Quality control and statistics

Material, followed by statistics using the in-house diluted cocktail98 over all runs:

NIOZ Cocktail

The NIOZ cocktail solution acts as a lab reference and quality control and was made in the NIOZ lab containing phosphate, silicate and nitrate in a solution containing 40 mg Hg_2Cl_2 per litre as a preservative. Every time it was used, it was diluted 100 times with the same pipette and the same volumetric flask for PO_4, Si and NO_3 analysis.

Overall statistics computed against the NIOZ Cocktail diluted 100 times, followed by statistics from the Japan Reference Material at a temperature of 22°C.

In one run; ANTCOCKX100 PO_4, Si, NO_3+NO_2 **Average Value** 2.448 µM/l, 122.65 µM/l, 34.87 µM/l **Standard deviation** 0.0085, 0.231, 0.042 **CV % Full Scale** 0.24, 0.14, 0.09, n 10, 10, 10

Japan RM PO_4, Si, NO_3+NO_2 **Average Value** 3.086 µM/l, 137.10 µM/l,

43.26 µM/l **Standard deviation** 0.016, 0.669, 0.226 **CV % Full Scale** 0.46, 0.42, 0.50; n 66, 66, 66.

Data quality & remarks

Monitoring the Japanese Reference Material and the NIOZ in-house Lab cocktail reference (cocktail98), the JRM shows slightly more consistent data for silicate considering the precision (CV %). It is suggested that through diluting the in-house cocktail by means of an electronic pipette and a calibrated flask, a small error of maximum 0.15 % is introduced. All data except nitrite was normalized to the NIOZ cocktail, resulting in a comparable data set. The overall statistics for in-between runs is 0.016 µmol l^{-1} for phosphate, 0.594 µmol l^{-1} for silicate and 0.130 µmol l^{-1} for nitrate, this being the average standard deviation of 113 differences between duplicates measured in two different runs.

Data management

After finalization of the data processing, the data will be submitted to data centres, as has been done with all data of previous cruises with *Polarstern*. The usual data centre for carbon research is the Carbon Dioxide Information and Analysis Center (CDIAC; Boulder, U.S.A.) together with CCHDO. Since nutrient data are used in close combination with the carbon data, they will also be submitted to this data center. In the past, data have also been transferred to Pangaea, which shall also be done with the carbon and nutrient data of cruise ANT-XXVIII/3. They should be published within two years after the end of the cruise.

References

Grasshoff, K. et al. (1983). Methods of seawater analysis. Verlag Chemie GmbH, Weinheim. 419 pp.

Strickland, J.D.H. and Parsons, T.R., 1968. A pracitcal handbook of seawater analysis. First Edition, Fisheries Research Board of Canada, Bulletin. No 167, 1968. p.65.

Murphy, J. & Riley, J.P., 1962. A modified single solution method for the determination of phosphate in natural waters. Analytica chim. Acta 27, 31-36.

5.3 Dissolved Oxygen

Felix Müller[1], Mario Hoppema[1] (not on board)

[1]AWI

Objectives

See paragraph 5.1.

Work at sea

Method

For the measurement of dissolved oxygen in the water column the classical Winkler method was used. This method is based on the following redox-reactions:

$2\ Mn^{2+} + 4\ OH^{-} \text{--->} 2\ Mn(OH)_2$

$2\ Mn(OH)_2 + O_2 \text{--->} 2\ MnO(OH)_2$

-

$2\ MnO(OH)_2 + 8\ H^{+} + 6\ I^{-} \text{--->} 2\ Mn^{2+} + 2\ I_3^{-} + 6\ H_2O$

$I_3^{-} + 2\ S_2O_3^{2-} \text{--->} 3\ I^{-} + S_4O_6^{2-}$

First an excess of dissolved manganese and a strong base with an excess of iodide ions are added to the seawater sample, the Mn^{2+} is oxidized by the dissolved oxygen in the water to higher oxidation states and precipitates as $MnO(OH)_2$ to the base of the sample bottle. After a few hours an excess of strong acid is added to the sample, to reduce the manganese back to the Mn^{2+} form. With the reduction of manganese the iodide ions become oxidized to iodine in the form of I_3-ions, which has an intense yellow color. The iodine is titrated back to the colourless iodide by thiosulfate. The amount of thiosulfate which is needed to decolorize the sample is proportional to the amount of dissolved oxygen in the seawater sample. The colour of the sample was determined by the light transmission through the sample bottle with a spectrophotometer. The titration was carried out by an automated Dosimat from Metrohm.

During the cruise, dissolved oxygen in the water column was measured at three main regions. The first region was a transect at 10°E, extending from 44°S to 52°S. At each degree of latitude the dissolved oxygen was measured from seawater collected from each Niskin bottle attached to the CTD rosette. Samples were taken from the sea surface to the bottom at about 20 depths. Between these stations there were typically two (sometimes only one) shallow stations to 1,500 m depth, where samples were taken at 10 depths. Overall, 404 oxygen samples were collected at 26 stations along this transect. The second region was an " eddy like structure" at about 52°S and 13°W. There was a cross of 9 deep CTD stations, and in addition four deep stations and 12 shallow stations in the corners of the grid. At most of these stations, oxygen samples were taken. The core station was measured 5 times within two weeks, the other stations only 1 or 2 times. Overall, 562 oxygen samples were collected at 28 stations in this area. The third region was northwest of South Georgia at about 50°S and 38°W. There was a grid of 5 x 6 shallow stations to 1,500 m and one deep station at the core. At 23 of these stations oxygen samples were measured at 14 different depths. In total, 351 oxygen samples were taken in the Georgia Basin area.

Preliminary results

Overall, a total of 1318 oxygen samples were measured from 78 CTD stations. The precision was determined as 0.65 μmol l^{-1} from each 10th sample that was measured in duplicate under the same conditions.

Data management

All data obtained from this cruise will be uploaded to PANGAEA.

5.4 Measurements of CFC-12 and SF_6

Tim Stöven[1], Boie Bogner[1]
Not on board:
Toste Tanhua[1], Mario Hoppema[2]

[1]IfM-GEOMAR,
[2]AWI

Objectives

A goal of the Southern Ocean expedition ANT-XXVIII/3 was to obtain tracer profiles of several eddy structures. The distribution and the relation between the two transient tracers CFC-12 and SF_6 should provide a detailed look into the transport processes of an eddy structure.

Work at sea

Two purge and trap GC systems have been set up to measure the transient tracers in parallel. However, the main heater unit of the GC system named PT3 had a technical defect and all water samples have been measured with the second GC system named VS1. We sampled at 59 stations with an overall number of 720 measurements. The sampling was performed with 300 ml glas ampoules to avoid contact with the atmosphere. An aliquot of about 250 ml was injected into the system through a vacuum-sparge technique. Standardization was performed by injecting small volumes of two different gaseous standards containing SF_6 and CFC-12. This working standard was prepared by the company Dueste-Steiniger (Germany). The CFC-12 and SF_6 concentrations in the standards has been calibrated vs. a reference standard obtained from R.F. Weiss group at Scripps Institution of Oceanography (SIO), and the CFC-12 data are reported on the SIO98 scale and SF_6 on the NOAA-2000 scale. Another calibration of the working standard will take place in the lab after the cruise, to determine any possible drift in the working standard. Calibration curves were measured every few days, depending on workload and system performance, to determine the non-linearity of the detector. Point calibrations were always performed between stations to determine the short-term drift of the detector. Replicate measurements of surface and bottom samples were normally run for each profile. Standard deviation of the measurements determined from these replicate measurements and the detection limits for SF_6 and CFC-12 are listed in Table 5.4.1.

Preliminary results

The tracer structures of the eddy surveys (Fig. 5.4.1) show a wide variability in depth and space compared to a non-eddy area. A detailed data analysis combining the tracer data with further obtained parameters will be performed at the GEOMAR in Kiel.

Tab.5.4.1: Precision and detection limit of VS1

	Precision	**Detection Limit**
SF_6	0.014 fM	0.05 fM
CFC-12	0.004 pM	0.4 fM

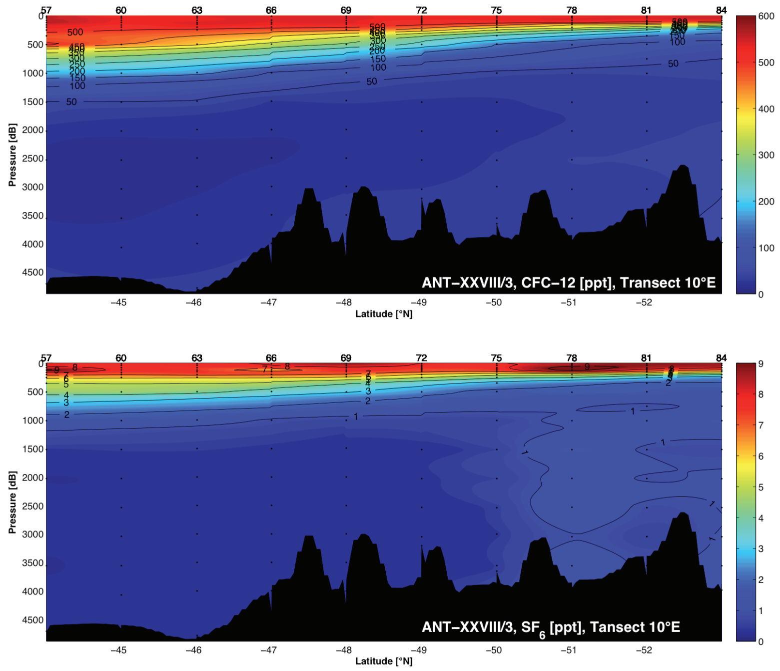

Fig. 5.4.1: Tracer concentrations along the 10°E transect

Data management

All data obtained from this cruise will be uploaded to PANGAEA.

6. PRIMARY PRODUCTIVITY AND IMPACT OF CO_2 AND DUST ON PHYTOPLANKTON GROWTH

Scarlett Trimborn[1], Clara Hoppe[1], Tina Brenneis[1], Louiza Norman[2],
not on board:
Christel Hassler[2], Björn Rost[1]

[1]AWI
[2]UTS

Objectives

The Southern Ocean accounts for ~20% of the global annual phytoplankton production and is considered to exert a large influence on the marine carbon cycle and to have the greatest potential in affecting atmospheric CO_2 concentrations. *In-situ* fertilization experiments have revealed that iron availability is the key factor controlling phytoplankton growth in the Southern Ocean. Dust deposition, ice melting or iron input from land run-off and contact with sediments are important processes through which in particular coastal regions of the Southern Ocean are naturally enriched with iron. In open ocean regions, atmospheric dust input is one of the major sources of iron. Only a few studies have investigated the impact of dust addition on open ocean phytoplankton productivity. Aside from this crucial factor, other environmental factors like changing atmospheric CO_2 concentrations due to ongoing ocean acidification as well as to seasonal changes in CO_2 were also found to exert control on both phytoplankton structure and growth. Unfortunately, its effects on the physiological ecology of the phytoplankton community have thus far received very little attention, even though large seasonal changes in CO_2 can be observed over the course of the growing season. Until now, research so far has focussed on the investigation of one of these two factors, while attention has not yet been paid to the assessment of dust deposition in conjunction with CO_2, even though the combination of both factors may be crucial in controlling the phytoplankton species composition in the Southern Ocean.

Work at sea

Primary production and fluorescence of phytoplankton populations along the cruise track were measured from different depths using Niskin bottles attached to a sampling rosette with conductivity, temperature and depth sensors (CTD rosette). From 26 CTD stations in total (Fig. 6.1), seawater samples were collected from 10, 20, 40, 60, 80, and 100 m depth. Using fluorescence induction relaxation fluorometry (FIRe) and the commonly used ^{14}C technique, fluorescence measurements as well as different assays for primary production were carried out, which will be described in the following.

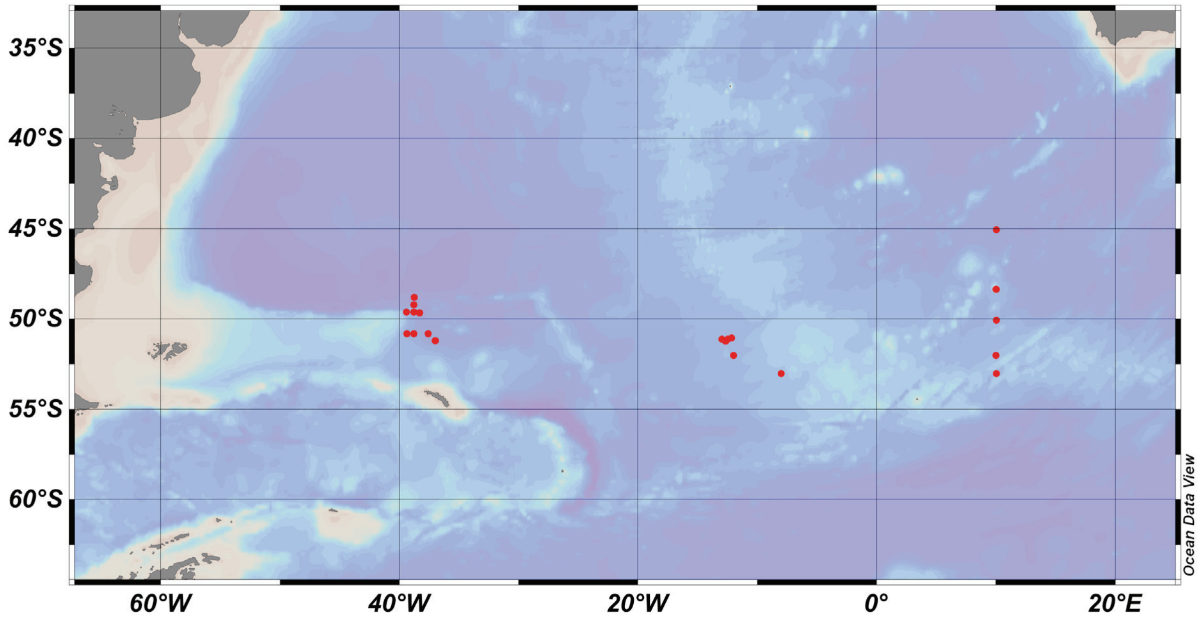

Fig. 6.1: Map of all sampled stations during the cruise track. In total, 26 CTD stations were sampled: PS79/60-5, 70-3, 73-2, 75-9, 81-11, 84-7, 85-3, 86-2, 91-5, 114-9, 128-10, 136-8, 137-7, 138-2, 139-3, 140-12, 147-1, 149-1, 155-1, 160-1, 165-5, 168-1, 169-1, 170-1, 174-9, 175-1.

Two approaches were applied to determine primary production rates of marine phytoplankton, the *in-situ* primary production and the 24h primary production. *In-situ* primary production rates were determined by exposing the phytoplankton from all sampled depths to the corresponding *in-situ* light intensity. *In-situ* light intensities were determined just before sampling by CTD via a RAMSES light sensor and were kindly provided by Wee Cheah and Marianna Soppa before all measurements. *In-situ* irradiance of the sampled depths was adjusted in a temperature controlled custom-build photosynthetron in the way that samples were illuminated by adjustable single LEDs. *In-situ* primary production was then determined by transfer of the unfiltered seawater into 1h of exposure to the respective *in-situ* irradiance after addition of a 1.5 μCi spike of ^{14}C. At the end of the incubation time the reaction was stopped by addition of 0.6 N HCl and left in the fume hood to degas overnight. Then to each sample, 10 ml of scintillation cocktail were added and measured with a scintillation counter (TRICARB) on board.

According to the JGOFS protocol (2002) 24h primary production rates were determined from all sampled depths by placing the phytoplankton samples into an outdoor incubator, thus exposing the samples to a natural day-light cycle. By the use of filters the *in-situ* irradiance was reduced by 50, 25, 12.5, 6, 3, and 1.5% corresponding to the sampled depth. After a 24h incubation, the same protocol was followed as for the *in-situ* primary production. To obtain also information on photosynthetic characteristics, primary production of the 10 and 60 m depth was measured after exposure to 15, 30, 50, 80, 200, and 500 μmol m^{-2} s^{-1} for 1 h.

To gain also information on the physiological state of the phytoplankton populations fluorescence induction relaxation fluorometry (FIRe) was applied. To this end, all sampled depths were dark acclimated for at least an hour to obtain highest maximum fluorescence. Further, information on the efficiency of photochemistry in PSII during varying light exposure was obtained by exposure of the 10 and 60 m depth to 15, 30, 50, 80, 200, and 500 μmol m^{-2} s^{-1} for 1h. Through the combination of dark-acclimated and light adapted fluorescence, information on electron transport rates as well as non-photochemical quenching processes can be derived.

The potential for domoic acid production to enhance iron uptake efficiency during a Pseudo-nitzschia bloom

To unravel whether domoic acid enhances the iron uptake efficiency of Pseudo-nitzschia cells, we followed the development of a Pseudo-nitzschia bloom over the duration of 2 weeks. To this end, at the CTD stations PS79/91, 114, 128, 136, 139, and 140 (Figure 1) we also sampled for domoic acid and carried out ^{55}Fe uptake assays, which will be described in more detail. Iron-clean seawater from 20 and 60 m depth was collected using GoFlo bottles. Iron uptake rates were then estimated by transfer of the unfiltered seawater into 24 h of light exposure (30 μmol m^{-2} s^{-1}) after addition of a 1 nM spike of ^{55}Fe. At the end of the incubation time, the sample was filtered onto GFF-filters and 10 ml of scintillation cocktail was added to each sample and measured with a scintillation counter (TRICARB) on board. To normalise ^{55}Fe uptake against biomass, samples for particulate organic carbon were also taken in replicates from the two sampled depths. To test for the presence of domoic acid at 20 and 60 depth, seawater was filtered through a GFF-filter and subsequently frozen at -20°C until further analysis at the AWI. As it is well known that domoic acid accumulates in higher trophic levels of the marine food chain, animals sampled by Evgeny Pakhomov and Brian Hunt, Dörte Janussen and Katharina Jörger were immediately frozen at -20°C for the analysis of domoic acid.

CO_2-/dust-/iron perturbation experiments

Shipboard CO_2-/dust-/iron pertubation experiments with a naturally iron-limited phytoplankton community were performed to address the important question of how CO_2-related changes in carbonate chemistry e.g. ocean acidification in combination with different iron availability (through either dust or inorganic iron addition) will directly affect primary productivity and phytoplankton species composition. To this end, 80 l seawater containing the starting phytoplankton community (filtered through a 200 μm mesh to avoid zooplankton inside the experimental bottles) were sampled at station PS79/84-5 at 53° S 10° E using a membrane pump sampling from 24m depth. To ensure prolonged exponential phytoplankton growth, in addition 200 l of iron-limited seawater were sampled using acid-cleaned 0,2 μm filter cartridges. This water was used to dilute the incubations when nitrate concentrations went below 14 μmol l^{-1}. For all experiments, triplicate incubation bottles were bubbled with CO_2 levels representing values of present-day (~380 μatm) and those projected for the year 2100 (~980 μatm) using a portable gas mixing system. To also test the influence of iron availability, incubations were grown under natural iron concentrations of 0.25 nM and under iron enrichment though either the addition of 0.7 nM $FeCl_3$ or by the addition of dust to a final concentration of 0.7 nM. No additional macronutrients were added to the incubation bottles.

The experiments were run in a temperature controlled growth chamber (2 °C) with a constant daylight irradiance of 30μmol m^{-2} s^{-1}. Incubation experiments lasted between 30 and 35 days depending on experimental treatment. Nitrate, silicate and phosphate concentrations were measured on a daily basis over the course of the experiments. Flow cytometry samples were taken at a regular basis to determine phytoplankton growth rates. At the beginning, the first dilution and the end of the experiments taxonomic species composition, cell density and chemical parameters were taken that will be more described in the following.

To determine taxonomic composition aliquots of 200 ml unfiltered seawater were preserved with both hexamine buffered formalin solution at a final concentration of 2% and lugol at a final concentration of 1%. Preserved samples were stored at 4°C in the dark until further analysis by light and epifluorescence microscopy back in the home laboratory. For bacterial composition, seawater was transferred into cryo vials to which gluteraldehyde of a final concentration of 0.1% was added. These samples were then stored at -80°C until they will be analysed at home. Further, pigment samples were collected, filtered and stored at -80°C until high performance liquid chromatography (HPLC) analysis will be performed in the home laboratory. Samples for particulate organic (POC) were filtered onto precombusted (500°C; 12 h) GFF filters and stored in precombusted petri dishes (500°C; 12 h) at -20 °C. Samples for the determination of biogenic silicate were taken, filtered and stored at -20°C until further analysis. To test for domoic acid production, seawater was filtered through a GFF-filter and subsequently frozen at -20°C until further analysis at the AWI.

Regarding the characterisation of the iron chemistry, filtered seawater samples for the determination of iron dissolved, iron speciation, humic acid-like compounds and ligands were taken. While iron dissolved samples were measured on board by Juan Santos and Luis Laglera, samples for iron speciation, Ha-like compounds and ligands were stored at -20°C until further analysis. Samples for iron speciation and humic-acid-like compounds will be analysed at the University of Technology Sydney using voltammetry while ligand samples will be analysed by the group of Prof. Boris Koch at the AWI by means of HPLC-ICPMS.

For the determination of the seawater carbonate chemistry from each station samples for alkalinity, dissolved inorganic carbon and pH were collected. Alkalinity samples were taken from the filtrate (Whatman GFF filter, 0.6 mm), stored in 100-ml borosilicate flasks at 4°C until further analysis by potentiometric titration at home. Dissolved inorganic carbon samples were sterile-filtered (0.2 mm) and stored in 13-ml borosilicate flasks free of air bubbles at 4°C until they will be measured with a Quaatro Autoanalyzer (Seal Analytical). pH was measured on board using a pH/ion meter (model 713, Methrom) that was calibrated (three-point calibration) at latest every third day. From these three parameters the carbonate system will be calculated using the program CO2Sys (Lewis and Wallace 1998).

Physiological characteristics of the different treatments were derived by means of FIRe, ^{14}C and ^{55}Fe based assays. Primary production was determined by transfer of the unfiltered seawater for 1 h at irradiances of 15, 30, 50, 80, 200, and 500 μmol m^{-2} s^{-1} after addition of a 1.5 μCi spike of ^{14}C. The reaction was stopped as described before. Using FIRe information on the efficiency of photochemistry in PSII after dark acclimation and during varying light exposure was obtained by exposure to 15, 30, 50, 80, 200, and 500 μmol m^{-2} s^{-1} for 1h. Further, iron uptake rates were estimated by transfer of the unfiltered seawater into 24 h of light exposure (30 μmol m^{-2} s^{-1}) after addition of a 1 nM spike of ^{55}Fe.

Preliminary (expected) results

At this stage it is very difficult to discuss preliminary results as most of the taken samples still need either to be analysed or to be processed. However, the extensive characterisation of 26 CTD stations along the cruise track will help us to provide a better ecophysiological explanation for the spatial distribution of Southern Ocean phytoplankton. Especially, the successful performance of shipboard CO_2 /dust-/iron manipulation experiments will bring us a step forward and will enable us to gain a process-based understanding of how the two environmental factors iron availabity and CO_2 will shape the Southern Ocean phytoplankton community structure, alter productivity and phytoplankton growth in the future.

Data management

All data obtained from this cruise will be uploaded to PANGAEA.

References

Lewis E. and Wallace D. W. R. (1998) Program Developed for CO2 System Calculations. In (C.D.I.A. Center). Oak Ridge National Laboratory, U.S. Department of Energy, ORNL/CDIAC-105, p. 21.

7. IRON CYCLING

L. M. Laglera[1], [1]UIB-CSIC
J. Santos Echeandía[2] [2]IIM

Objectives

Iron is the main factor limiting primary production in those nutrient-rich surface waters of the Southern Ocean separated from coastal inputs. This has been proved by natural iron fertilization near islands and by several artificial iron fertilization experiments carried out in the Southern Ocean.

During the Eddy Pump cruise iron concentrations were determined in the upper 300 meters in order to better understand the role of iron in the distribution of biomass in the areas of interest. Iron inventory was estimated from concentrations of leachable iron in the colloidal and particulate fractions. Samples were fractionated using 2 filters of different pore size and concentrations were reported in three different fractions: < 0.02 µm, unfiltered and one of the following < 0.4, 0.6 or 53 µm. Extra samples were frozen for determination in the laboratory of the organic speciation of iron.

Work at sea

Sampling

Water samples down to 300 m were collected by using eight 12 l GoFLo bottles fixed to a Kevlar line and fired by Teflon messengers. Once on deck, bottles were brought to a clean air plastic "bubble". The bubble consisted of a plastic enclosed space equipped with two laminar flow systems (HEPA filters) running continuously maintaining positive pressure of clean air inside the bubble. A pressure line carrying high purity nitrogen was plugged to the head of the sampling bottles to facilitate the filtration by overpressure. Samples for analysis on board were stored in 60 or 125 ml LDPE bottles and immediately acidified to pH 2.0. Other samples were stored in 250 and 500 ml LDPE bottles and frozen for analysis of iron organic speciation back in the lab.

The list of stations sampled includes: PS79/60, 70, 76, 81, 84, 85, 86, 91, 98, 114, 128, 136, 139, 140, 143, 163, 170.

Determination of the iron concentration in the water column - Iron partitioning

Two analytical systems for iron determination in seawater were set up onboard: a voltammeter for the determination of the concentration of iron in the presence of DHN and bromate (Obata and van den Berg, 2001) and a flow injection analysis (FIA) system with detection by chemiluminescence (Obata et al., 1993). Unfortunately, the FIA system did not work properly for the first month and for consistency all the analysis of the water column samples onboard was performed by voltammetry.

Analyses of dissolved iron were carried out after a minimum of 24 hours equilibration. From station PS79/81 to the end of the sampling, unfiltered samples were processed as 0.2 µm filtered samples but extending the equilibration time to 48-72 hours in order to obtain the concentration of leachable particulate iron. Due to the strong differences found on particulate iron in between stations a third fraction was determined using online filtration. Unfortunately due to lack of extra filter holders we could not sample more fractions. For stations PS79/91 and 98, a 0.4 µm filter was used, whereas the pore size was 3 µm for stations PS79/114 and 128. For the rest of the study a filter of 53 µm pore size was selected in order to determine the concentration of iron that can be leached from sinking particles.

Other metals

From some key stations, extra samples were taken for the lab-based determination of the Hg and Pt concentration and for determination of other metals by ICP-MS after pre-concentration. Trace metals determined by this method will be selected as a function of the pre-concentration step selected prior to analysis.

Iron speciation

In seawater the speciation of iron is dominated by the presence of binding ligands at concentrations higher than the dissolved iron concentrations. The analytical method consists of the titration of the sample with iron and the determination of the labile fraction by CSV.

Iron in excretion products

One of the important roles of zooplankton in ocean biogeochemistry is that they take part in trace metal cycling and storage of iron in the Southern Ocean waters (Tovar-Sanchez et al., 2007). Due to the big amount of salps collected we tried with the collaboration of Louiza Norman to determine the released of iron from their faecal pellets after acidification.

Iron in phytoplankton and zooplankton incubations

Two incubation experiments were conducted on board.

A first one led by Scarlett Trimborn under the CODEX project measured the evolution of phytoplankton cultures after spiking iron from different sources (i.e. dust or iron chloride). Iron concentrations were determined at different steps of the incubation experiments.

A second set was done by Louiza Norman, but this time the source of iron was salp faecal pellets. Iron concentrations were also measured in different stages of the incubation and under different conditions.

Preliminary results

Dissolved iron concentrations in the first 100 m of the water column were very low once we moved South of the Polar Front, consistently around 0.1-0.15 nmol l^{-1} with very few exceptions. Below the mixed layer concentrations increased to around 0.3 nmol L^{-1} at 300 m deep. This homogeneity, despite the wide range of chlorophyll concentrations found, pointed to the presence of iron reservoirs in bigger fractions.

We investigated the concentration of leachable particulate iron in unfiltered samples and in intermediate fractions in the high chlorophyll patch (up to 2.5 mg Chl_a m^{-3}). This concentration followed a very different pattern with a high correlation with chlorophyll concentrations in the mixing layer (Fig. 7.1). The depletion of the dissolved fraction in comparison would imply fast fluxes in between particulate, dissolved and intracellular iron.

No studies have been published about the nature of the particles that contribute to the concentration of total leachable iron. We know from previous experiments (LOHAFEX) that copepod faecal pellets contribute to this fraction. The microscopic observation of intact cells from many different species points to a non-significant contribution from the intracellular pool of healthy cells (thanks to Chistine Klaas). However the analysis of big salp faecal pellets showed very small release of iron after acidification. Unfortunately we could not pursue further how this organism that ingests important amounts of phytoplankton releases the iron ingested.

The use of 0.4 mm and 3 µm filters in some stations showed no significant differences with respect to filtration by 0.2 µm (Fig. 7.2). This should be indicative of the absence of iron removal through aggregation of inorganic/ organic iron species to colloidal size as it has been described in oligotrophic waters of the Atlantic and Pacific Ocean (Wu et al., 2001).

As a consequence we decided to study the possibility to detect vertical fluxes of iron associated to sinking particles using a 53 µm filter. For patch waters the results were not consistent with an important offset in between the unfiltered and 53 µm fraction for station PS79/136 (indicative of strong vertical fluxes associated to sinking particles) and barely any difference for stations PS79/139 and 140. Visual inspection of the material recovered by the filter showed high presence of algae chains, faecal material and copepods but no significant differences could be found in between stations (thanks to Morten Iversen).

We repeated the analytical procedure at a station at the edge of the South Georgia shelf to try to evaluate if iron in the mixing layer responds to the hypotheses of iron resuspension from island shelves of the Southern Ocean or if, as suspected from the high presence of iron on the island, lateral advection and atmospheric deposition could play a significant role in iron transport. The result is shown in Figure 7.3 and shows with a striking clarity that in the case of South Georgia important amounts of particulate iron are transported horizontally from the island in the size range 0.2-53 µ m. This result underlines the importance of the study of the particulate part of iron in order to explain the biological productivity pattern in the Southern Ocean.

Data management

All data obtained will be prepared for publication and will be made available via PANGAEA.

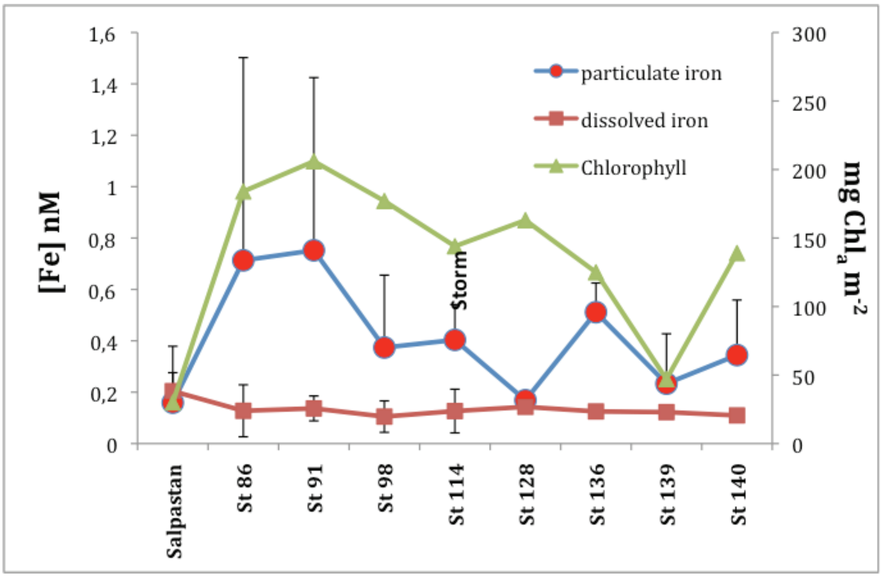

Fig. 7.1: Averaged dissolved and leachable particulate iron concentrations and chlorophyll concentrations integrated down to 120 m in the core stations. Station PS79/85 (Salpastan) is added to study the effect of very low chlorophyll concentrations.

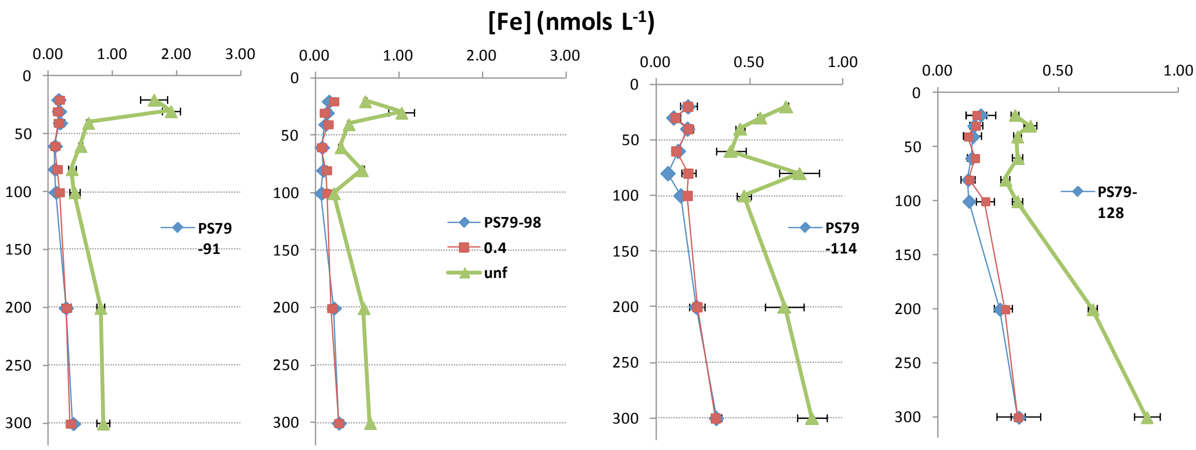

Fig. 7.2: Iron concentrations obtained in unfiltered, 0.2 mm filtered and 0.4 mm filtered samples form stations PS79/91 and 98. Iron concentrations in the fractions unfiltered, 0.2 mm filtered and 3 mm filtered samples from stations PS79/114 and 128.

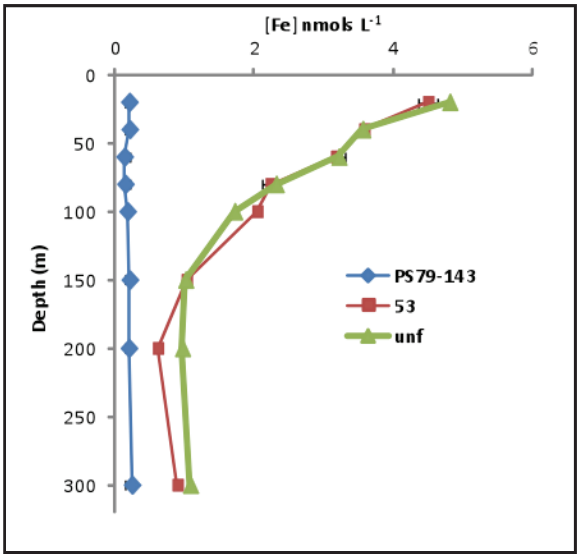

Fig. 7.3: Dissolved, > 53 mm and leachable particulate iron at station PS79/143 corresponding to the NE edge of the South Georgia shelf

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8. IMPACT OF GRAZERS ON IRON BIOAVAILABILITY

C. Hoppe[1], C. Hassler[2] , L. Norman[3], S. Trimborn[1], L. Laglera[4], B. Hunt[5], E. Pakhomov[5]

[1]AWI
[2]UTS/UGeneva
[3]UTS
[4]UIB
[5]UBC

Objectives

Most of the iron is present under organic forms, likely produced by the biota and controlling iron bioavailability to support the growth of phytoplankton. However, the nature of these organic compounds defining iron marine chemistry and bioavailability remains largely unknown. Biological interactions between phytoplankton and zooplankton are known to recycle iron, therefore re-supplying bioavailable iron forms. Grazers affect iron chemistry by lysing and digesting phytoplankton and also by producing fecal pellets. Perturbation experiments will be carried out to investigate how these two processes affect iron chemistry, the nature of organic material present and the bioavailability of iron to endemic phytoplankton community. For this purpose endemic grazing products (from large copepods exposed to natural phytoplankton) and fecal pellets will be collected and analysed. Because iron photochemistry is believed to be important in defining the chemical reactivity of iron and light affect iron biological recycling, exposure to dark and light will be used.

Work at sea

A single perturbation experiment was carried out with fecal pellets of salps, the predominant grazer present. Fecal pellets from salps were taken for analysis back on shore to complement data gathered at sea. An incubation was carried out to measure the potential effect that fecal pellets have on iron chemistry and associated organic ligands. Originally 3-4 experiments were scheduled. However we were only able to perform one (uncompleted) experiment due to health issue of the PhD student in charge of most of this work at sea, during the second half of the cruise.

Preliminary and expected results

This experiment could shed light on the role of grazing on iron chemistry. Based from total dissolved iron done at sea, very little to no dissolved iron were leached from the fecal pellets suggesting a minor role in iron cycling. Analysis of Fe(II) were not possible as the technique was not working at sea.

In order to evaluate the potential impact of salp's fecal pellets on the biogeochemical cycles on iron and carbon, samples were taken to measure their total iron content as well as iron chemical speciation (UGeneva), their impact on organic material will be measured by electrochemistry (HA-like, UGeneva), field-flow fractionation-

ICP-MS (UGeneva) and HPLC-ICP-MS (group of Prof. Boris Koch at the AWI). In addition, POC, flow cytometry and major nutrients analyses will be done on samples collected (AWI). Given that we were able to perform only one experiment, it is yet unsure whether we will be able to publish this work, nonetheless these data will provide grounds for future funding and securing ship time.

Data management

All data obtained from this cruise will be uploaded to PANGAEA.

9. NATURAL RADIONUCLIDES

Viena Puigcorbé[1], Montserrat Roca[1]
Not on board:
Michiel Rutgers van der Loeff[2], Pere Masqué[1]

[1]UAB/ICTA
[2]AWI

9.1. ^{234}Th as tracer of export production of POC

Objectives

Quantifying the export of carbon from the ocean surface to the deep waters is essential for determining the efficiency of the carbon pump. Natural radionuclides, such as ^{234}Th, have been frequently used as proxies to estimate this export.

Thorium-234 is a natural occurring radioisotope that is produced continuously in seawater through alpha decay of its soluble parent nuclide ^{238}U ($T_{1/2} = 4.5 \cdot 10^9$ y). Uranium is conservative in seawater at a concentration of approximately 3.1 $\mu g \cdot l^{-1}$, while Th has a high affinity for particles. This different behavior and the fact that the half-life of ^{234}Th (24.1 d) is very suitable for tracing events occurring over short time scales ranging from days to weeks, periods similar to the development of a phytoplankton bloom, have led the ^{234}Th/^{238}U disequilibrium method to be widely used as a tool to determine the export rate of particles and, especially POC, from the euphotic zone to the deep ocean (Buesseler et al., 1992; Cochran et al., 1995; Bacon et al., 1996; Benitez-Nelson et al., 2001; Benitez-Nelson and Moore, 2006). Both isotopes would be in radioactive equilibrium in the water column in absence of particles. However, due to its high particle affinity, Th is removed from the surface water through scavenging onto sinking particles. Thus, an idealized oceanic profile shows relatively low ^{234}Th activity in the surface waters, where scavenging is more intense, and an increase in ^{234}Th activity with depth as particle concentration decreases. The opposite happens when there are remineralization processes taking place and ^{234}Th is released into solution, finding it in excess with respect to ^{238}U.

Our objective was to quantify the ^{234}Th flux by measuring the depletion of this radionuclide with respect to ^{238}U in the upper water column. Repeated measurements of the integrated ^{234}Th depletion will allow the calculation of the downward flux of particulate ^{234}Th out of the surface water. In order to convert this flux to a carbon flux we will determine the POC/^{234}Th ratio in sinking particles (e. g. Buesseler et al., 2006).

Work at sea

During this cruise a total of 332 samples were collected to analyze ^{234}Th from a total of 27 stations. In addition, at stations PS79/84, 128 and 174, triplicates of deep samples (2,500 m) were collected for calibration purposes. Total ^{234}Th concentrations were determined from 4 l of seawater collected at 11-13 depths along the upper 1000 m in each profile. The samples were processed according to the MnO_2 co-precipitation technique (Benitez-Nelson et al. 2001, Buesseler et al. 2001). Briefly, the samples were acidified immediately after collection with 5 ml of nitric acid (65 %), spiked with ^{230}Th and allowed to equilibrate for at least 12 h. After that time, ammonia was added to raise the pH to 8.5 in order to produce a MnO_2 precipitate through the addition of $KMnO_4$ and $MnCl_2$.

The samples were filtered through QMA filters, dried at 50ºC and prepared for beta counting by covering them with a layer of Mylar and a layer of aluminium foil to block low energy beta emissions. The counting was done on board using low background beta counters (Risø National Laboratories). Although we had recurrent problems with the stability of the HV control of these counters, all counting could be completed on board. Samples will be recounted at the home laboratory to double check the first measurements done on board.

Due to the conservative behaviour of uranium in seawater, its activity is typically derived from salinity (Pates and Muir, 2007). However, additional seawater samples were collected at stations PS79/63, 84, 128 and 174 to measure ^{238}U by inductively coupled plasma mass spectrometry (ICP-MS) to confirm the U-Salinity relationship.

Samples for particulate ^{234}Th and organic carbon were collected using in-situ Challenger filtration pumps. Four pumps were deployed at 100, 150, 300 and 400 m at stations PS79/57, 69, 81, 84, 91, 139 and 174. Pumps filtered on average 1500 l during 1.5 hours, and particles were retained using a 53μm mesh screen. These particles were subsequently rinsed with filtered seawater and split in three: one was filtered through pre-combusted QMA, another fraction was filtered through silver filter, both of them for C and N analysis, and the third onto QMA filters for ^{234}Th measurements as described above for water samples. POC and PON will be determined later at the home laboratory.

Thorium-234 was also measured in samples from the sediment traps. A tube from each depth (100 or 120 m and 300 or 320 m) was split, one half will be used to analyze POC and the other was filtered through a pre-combusted QMA filter to measure ^{234}Th on board.

Preliminary results

The preliminary ^{234}Th fluxes at 100 m derived from the deficits in the water column (assuming steady state and with error estimates only including counting statistics), as well as those obtained from the sediment traps from all the sampled stations are shown in Fig. 9.1 These results need to be corrected for final background counts and for chemical recoveries.

At the region where an eddy-like structure was identified, with high Chl*a* concentration, sediment traps were deployed almost every day in order to follow the evolution of the particle flux and to compare it with the evolution of the bloom. The fluxes obtained at the eddy core from the sediment traps were in agreement with the fluxes derived from the water column during the first stations (from station PS79/91 to 114). However, the differences between both approaches became more significant with time (eddy core re-visits: stations PS79/128 and 140). We will need to investigate in more detail the causes that govern this trend.

Data management

Final data will be submitted to PANGAEA. If you wish to streamline this for the entire cruise report this could be extended as follows:

Data resulting from the geochemical program of the cruise (natural radionuclides, chapter 8) will be submitted to PANGAEA (http://www.pangaea.de/). Within two years of the end of the cruise the data deposited at PANGAEA will be made available to the international scientific community and the general public.

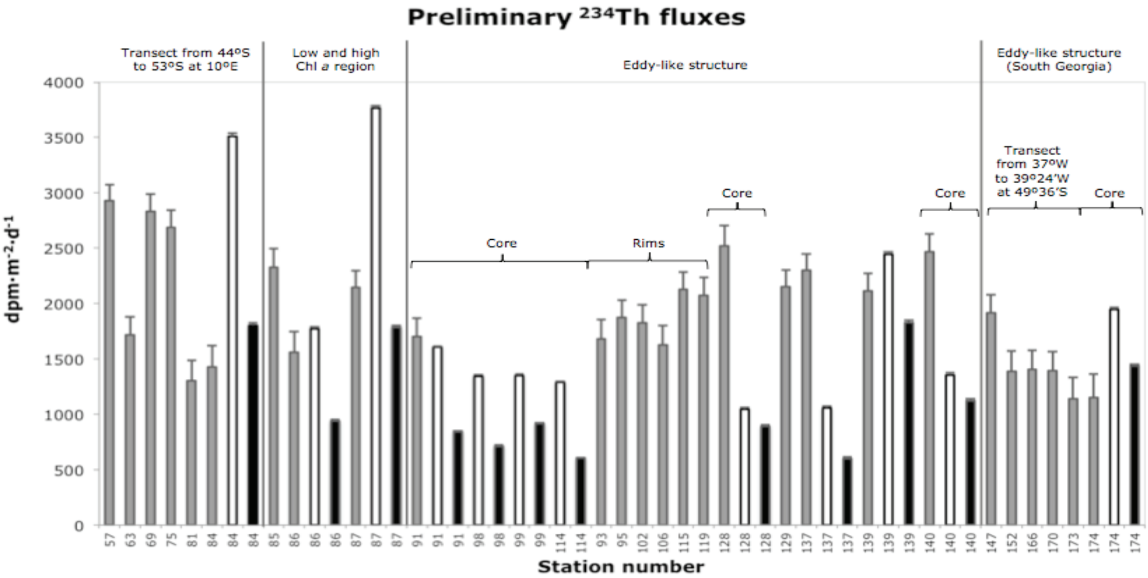

Fig. 1: Preliminary ^{234}Th fluxes derived from the water column at 100 m (grey columns) and fluxes obtained from the sediment traps at 100 or 120 m (white columns) and at 300 or 320 m (black columns), at all the sampled stations.

Fig. 9.1: Preliminary 234Th fluxes derived from the water column at 100m (grey columns) and fluxes obtained from the sediment traps at 100 or 120 m (white columns) and at 300 or 320 m (black columns), at all sampled stations

9.2. Testing the $^{236}U/^{238}U$ ratios as a new conservative and transient tracer in oceanography

Objectives

Uranium-236 is produced basically by neutron capture on ^{235}U. Atmospheric nuclear bomb explosions introduced a large amount of this radionuclide in the environment, thus increasing the natural $^{236}U/^{238}U$ ratio in the ocean from 10^{-12} - 10^{-14} range to a 10^{-9} range (Christl et al. 2011).

Data on ^{236}U in the Atlantic Ocean has only been reported for two profiles, of three depths each one. The results obtained showed a high $^{236}U/^{238}U$ ratio value in the AABW, which might be due to the release of particle-bound ^{236}U from the biologically active surface waters (Christl et al. 2011).

^{236}U might be a new tracer that needs to be further studied. Our goal regarding ^{236}U measurements during this cruise was to obtain more data in order to see if it can be used as a transient tracer in the oceans.

Work at sea

Three profiles, of 8 depths each, were sampled at stations PS79/84, 128 and 174. Samples of 10 l per depth were collected above 2,000 m, while for the deepest samples (one at 2,500 m and another at the bottom depth) the volume collected was 20 l. The samples were stored in 10 l cubitainers and packed to be sent to the Laboratory of Ion Beam Physics (Zurich, Switzerland) in order to be measured using low energy accelerator mass spectrometry (AMS).

Data management

Final data will be submitted to PANGAEA.

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10. BIO-OPTICAL MEASUREMENTS FOR SATELLITE VALIDATION AND RETRIEVAL

Mariana Altenburg-Soppa[1], Wee Cheah[1]
Astrid Bracher[1] (PI) (not on board)
[1]AWI

Objectives

Ocean satellite data is especially useful to investigate polar oceans due to the remoteness of the Polar Regions. Nevertheless, the uncertainty of ocean colour satellite data is still significant, mainly due to the lack of *in-situ* measurements for validation and development of remote sensing algorithms in the Southern Ocean. The objective of this project is to investigate and improve estimates of primary production and the distribution of the major phytoplankton functional groups in the Southern Ocean by using remote sensing technique and *in-situ* observations. Field measurements of phytoplankton pigment and group composition, optical characteristics of phytoplankton, and physiological conditions of phytoplankton were investigated on board *Polarstern* during the nine weeks of the ANT-XXVIII/3 cruise from Cape Town to Punta Arenas (7 Jan – 11 March 2012). Underwater reflectance and light availability that are highly precise and essential input parameters for the satellite retrievals and modelling were also measured.

Work at sea

Water samples

Discrete surface seawaters were collected every 3 hours with a peristaltic pump from ship's moonpool during cruise transect. At CTD stations, water samples from five to six different depths were collected from the CTD/Rosette Niskin Bottle. Collected water samples were then (1) filtered onto GF/F filters for high performance liquid chromatography (HPLC) pigment and particulate absorption (PABS) analyses; (2) measured with a flow cytometer to distinguish particle size and cell number, and also preserved for later analysis in the laboratory at Alfred Wegener Institute for Polar and Marine Research at Bremerhaven, Germany; (3) filtered onto 0.2 μm membrane filter and filtered samples were collected for later analysis of coloured dissolved organic matter (CDOM) fluorescence at AWI.

In-situ optical and fluorescence measurements

(1) A Fast Repetition Rate Fluorometer (FRRF) (Chelsea Technology Group) was used in a flow-through system to provide continuous surface (~10 m) measurement of phytoplankton photosynthetic performance (e.g. Fv/Fm) during the entire cruise; (2) A second FRRF was deployed in the water down to ~140 m during CTD stations to obtain the vertical profiles of phytoplankton photosynthetic performance; (3) A set of three TriOS's RAMSES spectroradiometers were also deployed together

with the FRRF during CTD stations and measured in-water downwelling spectral irradiance and upwelling spectral irradiance and radiance sensors; (4) Total incoming irradiance at sea surface was measured with another TriOS's RAMSES sensor mounted on the helideck during the entire cruise.

The number of CTD casts where water samples from five to six different depths were collected and the number of FRRF/RAMSES casts deployed in this cruise are as below.

Water samples were collected from 62 CTD casts.

A total of 20 FRRF/RAMSES casts were deployed during daytime.

A total six FRRF casts were deployed at night.

Below is the list of parameters that were measured during the cruise and data that will be obtained after the cruise.

Phytoplankton pigment concentration (mg m^{-3})

Phytoplankton cell size and count

Particulate absorption (m^2)

Phytoplankton photosynthetic parameters (e.g. Fv/Fm)

Downwelling irradiance at sea surface, Eo [mW/(m^2 nm)]

Downwelling irradiance in water, Ed [mW/(m^2 nm)]

Upwelling irradiance in water, Eu [mW/(m^2 nm)]

Upwelling radiance in water

Photosynthetic active radiation in water, PAR (μmol quanta/m^2/s)

Preliminary results

Underway FRRF measurements showed high values (>0.5) of maximum photochemical efficiency of photosystem II (Fv/Fm) in water close to South Georgia Island, towards to end of the cruise transect. Fv/Fm represents the potential photochemical efficiency of photosystem II and is interpreted as a diagnostic of the overall health or competence of phytoplankton. Fv/Fm has been shown to response to variations in physical and chemical properties of water, especially iron concentration (Kolber et al., 1994). High Fv/Fm values measured in waters close to South Georgia Island indicate phytoplankton in this region were in good physiological state, probably due to high iron concentration (See in this region compare to other region (Fig. 10.1).

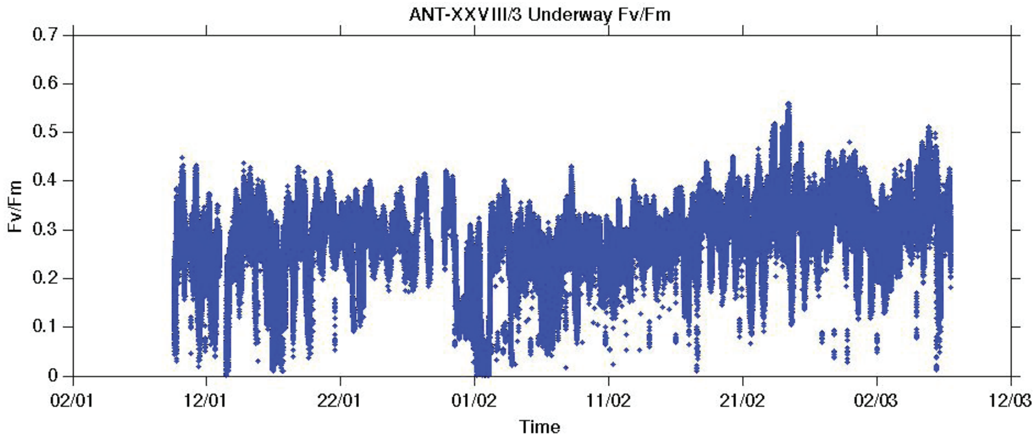

Fig. 10.1: Surface measurements of maximum photochemical efficiency of photosystem II (Fv/Fm) measured during the ANT-XXVIII/3 cruise on board Polarstern

Data management

All data obtained from this cruise will be uploaded to PANGAEA.

References

Kolber ZS, Barber RT, Coale KH, Fiztwater SE, Greene RM, Johnson KS, Lindley S, Falkowski PG (1994). Iron limitation of phytoplankton photosynthesis in the equatorial Pacific Ocean. Nature, 371, 145-149.

11. PLANKTON ASSEMBLAGE COMPOSITION, CHLOROPHYLL *A*, BIOGENIC SILICA, PARTICULATE AND DISSOLVED CARBON AND NITROGEN DETERMINATION

Christine Klaas[1], Fabian Altvater[1], Dorothee Kottmeier[1], Rita Kottmeier[1], Theresa Rueger[1], Vibe Schourup-Kristensen[1]

[1]AWI

Objectives

The Atlantic sector of the Southern Ocean is characterized by two major high productivity areas downstream of the Antarctic Peninsula (along the Scotia Arc and South Georgia) and in the Polar Front region, respectively. The composition of sediment assemblages in these two regions is dominated by distinct key diatom species assemblages: the open ocean *Fragilariopsis kerguelensis* dominating the eastern sector (Polar Front region) and spores of typical coastal species of the genus *Chaetoceros* dominating regions influenced by proximity to land masses. The magnitude and dynamics of iron inputs are thought to drive the differences in dynamics of phytoplankton assemblages and export in these two provinces. However, a quantitative process-based understanding of the link between higher iron availability and plankton community composition and export is still lacking. In this study, we aim to improve our understanding of the processes driving phytoplankton dynamics and sedimentation through field observations of development and decay of natural phytoplankton blooms in the Atlantic sector of the Southern Ocean in the water column. These goals will be accomplished through the study of the whole suite of factors controlling plankton dynamics and export by combining quantitative description of phytoplankton assemblage and dynamics, determination of key species *in-situ* growth rates and determination of composition of sinking assemblage (Iversen and Klaas, this volume).

Work at sea

Duplicate 200 ml water samples for microscopic analyses of protist assemblage (phyto- and protozooplankton) were be obtained from Niskin bottles attached to a Conductivity Temperature Depth (CTD) rosette from 8 discrete depths between 10 and 200 m depth at each station. One set of samples was preserved with hexamine-buffered formalin solution and one with acidic Lugol's iodine at a final concentration of 2% and 10%, respectively. Further, nano- and picoplankton assemblage was determined from analysis of the similar but undisturbed water samples using an ACCURI C6 flow cytometer after staining cells 15 minutes at room temperature with SybrGreen I (Invitrogen, Darmstadt, Germany) prepared freshly by diluting the stock solution from the supplier 1:20 with DMSO, followed by a 1:50 dilution with the sample. For determination of larger particles and protozooplankton, the whole content of two Niskin bottles (24 l) were sampled at 12 depths, between 10 and 3,000 m and concentrated down to 50 ml by pouring the water gently through a 10 μm mesh net and fixed with 2% buffered formalin. Fixed samples were stored at 4°C in the dark until counting back in the home laboratory. Species-specific growth rates of diatoms will be estimated from 24 hours on-deck incubation of undisturbed surface (10 m depth) water samples collected from the Niskin bottles attached to the CTD rosette after staining with the fluorochrome PDMPO that binds to the newly deposited silica during cell division. The difference between *in-situ* growth rates determined with the PDMPO technique and the actual accumulation rates of individual species populations during Eddy Pump will allow a quantitative estimate of the loss rates acting on individual species populations.

Water samples for Chlorophyll *a* (Chl*a*), biogenic silica (BSi), particulate and dissolved organic carbon and nitrogen (POC, PON, DOC and DON) determination were obtained from the same bottle and depth as for microscopic analysis. In addition, underway surface-samples for Chl*a* analysis were collected at hourly to 30 min intervals from the ship's pump. Further, larger volumes were collected at depths ranging from 500 to 3,000 m depth for POC analysis in order to calibrate the signal from the CTD-rosette transmissometer.

Chl*a* samples were filtered onto 25 mm diameter GF/F filters at pressures not exceeding 200 mbar. Filters were immediately transferred to centrifuge tubes with 10 ml 90% acetone and 1 cm^3 of glass beads. The tubes were sealed and stored at –20°C for at least 30 min and up to 24 hours. Chl*a* was extracted by placing the centrifuge tubes in a grinder for 3 min followed by centrifugation at 0°C. The supernatant was poured in quartz tubes and measured for Chl*a* content in a Turner 10-AU fluorometer. Calibration of the fluorometer was carried out at the beginning and at the end of the cruise. Results of the fluorometer calibration diverged by 2% between beginning and end of the cruise. Chl*a* content was calculated using the equation given in Knap et al. (1996) using average parameter values from the two calibrations.

1 to 2 liters seawater samples for BSi were filtered onto 25 mm diameter polycarbonate filters and stored in plastic (PE) petri dishes. For samples between the 10 and 200 m depth, a similar volume was filtered onto pre-combusted GFF filters and stored in pre-combusted glass petri dishes for POC and PON analysis. For deeper samples, 12 l seawater samples were filtered onto 25 mm diameter pre-combusted GFF filters for POC and PON analysis. After filtration filters were dried overnight at 50°C and stored frozen (-20°C) for further analysis on land.

About 60 ml samples for DOC and DON analysis were filtered onto 25 mm diameter pre-combusted GFF filters using a HCl-cleaned glass filtration unit. The procedure was repeated 3 times in order to rinse the vials and the filtration unit, keeping the last filtrate for analysis. The final filtrate was collected directly into HCl-rinsed plastic (HDPE) bottles and frozen (-20°C) for further analysis on land.

Preliminary results

Horizontal distribution of Chl*a* measured on board during the cruise is given in Fig. 11.1. The study focused on two regions of high phytoplankton abundance centred at around 52°12' S and 12°40' W and in the South Georgia basin (inserts in Fig. 11.1). In the first region, needle shaped diatoms (*Pseudonitzschia* spp. and *Thalassiothrix antarctica*) seemed to dominate phytoplankton standing stocks (Fig. 11.2). During the experiment a decrease in Chl*a* concentrations was observed starting northwest of the study area and progressing to the southeast. Temporal evolution of Chl*a* at 52°12' S and 12°40' W is given in Fig. 11.3. During the experiment a decrease in Chl*a* concentrations was observed (Fig. 11.3) starting northwest of the study area and progressing to the southeast while main currents in the area flowed in a northeastward direction. This was indicating that the observed decrease in Chl*a* was due to a sinking event.

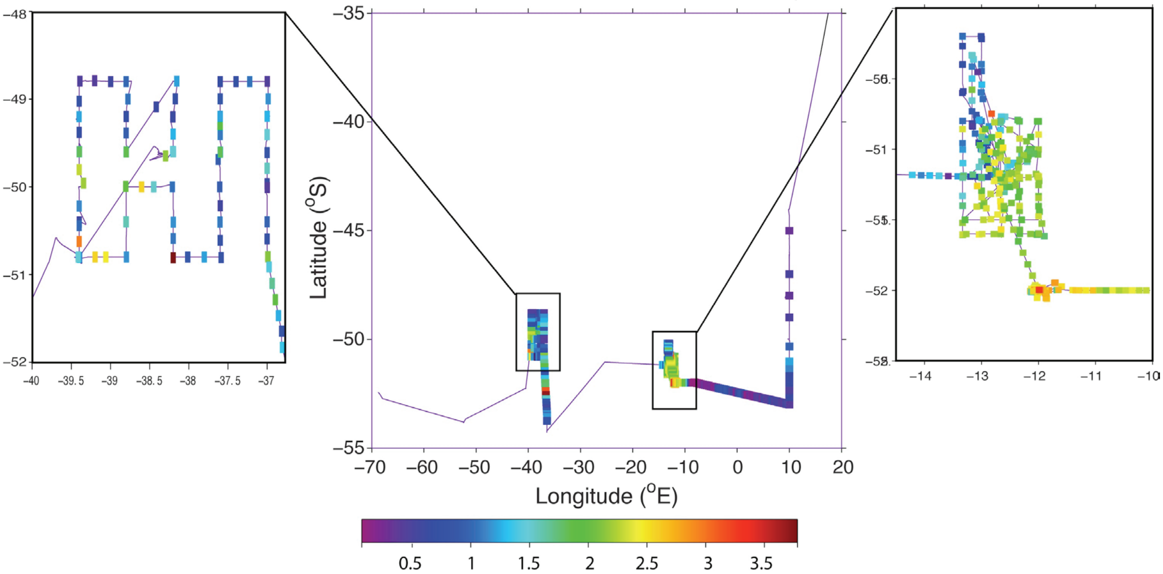

Fig. 11.1: Surface (8-10 m depth) Chl a concentrations in µg L^{-1} during ANT-XXVIII/3 (middle panel). Left and right panel illustrate the two main study areas visited during the cruise.

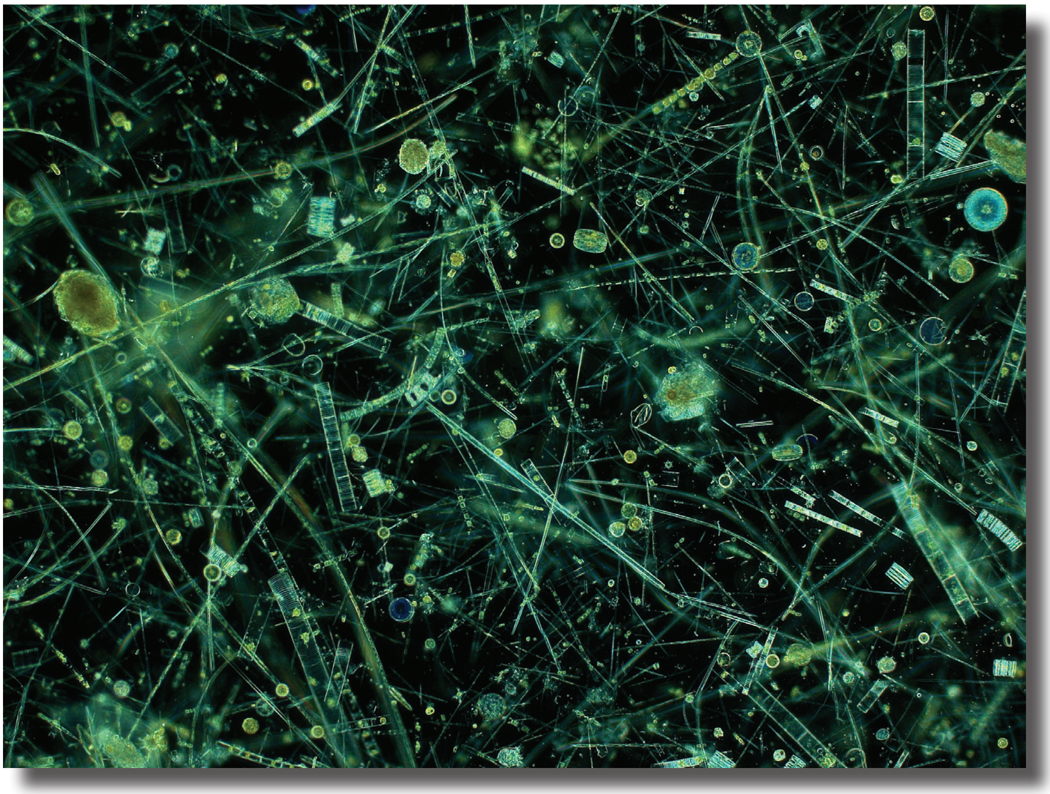

Fig. 11.2: Phytoplankton assemblage at 52°12' S and 12°40' W. Photograph taken at 10x magnification from a 20 µm mesh net surface sample.

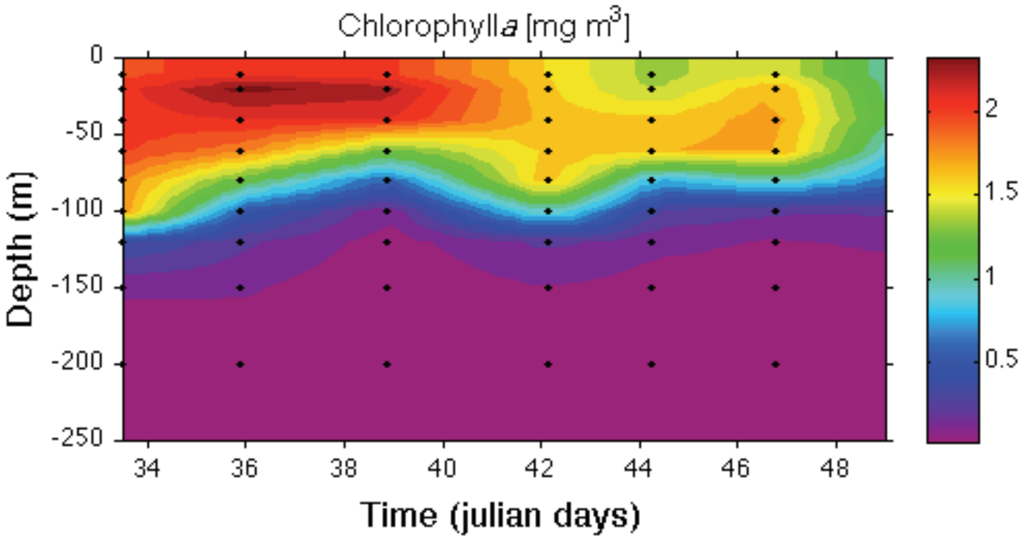

Fig.11.3: Temporal evolution of Chla at the core station (52°12' S and 12°40' W)

Data management

Data collected during the cruise will be copied to the data centre WDC-MARE/ PANGAEA (http://www.pangaea.de/) after post-cruise calibration and validation. Within two years of the end of the cruise the data deposited at PANGAEA will be made available to the international scientific community and the general public. Processed data obtained through laboratory analyses after the cruise will be uploaded to the database PANGAEA. It is expected that all data will be made available to the international scientific community three years after the cruise

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12. *SALPA THOMPSONI* BIOLOGY: DENSITY, POPULATION STRUCTURE AND GRAZING

Evgeny Pakhomov[1] UBC
Brian Hunt[1]

Objectives

Salps are abundant metazoans in the mid-Antarctic latitudes and appeared to be among the most important groups in the RMT-8+1 samples during ANT-XXVIII/3 (Hunt et al., this volume). Salps were almost exclusively represented by a single species, *Salpa thompsoni*. This species is known to undertake an explosive development (salp blooms) outcompeting other zooplankton species and contributing significantly to vertical carbon flux. During the cruise, we had a unique opportunity to sample this species in four areas that were separated longitudinally and had variable and at times contrasting productivity regimes. The main objective of this work was to characterize the population structure of *S. thompsoni*, describe general distribution patterns and provide preliminary measurements of its ingestion, egestion and growth rates.

Work at sea

Salps were sampled using the midwater rectangular trawl (RMT-8+1; 37 deployments) in the top 300 m water layer mainly during darkness. Salps were counted, sexed and measured from 1/8 to 1/16 sub-samples. Gut fluorescence was measured after extraction of the stomach content in 90 % acetone for 48 hours. Fecal pellet production was measured during the *in-situ* (immediately after catch) and *in-vitro* (on board incubation) experiments. The total amount of fecal pellets was counted and divided by the number of incubated individuals and duration of the experiment to obtain hourly fecal pellet production. Pigment content of pellets was measured after the extraction in 90 % acetone over 24-36 hours using Turner Design fluorometer.

Preliminary and expected results

Spatial distribution and standing stock

S. thompsoni were sampled in every station south of 46°S and were most numerous south of the Polar Front, in the region between 49° and 53°S, where its biomass generally ranged between 0.05 and 0.3 g WW.m^{-3}. Overall salps were identified as the most important group in terms of wet weight in the majority of RMT samples, followed by crustaceans (*Euphausia triacantha* (eastern stations), *E. vallentini* (mainly western stations) and *Themisto gaudichaudii*). There were two regions with exceptionally high salp catches. The first region ("Salpastan") was confined to waters with very low chlorophyll concentrations (ca. 0.1 mg.m^{-3}) at 52°S and 8°W.

The second, at 50°S and 37°W, was characterized by relatively high Chl*a* biomass (~ 1 mg.m^{-3}). On these occasions salp biomass reached 2.15 g WW.m^{-3} and 2.5 g WW.m^{-3}, respectively.

Salp biology

Salps were represented in samples mainly by small sized (OAL 10-25 mm) individuals in all regions (Fig. 12.1). Further analysis will be carried out to investigate in detailed biological differences between salp populations, including their stage development. From very preliminary data, it appears that despite young aggregate forms dominating, salp populations were overall at a variable state of development with either significant amount of males (size classes between 35 and 55 mm) or large number of solitary forms present in the catches (Fig. 12.1).

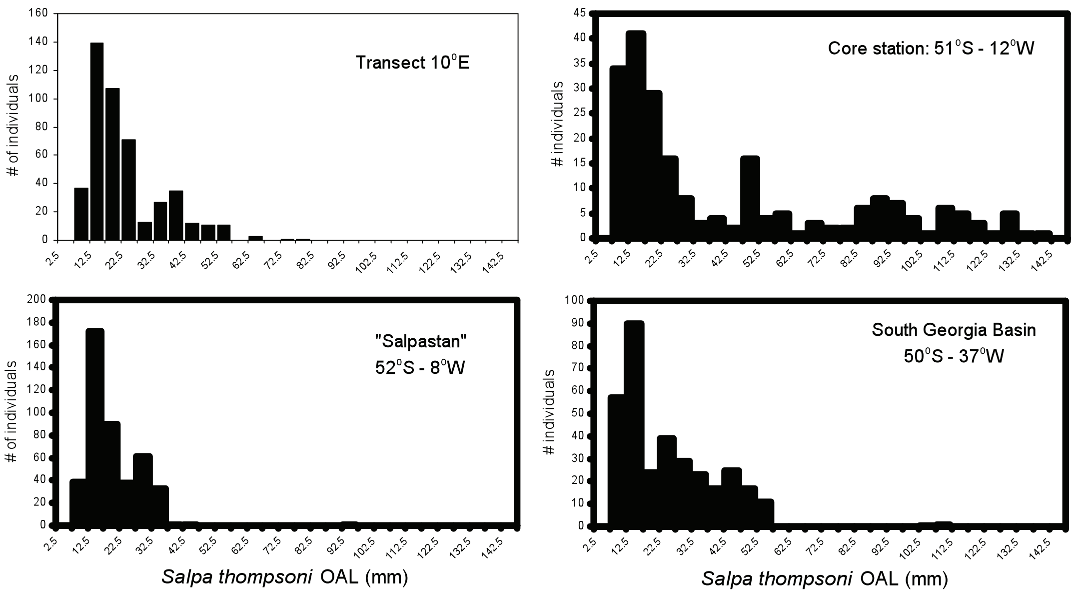

Fig. 12.1: Size frequency distribution of Salpa thompsoni populations in four main sampling areas

The aggregate to solitary ratios ranged widely and was the lowest at the Core Station at 12°W. Here we had opportunity to follow the salp population for almost two weeks (Fig. 12.2). The aggregate to solitary ratio generally followed an increasing trend, which in combination with the proportion of solitaries with chains ready for the release, is indicative of spawning occurring in the sampling area. Nevertheless, the salp biovolume was variable and a significant increase in the salp population density did not occurred. At the same time, *T. gaudichaudii* density roughly tripled (Fig. 12.2). It is possible that *Themisto* could act as a predator on young salp aggregates. This will be further investigated using stable isotopes and stomach content analysis of *T. gaudichaudii*.

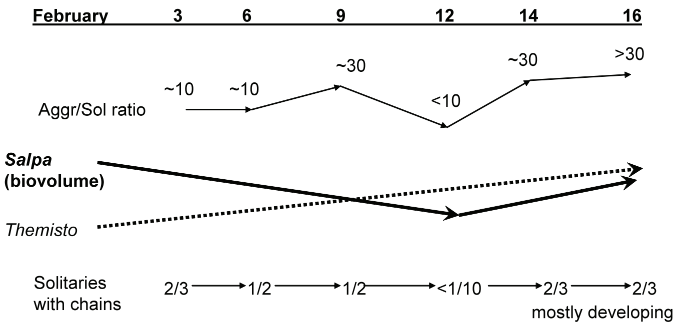

Fig. 12.2: Summary of salp biology at core station (51°S – 12°W) during February 3-16, 2012

Feeding dynamics and growth

The feeding intensity of *S. thompsoni* measured as pigment content was high at every station except "Salpastan" (Fig. 12.3A). It appeared that very low Chl*a* concentrations at the Salpastan affected the feeding activity of salps. In all other station, although Chl*a* concentrations ranged between 0.5 and 3 mg m^{-3}, no significant differences in salp gut pigment contents was found. The high variability in gut pigments, up to one order of magnitude, was found for both aggregates classified as males and solitary forms of *S. thompsoni* (Fig. 12.3A and B).

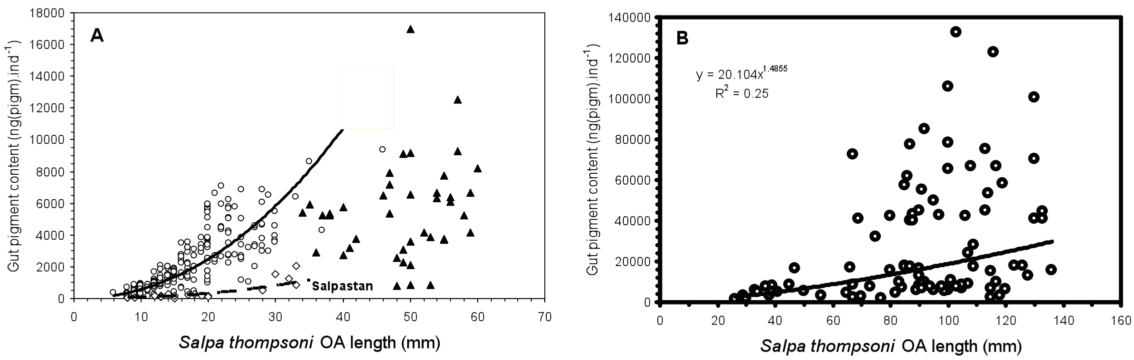

Fig. 12.3. Gut pigment content of Salpa thompsoni aggregates (A) and solitaries (B) during ANT-XXVIII/3. A: open diamonds – aggregates at Salpastan; open circles – aggregates on any other station (10°E, 12°W and 37°W); solid triangles – aggregates classified as males.

Previous studies found that there is insignificant diel variability in salp pigment content (Pakhomov, 2004). This allows rough calculations of salp daily ingestion rates, using the equation I = G x 24 x k, where I is ingestion rate (ng(pig).$ind^{-1}day^{-1}$), G is mean daily gut pigment content (ng(pig).ind^{-1}), and k is gut evacuation rate constant (taken from Pakhomov, 2004). Combining daily ingestion rates with salp size structure at each station, the preliminary grazing impact was estimated. It was the function of the both salp abundance and Chl*a* standing stock. Generally, grazing impacts were <1% of Chl*a* standing stock. The highest grazing impact was found at the Salpastan, where salp standing stock was estimated to be 441 in.m^{-2}. This translated to a population grazing impact equal to 1.3.mg Chl*a*.m^{-2}, or ≈ 6.3%

of Chl*a* standing stock, which is at the higher end of values reported to date for this species (Pakhomov et al., 2002, Pakhomov, 2004).

Preliminary results on fecal pellet (FP) pigment composition of *S. thompsoni* show that FP pigment content increased with salp length, averaging 108, 285 and 385 ng(pig).pellet^{-1} in 20-25 mm, 30-35 mm and 80 mm long salps, respectively (Fig. 12.4A). Due to high variability in fecal pigment content of in vitro produced pellets, there were no significant differences between fecal pellet contents of freshly produced pellets and pellets produced during in vitro experiments. This despite the mean values of fresh pellets being 2 to 3 fold lower pigment content (Fig. 12.4A).

Fecal pellet production clearly decreased with the salp length (Fig. 12.4B) and was within the range previously reported (0.03-1.5 pellet.ind^{-1}hour^{-1}) for *S. thompsoni* in the Lazarev and Bellinghausen Sea as well as in the vicinity of Antarctic Peninsula (Pakhomov, 2004, Pakhomov et al., 2006, Phillips et al., 2009)

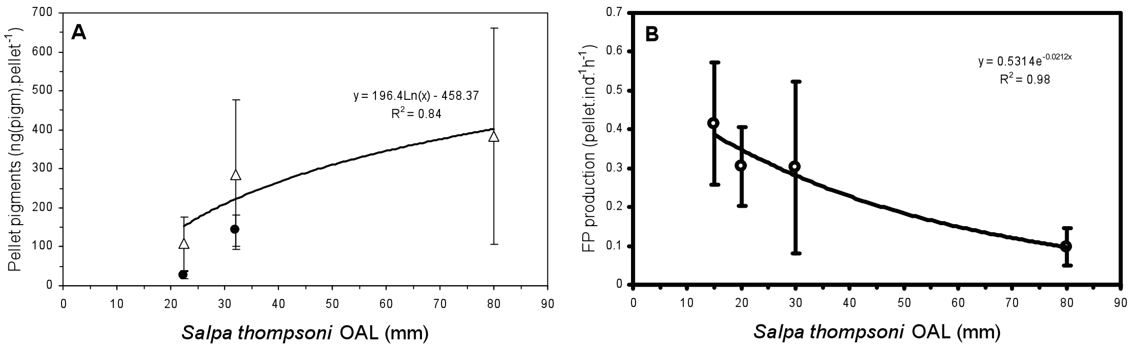

Fig. 12.4: Fecal pellet pigment content (A) and production (B) of Salpa thompsoni during ANT-XXVIII/3

Preliminary flux calculations (salps only) could be done by combining average salp abundance (assumed ~ 20 ind m^{-2} at the core station at 12°W). If we assume that all pellets sink out of the euphotic zone, mean fecal pellet production is ~7 pellets ind^{-1}d^{-1} (Fig. 12.4B), the mean fecal pellet content is ~200 ng(pig).pellet^{-1} and a Chla/C ratio of 200, the potential flux would be ~ 140 pellets.m^{-2}day^{-1}, ~ 1300 ng(pig).m^{-2}day^{-1} or ~ 5.8 mgC.m^{-2}day^{-1}. This could latter be compared to the sediment trap results.

During the core station at 12°W, there was opportunity to repeatedly sample the *S. thompsoni* population and obtain data that could be used to calculate the in situ growth rates by following a particular cohort of animals(Fig. 12.5). The main assumption for these measurementsis that the same population (or population at the same development state) was sampled. The smallest cohort (ca 7-15 mm) appeared to grow approximately 0.6 mm.day^{-1} (Fig. 12.5). The only previous in situ growth rates for *S. thompsoni* range from 0.23 mm.day^{-1} for solitariesand 0.4 mm.day^{-1} for 20-30 mm aggregates (Loeb et al., 2012).

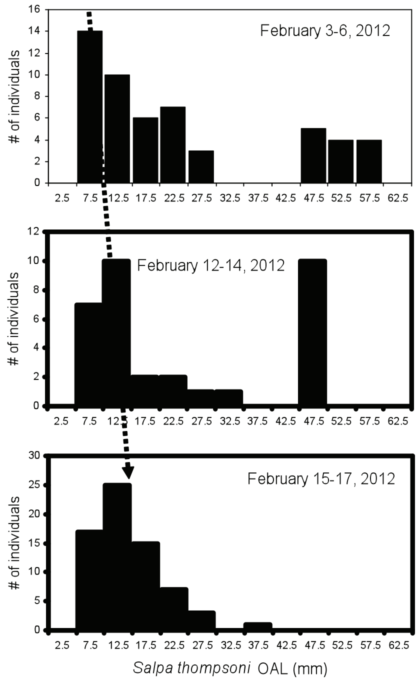

Fig. 12.5: Length frequency distribution of Salpa thompsoni during the Core Station. At 51°S and 12°W between February 3 and 17, 2012.

Conclusions

Population development of *Salpa thompsoni* appeared to be different regionally and requires further investigation to explain these patterns.

Physiological rates (gut pigments, ingestion, egestion, growth) of *Salpa thompsoni* appeared to be within the ranges of previously measured rates in different parts of the Southern Ocean.

Possible predatory control of the salp population development requires further investigation.

Data management

All data obtained will be prepared for publication and will be made available via PANGEA.

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13. ZOOPLANKTON AND PARTICULATE ORGANIC MATTER (POM): COMMUNITY, SIZE STRUCTURE AND STABLE ISOTOPE COMPOSTION

B.P.V. Hunt[1], E.A. Pakhomov[1], Heike Simon[2]

[1]UBC
[2]AWI

Objectives

Zooplankton community structure – spatial variation of zooplankton communities and their relationship to phytoplankton

Size structure of zooplankton – biomass distribution and food chain length

Work at sea

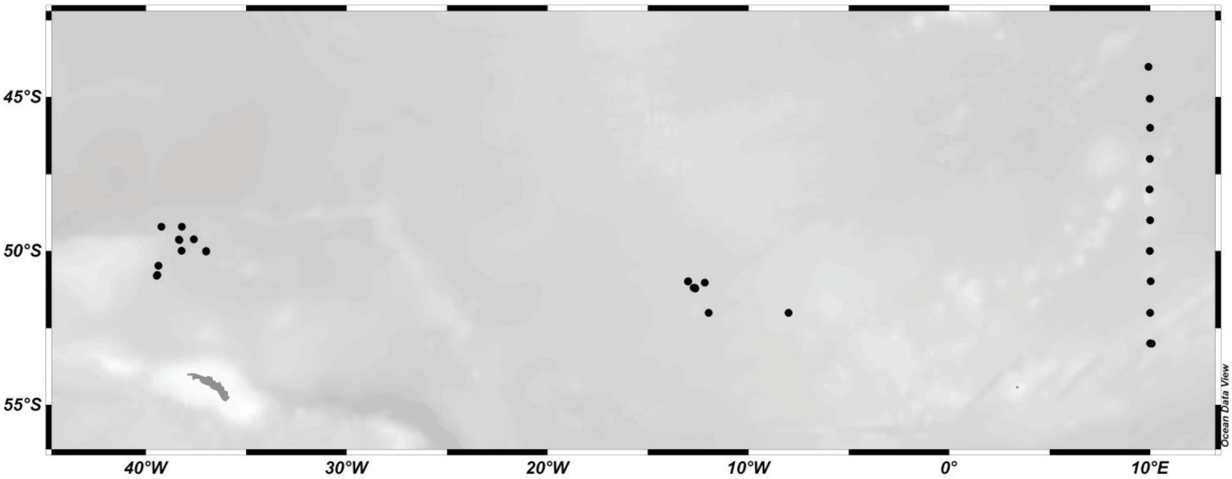

Fig. 13.1. Location of RMT sampling stations during ANT-XXVIII/3

The zooplankton community was sampled through a combination of nets, providing quantitative coverage of microzooplankton (handnet; 26 deployments), mesozooplankton (RMT1) and macrozooplankton/micronekton (RMT8) communities. A total of 36 RMT's were completed (Fig. 13.1). The bulk of these (29) were conducted at night as double oblique tows through the upper 250 m of the water column. Two daytime RMTs were conducted over the same depth range to provide data on diel migration, and an additional 5 mesopelagic tows were completed to a minimum of 1,000 m depth. Handnets were completed at all RMT stations, weather permitting, with some additional deployments at other stations of interest. In addition to the RMT and handnets, 14 multi-net deployments were completed, sampling five depth strata between either 1,500-0m, or 1,000-0m.

Deployments were made during both day and night in all of the three key sample areas, providing data on diel migration and depth distributions of mesozooplankton. *Ad hoc* bongo nets (10 deployments) were also completed, primarily to collect live salp specimens for faecal pellet production experiments.

Tab. 13.1: Summary of community, biomass and stable isotope data collected under the zooplankton program during ANT-XXVIII-3.

Sample type	**Gear**	**No. of stations**	**Mesh size (μm)**	**Sampling depth (m)**	**Community composition**	**Size fractions (biomass,** $\delta^{13}C$; $\delta^{15}N$)
Zooplankton	RMT1+8	37	300/ 4,500	250	Yes	Yes
Zooplankton	Hand-net	26	64	50	Yes	Yes
Zooplankton	Multinet	14	150	1,000	Yes	No
Zooplankton	Bongo	10	100/500	200	Yes	No
Particulate organic matter (POM)	Niskin	42	NA	0 m; Chl max	No	Yes

Sample processing was primarily aimed at the four objectives outlined above. For later analysis of community composition, a fraction of the sample from each net was preserved in a buffered 4 % seawater/formaldehyde solution. Size-structured sample processing proceeded by first washing the sample fraction through a column of sieves with the following mesh sizes (dependent on the mesh size of the net used): 64, 125, 250, 500, 1,000, 2,000 and 4,000 μm. The entire content of each size fraction was oven dried at 50°C for a minimum of 24 hours. The zooplankton from the 4000µm size fraction were identified to species level and measured, and the size classes of each species dried separately. Dried samples were packaged for transport to the University of British Columbia where each size fraction / species size class will be weighed and $\delta^{13}C$ and $\delta^{15}N$ measured.

POM was collected at 42 stations to provide the lower size fractions (0.7 to 64 μm) of the biomass and stable isotope size spectra. Samples were collected using a combination of surface bucket and Niskin bottle from the chlorophyll maximum. Due to the maximum 12 litre water volume available from the chlorophyll maximum, size fractionation was limited to the < or > 64 μm size classes. Unlimited surface water enabled more detailed size fractionation, using the following size classes: 64 to 20 μm, 20 to 2 μm, and 2 to 0.7 μm. All size fractions were filtered onto pre-combusted GF/F filters and dried for later analysis.

Additional data collections:

Salpa thompsoni - Grazing impact and contribution to vertical flux

Biochemistry - *Euphausia superba*, *Themisto gaudichaudii* and *Salpa thompsoni* specimens were collected biochemical analysis in collaboration with Dr Bettina Meyer at the AWI.

Polonium-210 – Phytoplankton, mesozooplankton size fractions, and key macrozooplankton and micronekton were collected across 3 stations in the Georgia Basin by Viena Puigcorbé and Muntsa Roca, to measure ^{210}Po accumulation in Southern Ocean zooplankton.

Domoic acid – Samples of key zooplankton species (amphipods, euphausiids and salps) were collected at PS79-136 and 140 for domoic acid analysis by Scarlett Trimborn and Clara Hoppe.

Genetics – Collections of the two forms of *Themisto gaudichaudii* (*bispinosa* and *compressa*) were made to resolve their taxonomic status through genetic analysis.

Preliminary and expected results

Three sampling areas were covered. The first of these, the 10°E transect between 44 and 53°S, spanned the sub-Antarctic Zone (SAZ), Polar Frontal Zone (PFZ) and Antarctic Zone (Fig. 13.2). Analysis of samples from this transect will provide insights into community biogeography, as well as physico-chemical effects on community size structure and trophic interactions. Preliminary results from the RMT8 showed a strong division between samples collected north and south of the northern Polar Front (nPF), most clearly evident is the high contribution of salps (the species *Salpa thompsoni*) south of this front. A feature of the 10°E transect was a warm core eddy at 46°S. The occurrence of sub-tropical zooplankton, notably the copepod *Sapphirina* sp. and the salp *Pegea coenfederata*, reflected the origins of this eddy.

The three zones sampled during ANT-XXVIII/3 provide a unique opportunity to analyse longitudinal variation in zooplankton community composition and size structure within the Polar Frontal Zone. Furthermore, the between zone variation in phytoplankton biomass and composition will be used to investigate the impact of lower trophic level dynamics on zooplankton community composition, size structure and food web inter-actions. Observations from the voyage were that the macro-zooplankton species composition was similar between the three sampling zones, being dominated by *Salpa thompsoni*, the amphipod *Themisto gaudichaudii*, and euphausiids (*Euphausia vallentini*, *E. triacantha*, *Thysanoessa macrura*).

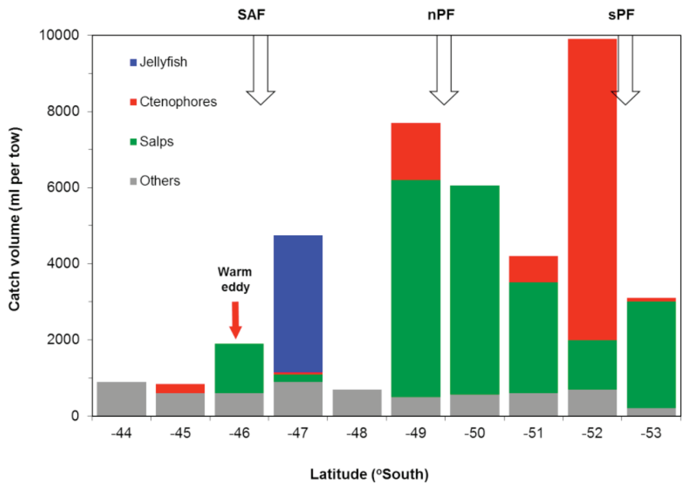

Fig. 13.2 Macrozooplankton community composition in RMT8 samples collected from Zone 1, a transect along 10°E. SAF – Sub-Antarctic Front; nPF and sPF – north and south Polar Front

Euphausia superba was not recorded in the eastern most zone, but increased in occurrence westwards, reaching a peak in the Georgia Basin, north of South Georgia. The proportional contribution to biomass of the species mentioned above was highly variable and was most strongly characterised by an alternation in dominance of *S. thompsoni* and *T. gaudichaudii*.

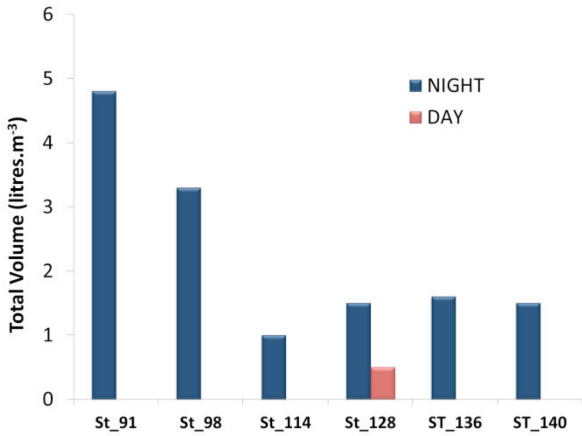

Fig. 13.3 Total volume of macrozooplankton collected at the eddy core of between 3 and 16 February

The two-week occupation of the eddy core in zone 2 (51°S and 10°W) provided the opportunity to monitor the temporal development of the zooplankton community in a high chlorophyll biomass environment. After our first occupation of the core station on 3 February we observed a decline in *S. thompsoni* (and total macrozooplankton) biomass which was associated with an increase in the contribution of the *T. gaudichaudii* (Fig.13.3). The apparent negative correlation between these two species suggested that the latter was preying on *S. thompsoni*. Additional *T. gaudichaudii* were collected to validate this through a combination of gut content and DNA analysis.

Data management

All data obtained will be prepared for publication and will be made available via PANGEA.

14. CONTROLS ON THE VERTICAL FLUXES OF THE SOUTHERN OCEAN

Morten Hvitfeldt Iversen[1] — [1] MARUM
Christine Klaas[2] — [2] AWI

Objectives

Sedimentation of marine snow, together with fecal pellets, produced by herbivorous zooplankton organisms, drives the export of organic matter from the surface to the deep ocean (Fowler and Knauer 1986). The transport of surface produced organic carbon to the deep ocean is termed ´the biological pump´ (Volk and Hoffert 1985). The Atlantic sector of the Southern Ocean has two areas with high productivity, downstream of the Antarctic Peninsula and in the Polar Front region. These two regions show differences in phytoplankton composition and dynamics, which may result in different efficiencies of the biological pump between the regions. Downstream of the Antarctic Peninsula the dominating diatom species is *Chaetoceros* spp. while the Polar Front region is dominated by *Fragilariopsis kerguelensis*. Benthic measurements of oxygen concentrations have indicated that both areas have high carbon fluxes to the sea floor (Sachs et al. 2009). However, the magnitude, variability, and composition of the carbon fluxes differ between the areas with constant high carbon fluxes downstream of the Antarctic Peninsula and more sporadic and overall lower carbon fluxes in the Polar Front (Abelmann et al. 2006, Sachs et al. 2009). The Polar Front region has high opal fluxes and accumulation rates in the sediment despite the sporadic carbon fluxes. This might suggest a decoupling between organic carbon and opal export supporting previous analysis of a global sediment trap data set showing low efficiency of organic carbon export in systems dominated by opal fluxes (Klaas and Archer 2002). However, this pattern seems only to apply to Polar Front region with fluxes dominated by large thick-shelled diatoms, while the region downstream of the Antarctic Peninsula have high organic carbon fluxes dominated by small resting spores from *Chaetoceros* spp.

The objectives are to investigate the driving factors leading to the different flux patterns in the two regions, by capturing the export fluxes at two depths in the upper ocean and relate chemical fluxes to settling particle types and phytoplankton composition.

Work at sea

Export fluxes were collected by free drifting cylindrical sediment traps deployed simultaneously at the base of the mixed layer (at 100 m) and at 300 m depth. At each depth an array of four cylindrical traps were deployed whereby samples from three tubes cylinders were used for biogeochemistry (particulate carbon, nitrogen, biogenic opal, calcium carbonate and lithogenic material). Further, sample aliquots from one of these cylinders, were stored for analysis using epifluorescence microscopy to identify the plankton composition and filtered for DNA extraction, respectively. The fourth cylindrical trap at each depth was equipped with polyacrylamide gel allowing preservation of sinking material in its original shape. Gels were processed on board using stereomicroscopy and digital camera to identify the different particle types (faecal pellet, marine snow aggregates, individual cells, etc.).

The combination of deployments at the base of the mixed layer will provide quantitative and qualitative information on the origin of sinking particles and processes leading to the export of organic matter and biogenic silica from the euphotic zone. At 300 m depth deployments will provide an estimation of the magnitude of flux in the deeper layers (> 300 m) as well as main processes leading to flux attenuation and particle transformation that occur primarily in the upper 200 m of the water column.

Direct measurements of size-specific sinking speed and microbial respiration on different particle types (marine snow aggregates and salp faecel pellets) were performed in the laboratory using a flow chamber and oxygen microsensors. Water samples from stations PS79/64 and 142 taken at the depth of maximum fluorescence was incubated to form marine snow aggregates using roller tanks.

Sediment traps were deployed at stations PS79/84, 86, 87, 91, 98, 100, 114, 128, 136, 137, 139, 140, and 174.

In addition to short-term surface traps a long-term (1 year) mooring was deployed in the Georgia Basin (Fig. 14.3) in order to study seasonality in the composition and magnitude of fluxes to the deep ocean in an area that is naturally fertilized by iron supply from the shelves around South Georgia.

Preliminary results

Fig. 14.1 shows the collected material for one of the upper (100 m) and the lower (300 m) trap cylinders from four different deployments. The small difference in the amount of material collected at 100 and 300 m indicates that a large part of the particles settled to deeper layers and degradation of settling material was rather low during our study.

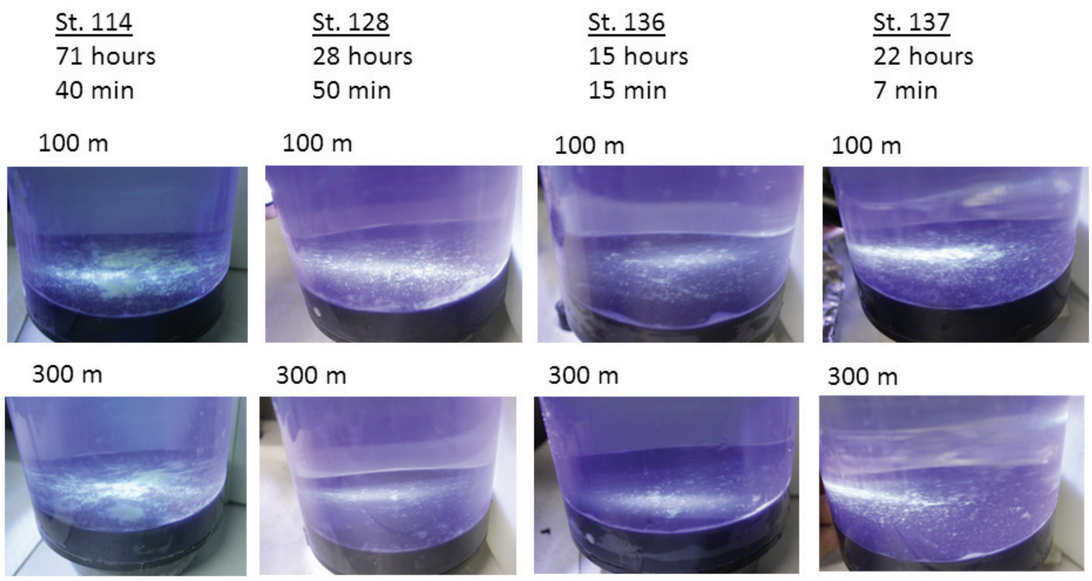

Fig. 14.1: Photographs of sediment trap cylinders with collected material from 100 and 300 m depths at four different stations. Station number, duration and depth of trap cylinder are indicated for each deployment above the photographs.

From material preserved within the gel traps different particle types could be identified. Fecal pellets seemed to dominate fluxes at the peak of the bloom while marine snow became more abundant as the chlorophyll *a* concentrations in the surface layers decreased. The dominant faecal pellet types differed between stations but consisted mainly either krill or salp pellets. The seemingly high fluxes at 300 m depth could be explained by the dominance of fecal pellets in the settling material, since our onboard measurements showed high sinking speeds of salp pellets reaching 900 m d^{-1} for very large pellets (see Fig. 14.2). However, sinking speeds of a few hundreds meter per day may be more realistic for *in-situ* settling velocity of salp pellets. Observations of salp pellets showed two different types of pellets: - one solid and seemingly fresh pellet type with high sinking speeds - a more loose and possibly partly degraded pellet type with low sinking speeds (see Fig. 14.2). The loose salp pellets resembled marine snow aggregates in appearance and sinking speed which averaged around 100 m d^{-1} similar to values measured for marine snow aggregates formed in the roller tank incubations (data not shown).

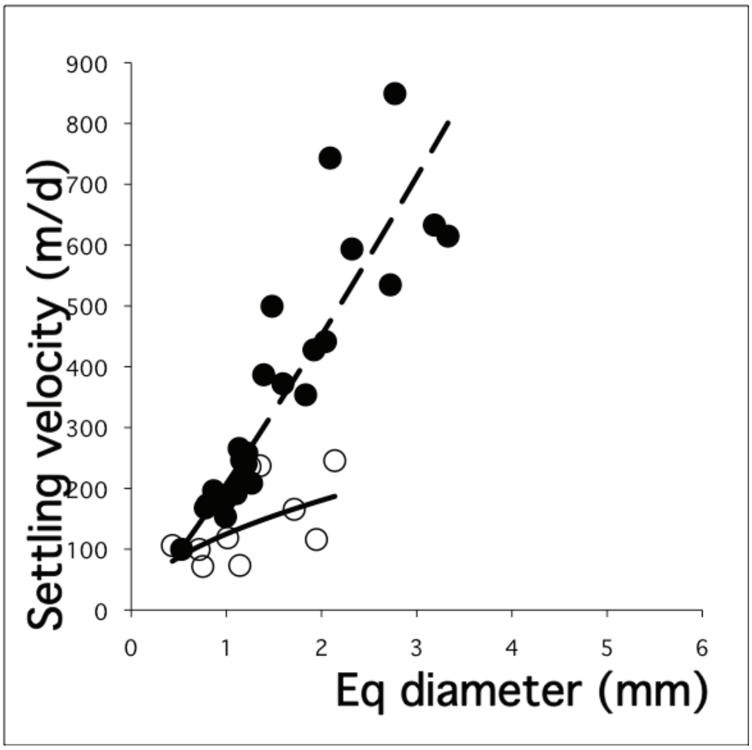

*Fig. 14.2: Sinking speed of salp fecal pellets plotted over the equivalent spherical diameter (ESD). Two different pellet types were distinguished, solid freshly produced pellets (closed circles) and loose and possible partly degraded pellets (open circles). The regression for the solid pellets is: sinking speed = 207 * $ESD^{1.12}$, R^2 = 0.88 and for the loose pellet it is: sinking speed = 125 * $ESD^{0.53}$, R^2 = 0.31.*

Data management

Data collected during this cruise will be deposited in PANGAEA.

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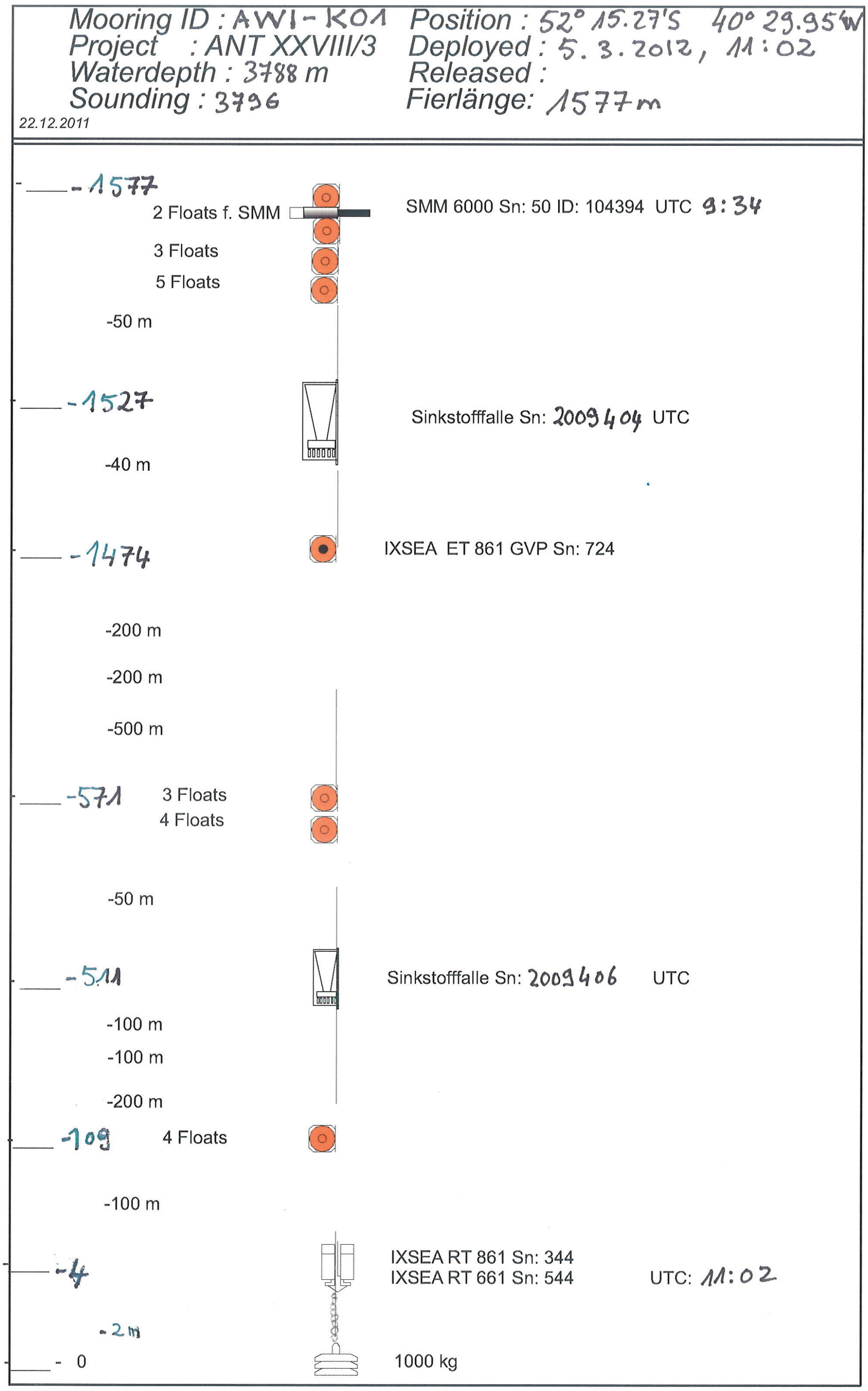

Fig. 14.3: Long-term (1 year) mooring deployed in the Georgia Basin

SYSTCO II

The scientific approach of SYSTCO II is based on the first venture and aims to pursue the international and interdisciplinary investigations of the seafloor which had started during ANDEEP-SYSTCO I in 2007/2008 in the Southern Ocean deep sea. The research area included those stations that were sampled during the "Eddy Pump" project.

SYSTCO builds on the close cooperation of scientists from different disciplines, such as physical oceanography, planktology, biogeochemistry, sedimentology, and bathymetry with benthologist concentrating on various aspects to shed light on atmospheric-pelagic-benthic coupling processes. This has already been performed with remarkable success on the SYSTCO I cruise.

Our contribution to SYSTCO II focussed on three aspects:

Diversity, distribution and abundance of deep-sea organisms from meiofaunal foraminifera to megafaunal organisms in relation to surface water productivity and sedimentation of organic material to the seafloor.

Ecology of deep-sea fauna with regard to coupling processes utilizing different approaches, like traditional and molecular gut content analyses as well as biochemical investigations (fatty acid profiles and stable isotope C and N ratios).

DNA preservation in the water column and the deep-sea sediments and its possible use to study the eukaryotes diversity in the present and the past.

Data management

Unless stated differently in the respective chapters, all SYSTCO II contributions are subject to the same data management. Metadata of SYSTCO-II can be provided for PANGAEA, however, after final determination and publication of the data, species data will be made available to the public via SCAR-MarBIN (SCAR-Marine Biodiversity Information Network), GBIF or EurOBIS like during previous expeditions, such as SYSTCO or ANDEEP or to the new Antarctic subproject of GBIF (Global Biodiversity Information Facility), ANTABIF (Antarctic Biodiversity Information Facility). Furthermore, all Antarctic species published are reported to Register of Antarctic Marine Species (RAMS). Genetic sequences are standardly submitted to the Genebank.

15. FORAMINIFERA OF THE DEEP SOUTHERN OCEAN: MUC DEPLOYMENTS

Tomas Cedhagen[1]	[1]UA
Freija Hauquier[2]	[2]UGent
Katharina Jörger[3]	[3]ZSM
Franck Lejzerowicz[4]	[4]DGE Geneva
Sandor Mulsow[5]	[5]LEET-UACH
Laura Würzberg[6]	[6]ZMH
Ann-Christine Zinkann[6]	

Objectives

Sampling of deep-sea sediments was carried out with a multicorer (MUC) to retrieve virtually undisturbed sediment cores. Cores were then divided between the different working groups for further processing and analyses. A variety of purposes were assigned to the different MUC cores, including determination of sedimentary properties, biochemical analyses, and faunal community analyses (mainly meiofauna, i.e. Foraminifera and Nematoda). For more details on the different uses of the cores, see contributions of the different authors.

Work at sea

During ANT-XXVIII/3, different multicorers were used. Due to problems in the first weeks of the cruise with the larger multicorer (approx. 10 cm diameter cores, 8 cores mounted on frame), we shifted to the "little" MUC during the first larger station. This smaller MUC fits 12 tubes, each with a diameter of approximately 6 cm (inner diameter of 5.7 cm, corresponding to approximately 25.5 cm² cross-sectional surface area). Table 15.1. gives an overview of the different MUC deployments, their position and depth, the used gear (large or small MUC) and the relative success of each deployment in number of cores retrieved.

MUC sampling was conducted within three oceanographic regimes (roughly 52°S 10°E, 52°S12°W, and 51°S39°W; depths between 3,000 and 5,000 m) in the framework of bentho-pelagic coupling. At each of these larger stations, a "full" benthic station took place, consisting of various MUC deployments, accompanied by the other benthic gears (EBS, AGT) and occasionally a CTD cast to collect bottom water for biochemical purposes. At the second position (52°S12°W) the benthos was sampled twice, once before the Eddy Pump work of the Figure 15.1. Composed photography of all the cores collected on one MUC at station PS79/86. The layering was very characteristic of this station. The sediment core was well oxygenated. Sedimentary correlation was done by matching colour-coded (Munsell Chart: Geological RockColor-Chart. 2009. Produced by Munsell Color) facies. The images were enhanced using ImageJTM (http://rsbweb.nih.gov) oceanographers, and one time afterwards (though at a slightly different position due to difficult bathymetry). At each full benthic station, 4 or 5 replicate MUC-drops were carried out to increase statistical power and rule out small-scale variations in deep-sea sediments as a factor influencing benthic communities. Next to the full stations, three extra MUC drops have been carried out on the way between different oceanographic regions. After the deep benthic stations, a shallow station at roughly 54°S52°W was sampled on the way to Punta Arenas. At this station, which had a depth of approximately 340 m, 6 MUC deployments were carried out, of which one failed.

At each position, the MUC was lowered to the seafloor with a speed of 1 or 1.5 m s^{-1}. At roughly 100-50 m above the bottom, the lowering was interrupted for ~2 minutes to allow the stabilisation of the gear. After that, lowering continued with a speed of 0.5 – 0.7 m s^{-1} until the gear hit the bottom (as observed on the tension meter). Subsequently, approximately 20 m of extra cable was released and the winch was stopped for a few minutes. Finally, the MUC was pulled out of the sediment with a speed of 0.2 m s^{-1} and heaved again with 1 or 1.5 m s^{-1}. Once back on the deck, the sediment cores were taken out, numbered, labelled, measured and distributed to the different groups.

Tab. 15.1.: MUC deployments during ANT-XXVIII/3 for both MUC6 (multicorer with ~6 cm diameter tubes) and MUC10 (~10 cm diameter tubes)

Station	Date	Longitude	Latitude	depth (m)	Gear	Success
PS79/072-6	16/01/2012	48° 59.96' S	10° 00.22' E	3195.2	MUC10	failed
PS79/072-7	16/01/2012	48° 59.99' S	10° 00.16' E	3197	MUC10	failed
PS79/075-6	17/01/2012	50° 01.45' S	09° 58.90' E	3544.5	MUC10	failed
PS79/075-10	17/01/2012	50° 03.63' S	10° 03.69' E	3669.2	MUC10	failed
PS79/078-5	18/01/2012	51° 00.00' S	10° 00.00' E	3949.5	MUC10	failed
PS79/081-7	19/01/2012	51° 59.63' S	10° 00.24' E	3745.7	MUC10	2 cores
PS79/081-8	19/01/2012	51° 59.99' S	09° 59.99' E	3760.5	MUC6	10 cores
PS79/081-9	19/01/2012	52° 00.01' S	10° 00.05' E	3760.7	MUC6	10 cores
PS79/081-12	19/01/2012	51° 59.93' S	10° 00.06' E	3757.5	MUC6	10 cores
PS79/081-13	19/01/2012	52° 0.042' S	09° 59.90' E	3760.5	MUC6	9 cores
PS79/084-24	23/01/2012	53° 00.67' S	10° 03.00' E	4320.2	MUC6	9 cores
PS79/085-14	27/01/2012	51° 59.98' S	07° 59.99' W	2749.2	MUC6	11 cores
PS79/086-26	1/02/2012	51° 58.87' S	12° 03.76' W	3966.2	MUC6	11 cores
PS79/086-27	1/02/2012	51° 58.97' S	12° 02.83' W	3943.2	MUC10	2 cores
PS79/086-28	1/02/2012	51° 58.74' S	12° 02.11' W	3968	MUC6	11 cores
PS79/086-29	1/02/2012	51° 58.78' S	12° 01.95' W	3970.8	MUC6	11 cores
PS79/086-30	2/02/2012	51° 58.91' S	12° 02.16' W	3965.4	MUC6	11 cores
PS79/141-3	17/02/2012	51° 11.93' S	12° 36.87' W	3925.5	MUC6	failed
PS79/141-5	18/02/2012	51° 16.04' S	12° 36.88' W	4115.5	MUC6	4 cores
PS79/141-6	18/02/2012	51° 15.98' S	12° 37.04' W	4113	MUC6	10 cores
PS79/141-9	18/02/2012	51° 16.03' S	12° 37.06' W	4114	MUC6	8 cores
PS79/141-10	19/02/2012	51° 15.97' S	12° 36.94' W	4113	MUC6	8 cores
PS79/141-11	19/02/2012	51° 16.02' S	12° 37.12' W	4113.2	MUC6	9 cores
PS79/174-23	02/03/2012	49° 33.80' S	38° 24.27' W	4881	MUC6	9 cores

Station	Date	Longitude	Latitude	depth (m)	Gear	Success
PS79/175-5	04/03/2012	50° 46.69' S	39° 25.35' W	4154.2	MUC6	9 cores
PS79/175-6	04/03/2012	50° 46.59' S	39° 25.33' W	4155.2	MUC6	10 cores
PS79/175-7	04/03/2012	50° 46.60' S	39° 25.38' W	4154.2	MUC6	11 cores
PS79/175-8	04/03/2012	50° 46.60' S	39° 25.39' W	4154	MUC6	11 cores
PS79/175-9	04/03/2012	50° 46.57' S	39° 25.33' W	4152.1	MUC6	7 cores
PS79/177-3	07/03/2012	53° 48.53' S	52° 21.31' W	338.7	MUC6	6 cores
PS79/177-4	07/03/2012	53° 48.54' S	52° 21.30' W	340.2	MUC6	6 cores
PS79/177-5	07/03/2012	53° 48.55' S	52° 21.30' W	340.5	MUC6	failed
PS79/177-6	07/03/2012	53° 48.56' S	52° 21.27' W	343	MUC6	7 cores
PS79/177-8	07/03/2012	53° 48.57' S	52° 21.29' W	340.7	MUC6	10 cores
PS79/177-9	07/03/2012	53° 48.53' S	52° 21.35' W	335.2	MUC6	9 cores

Preliminary (expected) results

See contributions of the different authors.

Data management

Refer to page 75.

16. ANTARCTIC DEEP-SEA BENTHOS - BIOGEOCHEMISTRY

Sandor Mulsow[1] [1]LEET-UACh

Objectives

Biogeochemical and sedimentological characterization of sediment columns using microelectrodes, geochemical analyses and geochronology.

Work at sea

Sediment cores were collected using a multicorer slow penetration device. The perspex liners have 63 mm internal diameter. Undisturbed cores were selected for oxygen micro profiles determination in a temperature-controlled laboratory (2-3°C). At least 2 sediment cores per station were analysed for oxygen (6 microprofiles per core) using a UNISENSE electrodes. The microprofiles were done at 200 µm intervals. Once the profiles were performed, each sediment core was sectioned every 5 mm down to 1 cm and thereafter every 10 mm until the bottom of the sediment core is reached. On one core, sections from 0-4 cm were sampled for pore water using a sediment water squeezer. One aliquot of the pore water samples was deep frozen for posterior analyzes of chlorophyll. The rest of pore water was frozen for posterior analyses of nutrients. All the sections (squeezed and non-squeezed) solid fraction was placed on pre weight petri dishes, stored at 2°C on coolers for transport to the lab. In the lab, the solid fraction of the sectioned cores will be wet weighed, salt corrected, and dry wt determined (UACh-Valdivia-Chile) to be used for chemical analyses (ICP-MS: Li, Ti, V, Cr, Cd, Cu, Zn, Mn, Fe, As, Se, Mo) and geochronology (^{210}Pb and ^{230}Th). The resulting ^{210}Pb profiles will be treated as time keepers (sedimentation rates derivation) as well as the result of biological benthic mixing rates of the visited benthic communities. All the parameters will be analyzed jointly with the biological benthic ecology variables collected during the sampling cruise as well.

Preliminary results

A total of 7 stations were sampled for sediments. A total of 21 sediment cores were collected for biogeochemical work. At least 16 *ex-situ* oxygen micro-profiles were performed at each station. Most of the sediments were characterised as well oxygenated. No anoxic conditions were found. At one station, PS79/174, oxygen consumption was higher than in any other sediment column sampled during this cruise. Some layering was observed at station PS79/86 (Fig. 16.1). This layered sediment core was sectioned at high resolution to study the provenance of the layers (geochemistry and geochronology).

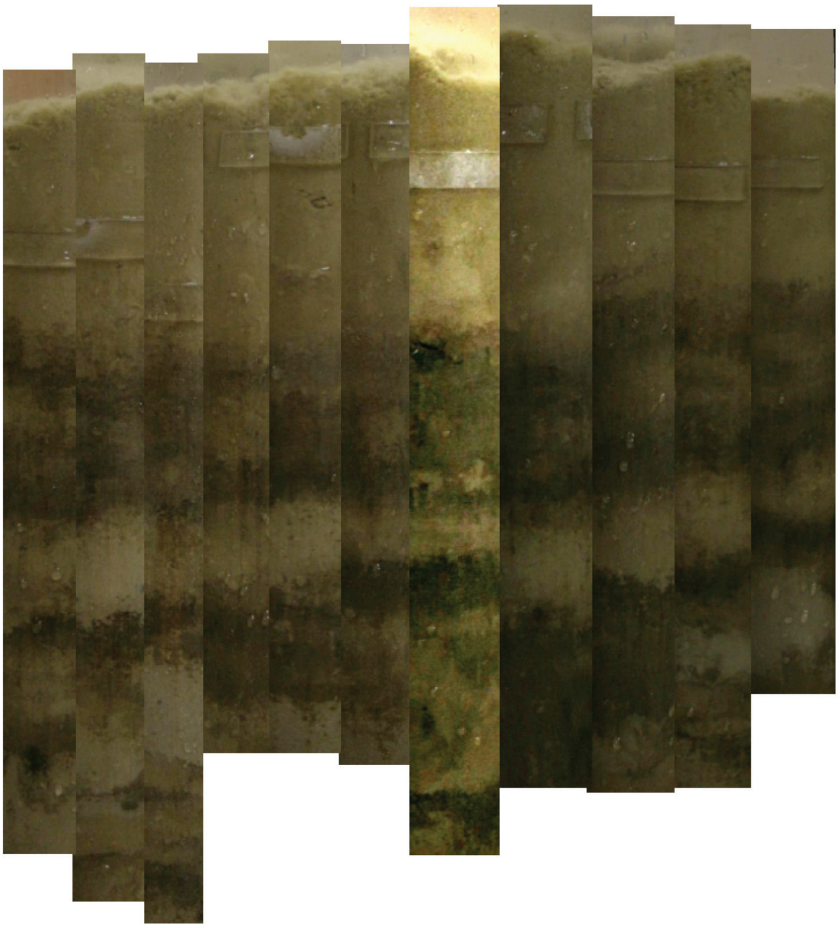

Fig. 16.1: Composed photography of all the cores collected on one MUC at station PS79/86. The layering was very characteristic of this station. The sediment core was well oxygenated.

Data management

Refer to page 75.

17. FORAMINIFERA OF THE DEEP SOUTHERN OCEAN: BENTHO-PELAGIC DISTRIBUTION AND PAST AND PRESENT METAGENETICS

Tomas Cedhagen[1], [1]UA
Franck Lejzerowicz[2] [2]DGE Geneva
Jan Pawlowski[2] (not on board)

Background and objectives

In high latitude systems, Foraminifera represents the most diversified and abundant group of protistan meiofauna thriving on the deep-sea floor. Given highly variable morphologies and patchiness across samples, accurate species identification and distribution surveys are challenging, especially for minute and inconspicuous monothalamous (single-chambered) species hidden within sediment particles. The non-fossilized monothalamous foraminifera and their bentho-pelagic distribution patterns are often overlooked in biodiversity studies, despite increasing evidence that they form a major driver of deep-sea benthic dynamics.

The main objective of this project is to target foraminifera in deep-sea Antarctic sediments to conduct a comprehensive metagenetic study across the bentho-pelagic deposition system. Using sorted specimens as well as bulk sediment material collected during this cruise, the following questions will be addressed: (1) Which and how many deep Southern Ocean species display small and large scale cosmopolitanism patterns? (2) Is there an unexplored pelagic group of monothalamous foraminifera restricted to the water column? (3) Is deposited and sediment-borne extracellular DNA a good proxy for seasonal variation? (4) Are ancient foraminiferal DNA sequences preserved in Antarctic downcore sediment recoverable and diverse?

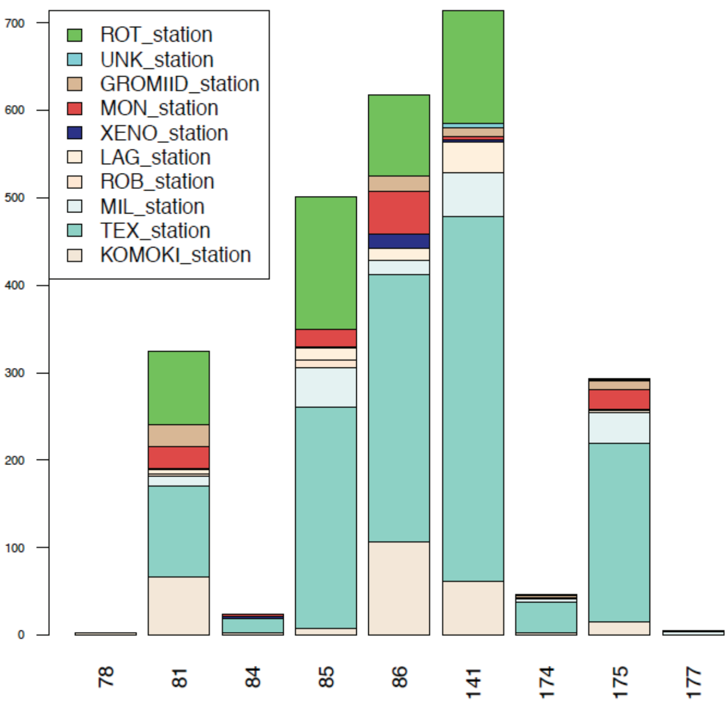

Fig. 17.1: Picked specimens of foraminiferans and related taxa for all stations. ROT: Rotaliids, UNK: not identifiable on board, GROMIID: Gromiids, MON: Monothalamiids, XENO, Xenophyophoreans, LAG: Lagenidae, ROB: Robertinidae, MIL: Miliolidae, TEX: Textulariids, KOMOKI: Komokiaceae.

Moreover, we will participate in the identification of foraminiferal components of isopods diet, based on DNA analysis of their gut content. We will also complete our taxonomic survey of Southern Ocean deep-sea foraminifera, with particular emphasis given to monothalamous species.

Work at sea

We collected surface sediment samples from abyssal water depths using a multicorer (MUC) and received supplementary material from Agassiz trawl (AGT) end epibenthic sledge (EBS). For species sorting, the top 2-3 centimeters of each core sample were sieved immediately after retrieval and living foraminifera hand picked under a binocular microscope. Each single living specimen was photographed and isolated in different fixative solutions for morphological characters preservation and DNA (and/or RNA) extraction in order to improve our small-subunit ribosomal RNA gene (SSU rDNA) sequence reference database. All handling of foraminiferans was done in a cool container at 0°C or on ice. For each benthic station, 6 cores were sub-sampled (3 deployments; 2 cores per deployment) for investigation of large-scale cosmopolitanism to small-scale micro-heterogeneity patterns. From each of these cores, 3 sub-samples were frozen at -20°C and 3 sub-samples deep-frozen at -80°C for DNA/RNA-based diversity analyses. For each station, the longest undisturbed sediment core was sub-sampled downcore in order to recover ancient DNA for paleogenetic analysis of past foraminiferal diversity. Using sterile spatulas and changing gloves between each 5 cm-separated sub-sampled layers, sediment replicates from the center of the core were frozen at -20°C for total DNA extraction as well as ca. 3 g of sediment mixed in 5 ml MoBio Lifeguard Preservation Solution for total RNA extraction. From each MUC deployment a replicate consisting of the upper 2 cm of an entire core was fixed in formalin for later quantitative analysis of the community. A limited number of selected foraminiferans with a very large volume of cytoplasm, as well as surface sediment, were frozen in order to analyze the content of algal pigments by the use of HPLC. Additionally, surface- and deep-water DNA samples were taken to search for monothalamous foraminiferans living in the water column and dispersal forms (propagules) stemming from the benthos. Ten liters of a mixture of CTD water from 1,000 and 2,000 meters depths were filtered over GF/F filters in replicates as well as from the bottom water.

Preliminary and expected results

Two thousands seven hundred and twenty-four specimens were assigned either to formally described genera or species or informal morphospecies names prior to future studies. Of these, a lower number were dried on micro-paleontological slides or fixed either in buffered 4 % formalin or 96 % ethanol for further morphological and histological analyses. The majority of foraminiferans – 1,624 individuals – were fixed in guanidine buffer with (508 individuals) or without (367 individuals) EDTA for single-specimen DNA extraction or in RNA later® (759 individuals) for both RNA and DNA extractions.

Based on gross morpho-logical characters, they were reliably binned into groups either well defined morphologically or phylogenetically. Fig. 17.1 shows the numbers of specimens retrieved from different stations for these groups.

Although the above data for picked specimen that are interesting for molecular work (phylogenetics, transcriptomics) do not represent the taxonomic composition of live species in the sieved samples, the sediment was dominated by various agglutinated forms (Textulariids). Almost no calcareous foraminifera were found at the stations off South Georgia (st. PS79/174 and 175).

Some representative species of deep-sea forminiferans are illustrated (Fig. 17.2). Some foraminiferans displaying large masses of cytoplasm pouring off the test were frozen for HPLC pigment detection (Fig. 17.2, A). A species belonging to the genus *Vanhoeffenella* was found alive (Fig. 17.2, B). According to a recent metagenetic analysis, this genus is the most cosmopolitan in the deep sea (Lecroq et al. 2011). Surprisingly, a robertiniid foraminiferan with aragonitic test was found in a 4,000 meters deep station (Fig. 17.2, C). The pan-Antarctic genus *Epistominella* was found in most stations (Fig. 17.2, D). Gromiids are generally poorly known but were found in fairly large numbers and in all deep stations (68 picked specimens, Fig 17.2, E).

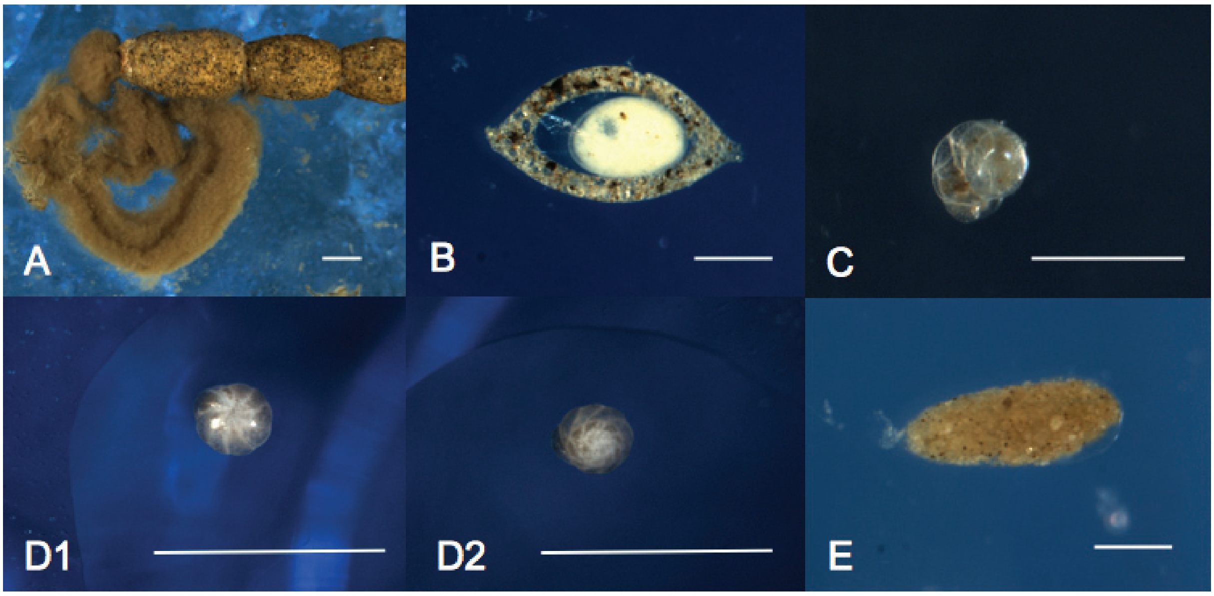

Fig. 17.2: Representative picked species. A „Botellina", B Vanhoeffenella, C Robertinidae, D1 and D2 Epistominella apical and umbilical sides, E Gromiida. Scale bars are 250 micrometers long.

Data management

All specimens isolated for molecular work will be found in the foraminiferal DNA reference database (http://forambarcoding.unige.ch).

Acknowledgements

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18. THE LINK BETWEEN STRUCTURAL AND FUNCTIONAL BIODIVERSITY OF THE MEIOBENTHOS IN THE ANTARCTIC DEEP SEA: FOCUS ON NEMATODES

Freija Hauquier[1]
Ann Vanreusel[1] (not on board)

[1]UGent

Objectives

Nematodes are the most abundant metazoan meiobenthic taxon in many areas of the world's ocean. Also in the deep sea they tend to be dominant and densities can be high, which makes them important players in the benthic food web. However, knowledge on the biodiversity and functioning of nematode communities is still scarce, especially in the deep realms of the oceans. In continuation of the SYSTCO I expedition we therefore aimed to further elucidate on the role of meiofauna, and especially nematodes, in the carbon flow through benthic deep-sea sediments of the Antarctic in relation to their biodiversity and surface water productivity. In order to unravel the link between nematode biodiversity and function, it is essential to reveal the interactions in the benthic food web and their trophic position at locations with contrasting food input. This contrasting food input was generated by sampling in three different oceanic regimes, with different chlorophyll a concentrations, as observed from satellite images. Through community analysis and biochemical profiles (fatty acids and/or stable isotopes) we hope to shed more light on the link between surface productivity and benthic nematode communities (i.e. bentho-pelagic coupling).

Work at sea

At all deep benthic stations, and for each MUC deployment, 2 cores were selected for meiofauna community analysis and fatty acid profiles (see Table 18.1. for an overview of the cores taken and their purpose). The core for community analysis was each time sliced down to 10 cm core depth in slices of 1 cm for the first 5 centimetres, and 1 slice of 5 cm from 5-10 cm. All separate sediment slices are stored on 4-7% buffered formalin until further analysis. The second core, to be analysed for fatty acids, was sliced down to 5 cm sediment depth in slices of 1 cm of thickness. Each slice is stored in petri dishes at -80°C. The same slices will be used afterwards to determine a set of sediment characteristics, including grain size, sediment-bound pigment concentrations and C/N ratios. To compare fatty acid and/or stable isotope signals in the nematodes with the water column, bottom and surface water (sampled with a CTD rosette mounted with Niskin bottles and with buckets) has been filtered over GF/F filters. The filters are stored in glass vials at -80°C.

At the shallow station at roughly 54°S52°W, samples were taken for a small-scale project where community structure is compared between regions, different deployments, different cores of each deployment and different parts of one core. For three deployments, 2 cores were taken and divided in slices of 0-3 cm and 3-5 cm. Subsequently, the slices were subdivided in 6 parts of which 3 are stored on 4-7% formalin and 3 at -80°C for sediment characteristics.

All organisms sampled quantitatively with the MUC6 will be sorted and counted on major taxon level at the lab of the Marine Biology Section of Ghent University. Nematodes will be identified down to genus level at the Marine Biology Section of Ghent University. Nematodes for fatty acid analyses will be picked out from each sediment layer stored at -80°C, after which the analyses (both extraction of fatty acids and identification of signals) will be performed in the lab. Fatty acid and/or stable isotope analysis on the GF/F filters stored at -80°C will also be carried out in the lab of Ghent University.

Tab. 18.1: MUC deployments and cores used for meiofauna community analysis and fatty acid profiles. (comm = community; FA = Fatty Acids; env = environmental characteristics)

Station info	Station	Date	Latitude	Longitude	Depth (m)	Core Id.	Purpose	Fixation
FULL STATION	PS79/081-8	19/01/2012	51° 59.99' S	9° 59.99' E	3760.5	3	comm	4% formalin
						4	FA+env	-80°C
						6	FA+env	-80°C
	PS79/081-9	19/01/2012	52° 0.01' S	10° 0.05' E	3760.7	8	FA+env	-80°C
						10	comm	4% formalin
	PS79/081-12	19/01/2012	51° 59.93' S	10° 0.06' E	3757.5	6	comm	4% formalin
						8	FA+env	-80°C
	PS79/081-13	19/01/2012	52° 0.042' S	9° 59.90' E	3760.5	6	comm	4% formalin
						7	FA+env	-80°C
TRANSECT	PS79/084-24	23/01/2012	53° 0.67' S	10° 3.00' E	4320.2	4	comm	4% formalin
						5	FA+env	-80°C
						6	FA+env	-80°C
WEST	PS79/085-14	27/01/2012	51° 59.98' S	7° 59.99' W	2749.2	8	comm	4% formalin
						9	comm	4% formalin
						11	FA+env	-80°C
FULL STATION (before Eddy Pump)	PS79/086-26	1/02/2012	51° 58.87' S	12° 3.76' W	3966.2	4	FA+env	-80°C
						8	comm	4% formalin
	PS79/086-28	1/02/2012	51° 58.74' S	12° 2.11' W	3968	6	FA+env	-80°C
						8	comm	4% formalin
	PS79/086-29	1/02/2012	51° 58.78' S	12° 1.95' W	3970.8	3	comm	4% formalin
						5	FA+env	-80°C
	PS79/086-30	2/02/2012	51° 58.91' S	12° 2.16' W	3965.4	1	FA+env	-80°C
						3	comm	4% formalin
FULL STATION (after Eddy Pump)	PS79/141-5	18/02/2012	51° 16.04' S	12° 36.88' W	4115.5	1	FA+env	-80°C
	PS79/141-6	18/02/2012	51° 15.98' S	12° 37.04' W	4113	3	FA+env	-80°C
						4	comm	4% formalin
	PS79/141-9	18/02/2012	51° 16.03' S	12° 37.06' W	4114	6	FA+env	-80°C
						8	comm	4% formalin
	PS79/141-10	19/02/2012	51° 15.97' S	12° 36.94' W	4113	3	FA+env	-80°C
						6	comm	4% formalin
	PS79/141-11	19/02/2012	51° 16.02' S	12° 37.12' W	4113.2	3	FA+env	-80°C
						5	comm	4% formalin
DEEP	PS79/174-23	02/03/2012	49° 33.80' S	38° 24.27' W	4881	7	FA+env	-80°C
						8	comm	4% formalin

Station info	Station	Date	Latitude	Longitude	Depth (m)	Core Id.	Purpose	Fixation
FULL STATION (South Georgia)	PS79/175-5	04/03/2012	50° 46.69' S	39° 25.35' W	4154.2	7	comm	4% formalin
						8	FA+env	-80°C
	PS79/175-6	04/03/2012	50° 46.59' S	39° 25.33' W	4155.2	5	comm	4% formalin
						6	FA+env	-80°C
	PS79/175-7	04/03/2012	50° 46.60' S	39° 25.38' W	4154.2	2	comm	4% formalin
						3	FA+env	-80°C
	PS79/175-8	04/03/2012	50° 46.60' S	39° 25.39' W	4154	1	FA+env	-80°C
						10	comm	4% formalin
	PS79/175-9	04/03/2012	50° 46.57' S	39° 25.33' W	4152.1	3	comm	4% formalin
						6	FA+env	-80°C
SHALLOW	PS79/177-3	07/03/2012	53° 48.53' S	52° 21.31' W	338.7	2	Small-scale	Formalin & -80°C
						4		
	PS79/177-4	07/03/2012	53° 48.54' S	52° 21.30' W	340.2	4		
						5		
	PS79/177-6	07/03/2012	53° 48.56' S	52° 21.27' W	343	1		
						2		

Preliminary and expected results

Since extraction of animals and the analysis of environmental characteristics and fatty acids have to be done in a standardised way in the lab, no preliminary results are available for the meiobenthos.

Due to their small size, nematode identification at genus level has to be carried out on a light stereoscope microscope. Only a limited number of nematodes have been identified in this way onboard, on a stereoscopic microscope belonging to the Hamburg group (ZSM). It concerns nematodes retrieved from the epibenthic sledge (EBS) instead of the MUC, and therefore only qualitative samples of the larger fraction of the nematodes (>300 µm). Of these few identified nematode specimens, no surprises were found. All genera identified are regular inhabitants of deep-sea sediments. Most frequently found are the genera *Halalaimus*, *Actinonema* and *Viscosia*. Identification of the nematodes of the quantitative samples will be carried out in the lab of the Marine Biology Section, Ghent University.

Data management

Refer to page 75.

19. THE EPIBENTHIC SLEDGE (EBS) DEPLOYMENT

Angelika Brandt[1],
Laura Würzberg[1],
Simone Brandao[1], Sarah Schnurr[1], Anna Meyer-Löbbecke[1], Charlotte Havermans[2], Ann-Christine Zinkann[3], Katharina Jörger[3], Enrico Schwabe[3], Dorte Janussen[4], Martina Vortkamp[5]

[1]ZMH
[2]IRScNB
[3]ZSM
[4]Senckenberg
[5]DZMB

Objectives

The epibenthic sledge was deployed in order to obtain macrofaunal organisms suitable for systematic, phylogenetic and ecologic studies. We were especially interested in peracarid crustaceans, molluscs and polychaetes, but also in meiofaunal organisms (foraminiferans and nematodes) as well as in megafaunal organisms such as sponges or echinoderms that are regularly caught with the EBS.

Work at sea

The epibenthic sledge (EBS) (Fig. 19.1.) was successfully deployed at seven stations (Fig. 19.2.; Table 19.1). While the epibenthic sampler extends from 27 to 60 cm above the seafloor, the suprabenthic sampler (fixed on the top of the epibenthic box; Fig. 19.1.) extends from 100 to 133 cm above the bottom. A plankton net is attached to each sampler, of 0.5 mm mesh size for the epinet and supranet and 0.3 mm for the cod ends. When the sledge touches the seafloor, a shovel fixed to the box door of the epibenthic sampler opens both boxes. The doors are closed mechanically when the sledge leaves the bottom.

The EBS was lowered with 0.7 m s^{-1} to the ground and then with 0.5 m s^{-1} (ship speed compensates for the lowering in order to lay the wire straight in front of the gear on the ground) to 1.5 cable length to water depth. It was then hauled over the ground for 10 min at a mean velocity of 1 knot. Afterwards the ship stopped and holstering was done with –0.5 m s^{-1} until the EBS had left the ground, then it was holstered with –0.7/1 m s^{-1} until it reached the deck of *Polarstern*. The haul distances were calculated from the time the sledge travelled on the ground until to the moment when it had left the ground, which was indicated by the tension meter. Haul lengths varied from 2,585 m to 4,789 m; for the comparative analysis the data will be standardised to 1,000 m hauls, equivalent to a bottom area of 1,000 m^2 sampled by the sledge. In total, 29,090 m^2 ocean bottom were sampled. On deck the sample was immediately transferred into pre-cooled 96 % ethanol and kept at least for 48 hours at -20°C for DNA extraction, selected individuals were quickly sorted and selected key species were frozen at -80°C for biochemistry. First extractions of DNA had already been done on board. Specimens were completely sorted on board to species level, identification will later be done in the laboratory in the Zoological Museum of the University of Hamburg, where extensive literature is available.

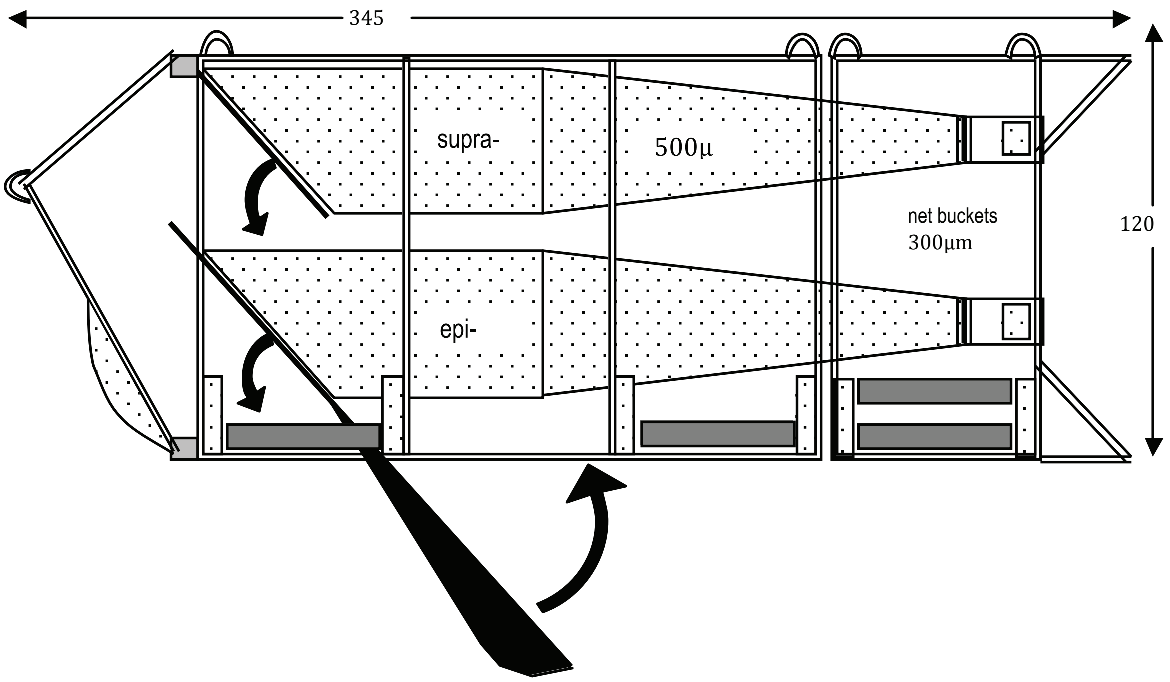

Fig. 19.1: Schematic illustration of the epibenthic sledge (Nils Brenke, DZMB)

Tab. 19.1.: EBS station table. EBS was lost at station 141-4 (grey)

station	date	Long_start	Lat_start	Long_end	Lat_end	distance	depth (m)
81-17	20. Jan 12	010° 00.72' E	52° 00.18' S	009° 59.27' E	51° 59.67' S	3926,333	3756
81-18	20. Jan 12	010° 01.47' E	52° 00.36' S	009° 59.58' E	51° 59.88' S	4789,467	3756
84-25	23. Jan 12	010° 03.55' E	53° 00.89' S	010° 02.12' E	53° 00.22' S	4524,6	4046
85-15	27. Jan 12	007° 59.73' W	51° 59.88' S	008° 00.59' W	52° 00.29' S	2585,533	2752
86-20	31. Jan 12	012° 03.17' W	59° 59.83' S	012° 10.10' W	51° 59.69' S	4441,533	3970
86-24	01. Feb 12	012° 02.94' W	52° 00.07' S	012° 04.52' W	51° 59.21' S	4318,934	3994
86-25	01. Feb 12	012° 02.05' W	52° 00.49' S	012° 03.65' W	51° 59.56' S	4503,267	3940
141-4	17. Feb 12	012° 37.06' W	51° 11.97' S	012° 37.06' W	51° 12.08' S	lost	3913

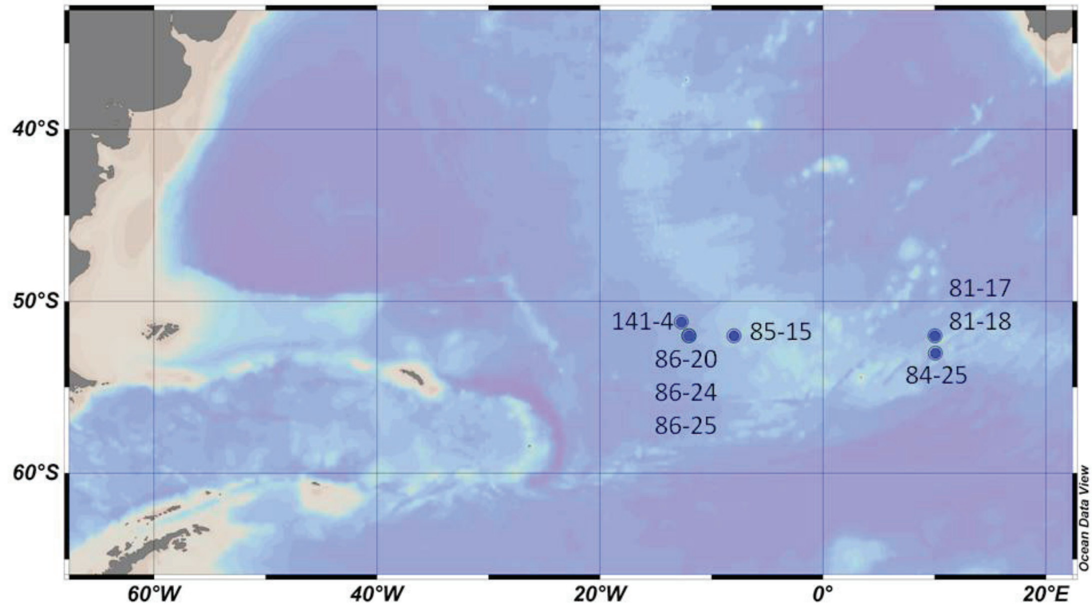

Fig. 19.2: SYSTCO II stations sampled by means of the epibenthic sledge

Preliminary and expected results

From the major macrofaunal taxa more than 3,000 specimens were sampled. Crustacea occurred most frequently in the samples, followed by polychaetes and molluscs. Objectives and results from this work will be presented in subsequent reports of the EBS, only a general table is presented here (Tab. 19.2.).

Tab. 19.2: Abundance of macrofaunal taxa in the EBS catches (raw data)

haul	17	18	25	15	20	24	25	number
Polychaeta	13	104	153	23	10	208	19	530
Crustacea	49	329	252	177	350	504	365	2026
Echinodermata		6	7	12	2	3	0	30
Mollusca	18	34	36	14	27	94	102	325
Nemathelminthes	4	41	63	10	14	21	8	136
Porifera	3	7	3	1	0	3	0	17
Total	87	521	514	237	403	833	494	3113

In general it can be noted that the abundances are generally rather low at all stations in the Polar Front region compared to stations taken at higher latitudes in the Weddell Sea (Brandt et al., 2007a-c; Brökeland et al. 2007; Malyutina & Brandt 2007).

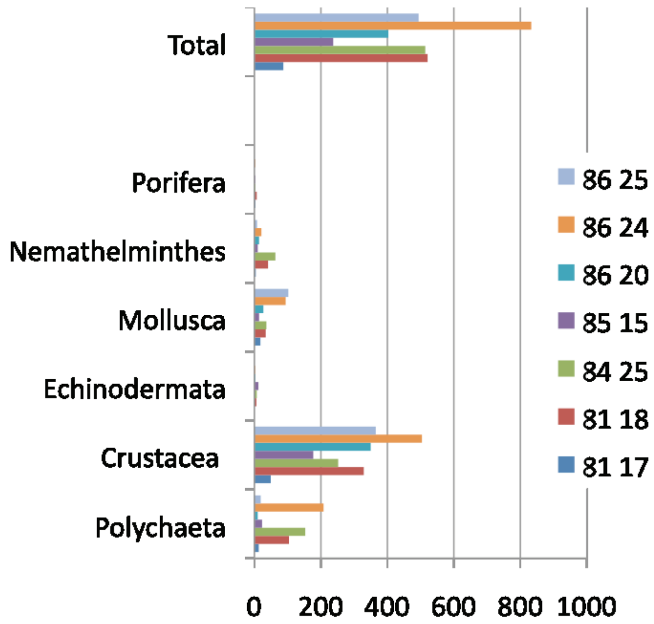

Fig. 19.3: Abundance of macrofaunal taxa in the EBS catches (raw data)

Data management

Refer to page 75.

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20. ON THE FUNCTIONAL BIODIVERSITY AND ECOLOGY OF BENTHIC ABYSSAL KEY SPECIES

Laura Würzberg[1], Ann-Christine Zinkann[1], Angelika Brandt[1]

[1] ZMH

Objectives

Still many knowledge gaps exist concerning ecology and role of deep-sea fauna in trophodynamic processes in oceanic ecosystems. In course of the SYSTCO II project, we therefore aim at examining the trophic structure and functioning of the abyssal benthic community of the Southern Atlantic Ocean, focusing specifically on the coupling of water column processes with the deep-sea ecosystem in three contrasting areas (regimes). All three regimes present a characteristic sediment composition partly due to different algae communites 1) *Fragilariopsis kerguelensis*, 2) *Chaetoceros* spp. and 3) overlap of *F. kerg*. and *C*. spp. Besides these three regimes, we sampled at distinct primary production scenarios, including low chlorophyll stations, one station during an algae bloom with high chlorophyll values and the same area just shortly after the downward export occurred, to investigate pelago-benthic coupling processes (Tab. 20.1).

Various benthic organisms sampled by means of Agassiz trawl and Epibenthic sledge were collected for biochemical analyses, such as fatty acid and stable isotopes, as well as for gut content analyses based on molecular methods.

Analyzing the fatty acid composition provides the opportunity to reconstruct the diet composition and to interpret the importance of specific food sources of each sampled specimen by applying the trophic marker approach (Dalsgaard et al. 2003). Additionally, ratios of the C and N stable isotopes will provide information about the trophic level of the analyzed specimens (Post, 2002). An additional method providing higher taxonomic resolution of dietary organisms is the application of molecular sequencing methods on gut contents. This approach builds on the fact that DNA from consumed organisms is usually not completely degraded during digestion and therefore can be analyzed using PCR (polymerase chain reaction) applied with universal primers (Jarman et al., 2004).

In order to obtain information throughout the whole benthic food web, animals representing different trophic levels were sampled. For the biochemical analyses we focused sampling effort mainly on echinoderms (Holothuroidea, Asteroidea and Ophiuroidea), but additionally sampled bivalves, gastropods, isopods, polychaetes, cnidarians and fishes (Tab. 20.2). In case of the gut content analyses, the focus was laid on investigating the importance of foraminiferans in the diet of selected isopod and polychaete species (in cooperation with Jan Pawlowski (not on board) and Franck Lejzerowicz; Tab. 20.3). As one of the main objectives is the comparison between different regimes and divergent primary production states, it was crucial to succeed in sampling the same taxa (preferably genera) at each station. Pelago-benthic coupling processes will be investigated by comparing the obtained results with ample parameters. These include fatty acid composition and stable isotope ratios of sediment, bottom and surface water, stable isotope ratios of pelagic and mesopelagic zooplankton (in cooperation with Evgeny Pakhomov and Brian Hunt), specific chlorophyll values of each sampled regime (in cooperation with Christine Klaas), downward flux of particles (in cooperation with Morten H. Iversen) and HPLC pigment analysis of bottom water (in cooperation with Wee Cheah and Mariana Altenburg Soppa).

Work at sea

Specimens for biochemistry were primarily collected with the Agassiz trawl, while isopods and polychaetes for the molecular gut contents were mainly sampled with the Epibenthic sledge. Voucher pictures were taken of each sampled animal. Identification to the lowest taxonomic level was conducted as far as possible on board and will be finalized in cooperation with the according specialists for each group. Tissue samples for biochemical analyses were taken from larger individuals (e.g., fish, holothurians), while smaller individuals were frozen completely. Tissue samples of subsampled specimens were additionally preserved in 96 % ethanol to allow subsequent genetic analyses. Complete isopod and polychaete specimens for molecular gut content analyses were preserved in 96 % ethanol and will be dissected later on. Additionally, biomass measurements (length and volume) of some taxa were conducted.

Sediment samples for comparative fatty acid and stable isotope analyses were collected from the Multiple Corer (MUC). Additionally, samples of the sediment surface water for pigment analyses (HPLC) were taken from the MUC. Bottom water was sampled by means of a CTD (conductivity, temperature, depth DROP: density probe with Niskin bottle rosette), while surface water was sampled with buckets. The water was immediately filtered over pre-combusted and pre-weighed GF/F filters at 200 mbar for comparative fatty acid and stable isotope analyses. Different volumes of water (depending on the content of particulate organic matter, POM) were filtered until a distinct coloring appeared on the filter.

Preliminary results

In total, seven benthic stations were sampled (Tab.20.1).

Tab. 20.1: Station details

Station	longitude	latitude	Depth [m]	Regime
PS79/177	052°21.30'W	53°48.53'S	340	Shallow station Burdwood Banks
PS79/175	50° 46,63' S	39° 25,41' W	4153.7	South Gorgia high Chlorophyll
PS79/141	012°37.06'W	51°16.03'S	4114.2	West low high chlorophyll boundary
PS79/86	012°02.11'W	51°58.74'S	3968.7	Full Station high Chlorophyll
PS79/81	09°59.99'E	51°59.99'S	3760.5	Full Station low Chlorophyll

A total of 288 organisms were sampled for biochemical analyses in course of the expedition. We were successful in obtaining comparable samples at the different regimes. This accounts especially for echinoderms, of which the same genera (possibly species) were found at different stations. In case of other taxa (e.g., fish, bivalves) we were able to sample representative species of different trophic levels which will also allow comparison between the stations (Table 20.2).

Tab. 20.2: Organisms sampled for biochemical analyses at each station

	PS79/81	PS79/84	PS79/85	PS79/86	PS79/141	PS79/175	PS79/177	sum
Cnidaria	1	0	0	0	4	0	0	5
Bivalvia	2	0	0	0	7	6	3	18
Gastropoda	0	0	0	2	9	6	0	17
Polychaeta	0	0	0	3	10	0	7	20
Isopoda	3	0	0	0	4	3	0	10
Asteroidae	3	3	0	3	12	23	6	50
Holothuridae	5	7	3	18	22	63	5	123
Ophiuridae	3	3	0	3	6	6	3	24
Pisces	3	1	0	0	4	10	3	21
Total sum								**288**

Concerning molecular gut content analyses, 61 individuals of the targeted polychaete taxa and 30 individuals of the targeted isopod taxa could be obtained (Table 20.3). Further specimens will be picked from bulk samples later on.

Tab. 20.3: Isopod and polychaete specimens sampled for molecular gut content analyses at each station

	PS79/81	PS79/85	PS79/86	PS79/141	PS79/175	PS79/177	**sum**
Isopod target species	14	3	2	5	6	0	**30**
Polychaete target species	7	4	8	2	28	12	**61**

Data management

Refer to page 75.

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21. BARCODING DEEP-SEA ISOPODA

Sarah Schnurr[1,2],
Anna Meyer-Löbbecke[2],
Angelika Brandt[2]
Saskia Brix[1] (not on board)

[1]Senckenberg/DZMB
[2] ZMH

Objectives

Crustaceans are particularly regarded as ubiquitous and extremely diverse, in terms of species numbers and in their range of morphologies (Hessler, 1981). Especially asellote isopods are regarded as the most frequent crustacean taxon present in most abyssal benthic samples (Sanders et al., 1965, Sanders & Hessler, 1969, Brandt et al., 2007).

DNA barcoding is known as a standardized approach in order to identify species by comparing small DNA sequences with each other. DNA barcoding can be used to delineate species complexes. Thus, DNA barcoding is used to combine the classic taxonomic approach of species descriptions. The Folmer primer set (HCO and LCO) will be used for amplification of a 658 bp fragment of the CO I gene (Folmer et al., 1994). In addition, other mitochondrial genes like 16 S and 12 S will be amplified after the expedition.

Work at sea

Epibenthic sledge (EBS) samples were immediately fixed in 96 % pre-cooled undenatured ethanol and stored at -20°C. In order to guarantee a good fixation of the whole sample, samples were gently shaken every two hours within the first 24 hours. After 24 hours ethanol was renewed. Sorting of samples could be started subsequently 48 hours after fixation. Samples were kept cooled throughout the whole time in order to prevent tissue digestion.

All isopods were determined to family level, while the family Munnopsidae was sorted on genus level. Specimen of selected isopod families, which were in a good condition were used for genetics. After taking pictures of each voucher specimen, two to three pereopods were taken of each specimen and put into 96 well plates together with 50 µL of RNA buffer. These plates were stored at 0°C.

Preliminary results

Due to the in general rather low number of isopods within the EBS samples a total of 70 individuals were used for DNA barcoding. Thereof 29 specimen of the family Macrostylidae, 26 specimen of the family Desmosomatidae, 6 specimen of the family Nannoniscidae as well as 9 specimen of the family Munnopsidae were dissected and their pereopods were transferred into the RNA buffer.

Extractions and further steps like PCR and sequencing will be done at the laboratory of the Smithsonian Institution, Washington, DC.

Data management

Refer to page 75.

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22. ON THE FUNCTIONAL BIODIVERSITY AND ECOLOGY OF MACROBENTHIC ABYSSAL KEY SPECIES WITH FOCUS ON THE ISOPODA AND POLYCHAETA

Angelika Brandt[1],
Laura Würzberg[1],
Sarah Schnurr[1],
Anna Meyer-Löbbecke[1],
Ann Christine Zinkann[2],Martina Vortkamp[3]
Myriam Schüller[4] (not on board)

[1] ZMH
[2] ZSM
[3] DZMB
[4]Uni Bochum

Objectives

Very little is known about the ecology and role of deep-sea fauna in the trophodynamic coupling and nutrient cycling in oceanic ecosystems. This project examines the trophic structure and functioning of the abyssal macrobenthic community of the Southern Atlantic Ocean, focusing specifically on the role of the Isopoda and Polychaeta including 1) systematics, 2) general feeding biology, 3) bentho-pelagic coupling, and 4) the reproduction of certain key species. Epibenthic sledge samples from four previous *Polarstern* expeditions (ANDEEP I-III and ANDEEP-SYSTCO) and new epibenthic sledge and sediment core samples taken during the *Polarstern* expedition ANT XXVIII/3 (7.1.2012–11.03.2012). A variety of methods will be used including gut content analysis, functional morphology of target species as well as biochemical measurements. The latter include analyses of biomarkers, and examination of stable isotopic signatures of epifaunal animals. The results will be compared and combined with the findings of research groups examining other aspects of the Southern Ocean food web or biogeochemistry of the sediment. Combining the comprehensive datasets concerning diversity and colonisation patterns available from ANDEEP I-III, ANDEEP-SYSTCO I and this planned study focusing on food-web dynamics allows us to better understand the trophodynamics including the role of deep-sea fauna in the ecology of the Southern Atlantic Ocean.

Work at sea

The identification of key species from the above mentioned Southern Ocean material prior to the expedition allowed us to more quickly identify and collect them from the SYSTCO samples in the cool room.

Sampling: In order to save as much steaming time as possible, our sampling stations were taken in close vicinity to the stations that were visited by the "Eddy pump" group. As planned, we worked for a longer period of time at three major sampling areas (see general introduction and station list of the expedition) and took one additional short station at a seamount. Abyssal station depth was around 4,000 m.

As soon as the samples were on board, they were sorted on ice by the most important taxa and key abyssal species of these groups, in order to freeze it immediately for the further described treatment in the laboratories in Hamburg (ZIM and IHF). At each station we also took sediment samples (see contribution of Mulsow, this volume) and material for microbiology (see contribution of Würzberg & Zinkann, this volume) were obtained.

Those isopod and polychaete specimen which will not be used for biochemical analyses, will be studied with regard to the functional morphology of the mouthparts, gut contents or they will be available for other projects dealing with systematic or phylogenetic investigations. For molecular genetic studies concerning phylogenetic relationships or population genetics of selected key species, we dissected specimens for later DNA extraction after precooling of the samples at -20°C for at least 48 hours (see contribution from Schnurr & Meyer-Löbbecke, this volume). These results will be compared with those obtained from the isopod material from the previous ANDEEP and ANDEEP-SYSTCO expeditions.

Preliminary and expected results

Abundances of macrofaunal taxa were very low. For example in seven epibenthic sledge samples 278 isopod individuals were found and 530 polychaetes, compared to more than 13,000 isopods at higher latitudes in the Weddell and Bellingshausen Seas (Brandt et al., 2007) where nearly 11,000 polychaetes were collected, belonging to at least 241 species in 46 families (Brandt et al., 2012).

Numbers of isopods were highest among the brooding peracarids, but crustaceans generally occurred with low numbers in the samples (Tab. 22.1).

Further results on the composition of isopods and polychaetes are found in the chapters of Meyer-Löbbecke & Brandt, this volume, and Zinkann & Würzberg, this volume.

Tab. 22.1: Numbers of Crustacea sampled at seven epibenthic sledge stations. Stations PS79/81-86 were stations in the second working area. Station PS79/81-17 (blue) is from 52°S, 8°W, in a low productivity patch, stations 86 (green) are from 52°S, 12°W in a high productivity area.

Station	PS79/85	PS79/84	PS79/81	PS79/81	PS79/86	PS79/86	PS79/86
haul	15	25	18	17	20	24	25
Amphipoda	**12**	**25**	**29**	**11**	**6**	**24**	**5**
Copepoda	**88**	**145**	**151**	**38**	**301**	**374**	**263**
Cumacea	**8**	**4**	**2**	**1**	**3**	**3**	**0**
Isopoda	**40**	**47**	**109**	**23**	**7**	**54**	**38**
Mysidacea	**1**	**2**	**0**	**2**	**0**	**0**	**0**
Ostracoda	**18**	**19**	**19**	**13**	**23**	**36**	**49**
Phyllocarida	**0**	**0**	**0**	**1**	**0**	**1**	**1**
Tanaidacea	**10**	**10**	**19**	**4**	**5**	**11**	**3**
Total	177	252	329	93	345	503	359

Data management

Refer to page 75.

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23. INVESTIGATIONS ON SYSTEMATICS, ZOOGEOGRAPHY AND DIVERSITY OF DEEP-SEA ISOPODA (CRUSTACEA, MALACOSTRACA)

Anna Meyer-Löbbecke[1], Angelika Brandt[1] [1]ZMH

Objectives

Although most of the Southern Ocean (SO) is deep sea little is known about its faunal composition of the abyssal plain which limits our understanding of deep-sea benthic biodiversity patterns (Ellingsen et al., 2007). One important component of deep-sea communities in terms of abundance and diversity in the SO are isopod crustaceans (Choudhury & Brandt, 2009). This may be due to their long evolution in isolation of the SO (Brandt et al., 2005) where extensions of the ice sheet may have enhanced speciation processes on the Antarctic shelf, named the Antarctic "diversity pump". During the three ANDEEP expeditions over 13,000 isopod specimens were found, 35% of all Peracarida. Overall 674 species were identified, most of them were new to science (Brandt et al., 2007). The suborder Asellota comprised 97% of all isopods and the Munnopsidae were the most dominant family. The SYSTCO II expedition near the Antarctic Polar Front (APF) aims to expand the knowledge about biodiversity, systematic and zoogeography of Antarctic deep-sea Isopoda obtained until now. Will there be a similar isopod family composition like during previous expeditions and also a reservoir of high species diversity within some isopod taxa? Do isopods in the deep sea occur patchily or are they widely distributed? And does the deep-sea fauna differ from that of the South Atlantic (Brandt et al., 2007)?

Work at sea

Samples were taken at seven deep-sea stations from three sampling sites near the APF with an epibenthic sledge (EBS). On deck the samples were immediately transferred into pre-cooled undenatured ethanol (96%) and kept for 48 hours at -20°C. Isopod specimens were sorted to family or genus level on board and will be determined to species level later in the laboratory in the Zoological Museum of the University of Hamburg.

Preliminary results

The total number of isopod specimens collected with the EBS at the three sites of the SO was 281 (42% of Crustacea without Copepoda), all belonged to the suborder Asellota. In total the Haploniscidae were the most abundant isopod family with 31% of specimens followed by the Desmosomatidae with 21 % and the Munnopsidae with 20% while the Macrostylidae, Ischnomesidae, Nannoniscidae and Cirolanidae occurred at lower numbers and comprised 21 % of all isopod specimens. Specimens of the Munnopsidae were already determined to genus level on board, six genera were found: *Baeonectes*, *Betamorpha*, *Eurycope*, *Disconectes*, *Ilyarachna* and

Syneurycope. Isopod family composition and the number of specimens differed between the stations (Tab. 23.1).

Tab. 23.1: Isopod family composition (alphabetically) at the SYSTCO II stations in the polar front (Raw data).

Station PS79/	81-17	81-18	84-25	85-15	86-20	86-24	86-25	Total
Cirolanidae				1				1
Desmosomatidae	1	26	4	12		14	1	58
Haploniscidae	3	19	14	6	5	24	15	86
Ischnomesidae	1	7	3	4		2		17
Macrostylidae	5	15	8	3	1	1	2	35
Munnopsidae	10	27	4	7	1	6	2	57
Nannoniscidae			1	2			5	8
Parasitic isopods		1						1
undeterminated	1	4	5	7		1		18
Total	21	99	39	42	7	48	25	281

At station PS79/81-18 number of isopod specimens was highest with 99 individuals, followed by station 86-24 where 48 isopods were collected. At station PS79/81-17 the Munnopsidae were most abundant, at 81-18 the Munnopsidae and the Desmosomatidae were most frequent. At station PS79/84-25, 86-20, 86-24 and 86-25 the Haploniscidae were the family with most specimens while at station 85-15 the Desmosomatidae occurred most frequently. The number of specimens differed strongly between the stations of one location (Tab. 23.1) indicating a high degree of patchiness (Griffiths, 2010). Additional 41 specimens of isopods were sorted from Agassiz-Trawl samples so far. Beside the isopod families that already occurred in EBS samples, specimens of the Antarcturidae, Paramunnidae and Microparasellidae cf. have been found until now. Diversity and abundance of the deep-sea isopod species collected during this expedition will be compared with stations during SYSTCO I and with the results from the ANDEEP I-III expeditions. Parameters like depth, temperature, salinity and sediment characteristics (grain size, chlorophyll-pigments, oxygen consumption and carbon concentration) will be included in the analysis provided by several colleagues.

A first preliminary conclusion is that abundance and also diversity of isopods are very low compared to other deep-sea locations in the SO like in the Weddell Sea. The three ANDEEP expeditions yielded 13,046 specimens of 674 isopod species from 40 deep-sea stations (Brandt et al., 2007) what is comparatively high to 281 specimens collected during SYSTCO II from seven stations in the polar front. The fact of latitudinal gradients in deep-sea species diversity and abundance has been strongly debated in the literature (Brandt et al., 2004). The data obtained during ANDEEP and SYSTCO indicate an increase of isopod biodiversity and abundance in the deep sea from the Antarctic Polar Front towards the Antarctic continent.

Data management

Refer to page 75.

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24. CHARACTERIZATION OF THE POLYCHAETE FAUNA WITH REGARD TO WIDELY DISTRIBUTED SPECIES

Laura Würzberg[1], Ann-Christine Zinkann[1]
Myriam Schüller[2] (not on board)

[1]ZMH
[2]Universität Bochum

Objectives

Many polychaetes are considered to be widely distributed or even cosmopolitan. However, particularly the large-scale studies under the auspices of the Census of Marine Life have casted some doubt on the presence of cosmopolitan species as for the first time sufficient material was collected worldwide. Molecular genetic methods further challenge the concept of very wide distributions, at least among the macrobenthos.

The Antarctic Polar Front may or may not be a barrier to dispersal of polychaetes, and it may even be a zone of a particular assemblage. According to the literature based on classical taxonomy, about 100 species of polychaetes were recorded both south and north of the Antarctic Polar Front (e.g., Hartmann-Schröder 1993; Hartmann-Schröder and Rosenfeldt 1988, 1990, 1992). Genetic evidence may prove some of these records wrong. The objective is therefore to cooperate with the NSF-funded project WormNet II and preserve any species that are found in sufficient quantities, but not needed for ecologic studies (see Würzberg, Zinkann and Brandt), in several ways to identify both morphospecies and haplotypes. Material from the South Atlantic Ocean is available for comparison (e.g., DIVA III, Argentine Basin) and ANDEEP. As data on many abiotic parameters will be collected as well (see Mulsow), we hope to match haplotypes with certain environmental conditions such as sedimentary characteristics. Additionally, we will compare different reactions of haplotypes to increased amounts of available food during and after a plankton bloom.

Work at sea

Polychaete individuals from Agassiz trawl and Epibenthic sledge were immediately sorted and fixed individually in pre-cooled 96 % ethanol. Further polychaete bulk samples have been sorted to the lowest taxonomic level possible and identifications will be reassessed thoroughly on land after the end of the expedition.

Preliminary results

A total of 661 polychaetes were sampled and identified to the lowest taxonomic level possible during the SYSTCO II expedition. The number will most likely increase further due to sorting of bulk samples later on. At the moment, 22 different polychaete families have been identified. Thorough morphologic and genetic taxonomic examinations will be conducted at the Universities of Hamburg and Bochum. In general, the polychaete family composition seems to be concordant with what has been reported before for the Atlantic sector of the Southern Ocean deep sea (e.g., Hartmann-Schröder 1993; Hartmann-Schröder and Rosenfeldt 1988, 1990, 1992; Hilbig, 2001). It includes (in alphabetical order) Ampharetidae, Capitellidae, Cirratulidae, Euphrosinidae, Glyceridae, Lumbrineridae, Maldanidae, Nephtyidae, Opheliidae, Paraonidae, Phyllodocidae, Polynoidae, Scalibregmatidae, Sphaerodoridae, Spionidae, Syllidae, and Terebellidae.

Tab. 24.1: Polychaete specimens and numbers of families found at different stations, gear used for sampling.

Station	longitude	latitude	Depth [m]	Regime	Polychaetes [n]	Families [n]
PS79/177	052°21.04'W	53°48.53'S	339	Shallow station Burdwood Banks	127	
PS79/175	039°23.96'W	50°48.02'S	4137.2	South Gorgia high Chlorophyll	74	
PS79/174	38° 16,25' W	49° 40,05' S	4989.1	South Gorgia high Chlorophyll	2	
PS79/141	012°35.67'W	51°15.96'S	4105.2	West low high chlorophyll boundary	27	8
PS79/86	012°04.26'W	51°59.68'S	3840.2	Full Station high Chlorophyll	174	18
PS79/85	007°59.29'W	51°59.99'S	2871.5	West Low high chlorophyll boundary	27	10
PS79/84	010°03.32'E	53°01.18'S	3444.2	Transect	107	16
PS79/81	010°00.71'E	52°00.18'S	3637.5	Full Station low Chlorophyll	123	21

Data management

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25. BENTHIC AND PLANKTONIC OSTRACODA OF THE SOUTHERN OCEAN: BIODIVERSITY AND BIOGEOGRAPHY

Simone Nunes Brandão Senckenberg/DZMB

Objectives

The class Ostracoda is taxonomically and ecologically very diverse, its representatives live in varied aquatic ecosystems as benthos as well as plankton. This Class has one of the most extensive fossil records, and thus represents important proxies in palaeoenvironmental reconstructions. Several studies have investigated the local diversity changes through geological time. However, comparisons between regions, i.e. the study of β- and γ-diversities are still limited by the differences in the sampling. Therefore, the first objective of the present project is to measure the biodiversity of the Southern Ocean deep sea, and compare it with other deep-sea regions sampled by other projects. With such a comparison, it will be possible to test prevailing theories on bathymetrical and latitudinal gradients of diversity.

Work at sea

As described above, we deployed the EBS seven times at four stations and sorted all its samples on board. The ostracods were identified to the lowest level possible, i.e. either species, genus or family depending on the case (see table below).

The ostracods sampled by the AGT were also identified. Here it is very important to stress that because the opening of the AGT remains open during the whole deployment, it is not possible to know in which depth the planktonic animals were collected. Therefore, no further work will be done on this material.

All specimens of the family Krithidae collected with the AGT will be used for biochemical analyses. They were transferred to micropalaeontological slides. In the slides, the chemical composition of the valves of these specimens are kept closer to the original composition, while the ethanol may cause decalcification or other chemical changes.

In order to better preserve the subfossils, all empty valves were transferred to micropalaeontological slides while the animals with soft parts were kept in ethanol.

Preliminary and expected results

Since only a few publications on ostracods are available on board, not all specimens could be identified to species level. Interestingly, the preliminary results indicate that no new species have been collected, contrary to previous cruises (e.g. ANDEEP III), where several new species were collected. Additionally, typical deep-sea genera (e.g. *Australoecia*, *Bradleya*, *Echinocythereis*, *Henryhowella*, *Legitimocythere*, *Macropyxis*, *Poseidonamicus*, *Pseudobosquetina*, *Vitjasiella*), a few Southern Ocean species (e.g. *Bradleya mesembrina* Mazzini, 2005) and a few Southern Atlantic deep-sea species (e.g. *Australoecia abyssophila* Maddocks, 1969, *Pseudobosquetina nobilis* Jellinek *et al.*, 2006) were collected during the present cruise.

The macroecological analyses will be done in my home institution. The biogeochemical analyses on the Krithidae will be done in the USA in the next months.

Data management

Refer to page 75.

References

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26. PHYLOGENY AND PHYLOGEOGRAPHY OF DEEP-SEA AMPHIPODS: CONNECTIVITY WITHIN AND BETWEEN ANTARCTIC, SUB-ANTARCTIC AND ATLANTIC REGIONS

Charlotte Havermans[1]

[1] IRScNB

Objectives

With over 600 described species, amphipods are the most specious group in Antarctic shelf regions, with a high percentage of endemic species. Even if Antarctic shelf species have been extensively investigated, recent studies showed that many species are inadequately described and several morphospecies are composed of genetically heterogeneous species complexes (Havermans et al. 2011). In contrast, the Antarctic deep sea remained virtually unknown until the ANDEEP and SYSTCO I cruises. These expeditions revealed an overwhelming abundance and diversity of amphipods.

By molecular analyses, we investigate for several amphipod species the link between (i) Antarctic and sub-Antarctic regions and (ii) Antarctic regions and Atlantic abyssal basins. We will test how phylogeographic patterns differ between shelf and deep-sea species and whether deep-sea species are genetically less variable than shallow water species. By phylogenetic analyses, the relationships between Antarctic shelf and deep-sea fauna (submergence *vs*. emergence hypothesis) will be examined as well as the relationships between Antarctic and Atlantic species. Former analyses on lysianassoid species demonstrated the presence of identical haplotypes between Atlantic abyssal basins and the Antarctic Peninsula which can be explained by the existence of the Antarctic bottom water, connecting these basins. Furthermore, there are indications for several independent colonizations of these Atlantic abyssal basins from the Antarctic deep sea (Havermans et al. in prep.). More deep-sea samples are needed to confirm these hypotheses.

Specific topics to investigate include: (1) To document faunistical and zoogeographical of amphipod taxocoenoses from different abyssal areas; (2) To contribute to the description of the Antarctic amphipod biodiversity, with a special focus on the Lysianassoidea; (3) To use fast evolving genetic markers to measure the intra- and interpopulation genetic variability and to compare the phylogeography of target taxa; (4) To use more slowly evolving genetic markers to identify colonization patterns between different abyssal basins; (5) To contribute to the SCAR-MarBIN database (www.scarmarbin.be) in bringing a new dataset of distributional, ecological and photographic information on Antarctic amphipods.

Work at sea

Sampling was carried out using three different gears: Agassiz trawl, epibenthic sledge and Rauschert dredge. The epibenthic sledge and Agassiz trawl were deployed at seven stations, the Rauschert dredge only at the last four stations. Amphipods were identified to family, genus or species level and photographed. Specimens were fixed in 96 % pre-cooled undenatured ethanol and stored at 20°C. DNA was extracted from 129 specimens from the deep-sea stations and 14 specimens collected in the shallow-water station.

Preliminary results

All specimens collected were sorted out and identified until species, genus or family level and the different species were photographed. The number of species and individuals per amphipod family for each deep-sea station is represented in Table 26.1, 26.2 and 2.63 according to the different gears. However, the numbers for the last stations (St. PS79/141 and 175) are likely to increase when all samples will be sorted, which has not been done yet onboard due to time limitations. The most abundant taxa found in the Agassiz trawl belonged to the Hyperiidea, a group of pelagic amphipods, most probably caught in the net when the trawl was retrieved through the water column. This group was much less abundant in the epibenthic sledge samples. The second most abundant and diverse group in the AGT samples is the superfamily Lysianassoidea, of main interest for our studies. This group also appeared to be the most diverse and abundant in the EBS samples. Surprisingly, we observed a higher diversity within this group in the low productivity area (St. PS79/81, 84, 85) than in the high chlorophyll area (St. PS79/86, 141), both for EBS and AGT samples.

DNA extractions were carried out for 143 specimens (129 from the deep-sea stations and 14 from the shallow station) of which 60 belong to the Lysianassoidea, 45 to the Hyperiidea and the remaining specimens belonging to Eusiroidea, Liljeborgiidae, Stegocephalidae. In addition, DNA was extracted of a large number of specimens of the bathypelagic species *Cyphocaris richardi*, *Parandania boecki*, *Eurythenes obesus*, *Themisto gaudichaudii* and Eusiroid sp. for future phylogeographic and population genetic studies. At the RBINS, mitochondrial (cytochrome oxidase I, 16S rRNA) and nuclear (28S rRNA) gene fragments will be amplified and sequenced for all these specimens.

An additional sampling was carried out at a shallow-water shelf station (54°S 52°W, 336 m). More than 115 specimens were sorted out alive during the sieving of the material; 80 specimens from the Rauschert dredge and 35 specimens from the Agassiz trawl. Due to time limitations, the sieved fractions of the sample will be sorted out back home. The dominant species in the Agassiz trawl sample was *Leucothoe* sp. (26 specimens), of which some individuals were found inside a sponge, indicating a possible commensally life style. This could explain the high abundance of this species in the catch, which was dominated by sponges. The other abundant taxa included several lysianassoid, liljeborgiid and eusiroid species. The most important taxa found in the Rauschert dredge sample were: *Schraderia gracilis* (Eusiroidea), *Liljeborgia* sp. (Liljeborgiidae), oedicerotids, stenothoids and several lysianassoid species of the family Tryphosinae. Afterwards, DNA was extracted of 14 specimens belonging to the families Liljeborgiidae and Lysianassoidea for further molecular studies.

Data management

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References

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Tab. 26.1.: Number of species and individuals per amphipod family sampled at each deep-sea station with the AGT.

	PS79/81-19	**PS79/84-26**	**PS79/85-16**	**PS79/86-21**	**PS79/86-23**	**PS79/141-7**	**PS79/141-8**	**PS79/175-3**	**PS79/175-4**
Caprellidea							1 sp. (N=1)		
Chuneolidae						1 sp. (N=1)			
Eusiroidea	1 sp. (N=1)			1 sp. (N=1)					
Hyperiidea	8 spp. (N=16)	5 spp. (N=18)	4 spp. (N=15)	2 spp. (N=94)	6 spp. (N=52)	9 spp. (N=33)	5 spp. (N=29)	4 spp. (N=9)	1 sp. (N=2)
Hyperiopsidae				1 sp. (N=1)					
Liljeborgiidae						1 sp. (N=1)		1 sp. (N=1)	
Lysianassoidea	2 spp. (N=4)	2 spp. (N=3)	1 sp. (N=2)	6 spp. (N=6)		3 spp. (N=5)	3 spp. (N=3)	1 sp. (N=1)	1 sp. (N=1)
Melphidippidae				1 spp. (N=1)					
Phoxocephalidae								2 spp. (N=2)	2 spp. (N=2)
Stegocephalidae	2 sp. (N=5)	1 sp. (N=3)		2 spp. (N=10)	1 sp. (N=8)	1 sp. (N=9)	1 sp. (N=4)		
Indet.	1 sp. (N=1)	3 spp. (N=3)		4 spp. (N=4)				1 sp. (N=1)	1 sp. (N=1)

Tab. 26.2.: Number of species and individuals per amphipod family sampled at each deep-sea station with the RD.

	PS79/141-7	PS79/141-8	PS79/175-3	PS79/175-4
Epimeridae			1 spp. (N=1)	
Lysianassoidea			1 spp. (N=2)	1 spp. (N=1)
Eusiroidea				
Hyperiidea	4 spp. (N=4)	2 spp. (N=4)	4spp. (N=5)	3 spp. (N=5)
Oedicerotidae			1 sp. (N=1)	
Stegocephalidae	1 sp. (N=1)	1 sp. (N=1)		
Indet.	1 sp. (N=1)			

Tab. 26.3.: Number of species and individuals per amphipod family sampled at each deep-sea station with the EBS

	PS79/81-17	PS79/81-18	PS79/84-25	PS79/85-15	PS79/86-20	PS79/86-24	PS79/86-25
Aoridae						1 sp. (N=1)	
Calliopiidae		1 sp. (N=1)					
Corophioidea	1 sp. (N=1)	2 spp. (N=2)				2 spp. (N=2)	
Hyperiidea	2 spp. (N=2)		3 spp. (N=3)	2 spp. (N=3)	1 sp. (N=1)	1 sp. (N=2)	1 sp. (N=1)
Lysianassoidea	9 spp. (N=10)	11 spp. (N=12)	5 spp. (N=6)	2 spp. (N=3)	4 spp. (N=4)	2 spp. (N=3)	
Pardaliscidae						1 sp. (N=2)	
Phoxocephalidae		2 spp. (N=2)	2 spp. (N=4)	1 sp. (N=1)		2 spp. (N=8)	
Oedicerotidae		1 sp. (N=1)	1 sp. (N=1)	2 spp. (N=7)			1 sp. (N=1)
Stegocephalidae			1 sp. (N=1)			1 sp. (N=1)	1 sp. (N=1)
Indet.		3 spp. (N=4)	5 spp. (N=5)	3 sp. (N=3)	1 sp. (N=1)	2 spp. (N=2)	1 sp. (N=1)

27. BIOGEOGRAPHY AND PHYLOGENY OF SOUTHERN ATLANTIC DEEP-SEA MOLLUSCA

Enrico Schwabe[1], Katharina M. Jörger[1], Laura Würzberg[2]
Michael Schrödl[1] (not on board)

[1] ZSM
[2]ZMH

Objectives

Within the framework of an inventory of Atlantic cold water and deep-sea molluscs, we observed a generally high species richness and local abundance of molluscs in the Southern Ocean. Many Antarctic gastropods appear eurybathic, however, traditional shell-based taxonomy remains to be confirmed by molecular approaches. Surprisingly, just a single benthic Antarctic deep-sea gastropod species was found to extend slightly north of the boundary of the Southern Ocean yet and so far no faunal overlap between Atlantic and Antarctic deep-sea basins could be found (Schrödl et al. 2010) In lower latitudes of the southern Atlantic, gastropod faunas were found to be poor in species and abundance (Schwabe et al. 2007, Schrödl et al 2010). Comparisons along a transect from the Equator to the Weddell Sea thus showed increasing gastropod diversity from lower to higher latitudes, opposing a previous paradigm. During SYSTCO II we collected molluscs from stations along the Antarctic convergence, a thus far unsampled area that is crucial for addressing apparent biogeographic boundaries between the strictly Antarctic fauna and the South Atlantic Ocean deep-sea basins previously investigated. Species limits as revealed by morphology will be assessed by molecular markers.

In the era of molecular systematics the phylogeny of basal molluscs and of several subgroups is in a state of revolution and Antarctic/deep-sea taxa such as e.g. monoplacophorans have played a key role. Further members of basal taxa and more adequately preserved specimens are needed for molecular and, ultimately, phylogenomic research. Transcriptome analyses will give further insights into functional aspects and adaptations to the special ecological conditions in the deep-sea and a comparison of expression patterns of shell building proteins is planned. In order to explore the trophic ecology of molluscs in benthic deep-sea communities we will apply comparative studies on fatty acid and isotope compositions.

Work at sea

We sorted and pre-identified molluscs from 7 EBS stations (2,752 m - 4,046 m) and 10 AGT stations (330 m – 4,150 m) (for details, see gear chapters). EBS and AGT catches were sorted on ice for approximately one hour after each deployment. (Sub-) samples of the encountered material were directly fixed in RNALater for molecular work or anesthetised in $MgCl_2$ and fixed in 4 % glutardialdehyd (buffered in cacodylate) for histology. All remaining material was bulk fixed in 96 % ethanol. AGT-samples from station PS79/141, 175 and 177 were only partially sorted but could not be finished on board due to a shortage of time. To cover putative meiofaunal molluscs, 2-3 MUC cores were sampled at each major station. The first 5 cm (suspected to contain most meiofauna) of each assigned sediment core were sieved to 100 µm and bulk fixed in 96 % ethanol. Due to the minute size of the animals, reliable sorting is impossible in the field and will be conducted later in the lab.

All taxonomic identification herein is in a preliminary stage and needs thorough reinvestigation with comparative material and revised literature.

Preliminary results

To date we collected 1041 specimens of molluscs from all gears, preliminary identified to 111 morphospecies. With approx. 65 morphospecies, Gastropoda are the dominant group in terms of species numbers, followed by Bivalvia with 29 morphospecies. Concerning local abundance bivalves dominated the samples from the first two regimes (Fig. 27.1). Even though AGT samples cannot be used for quantative comparison, the first rough evaluation shows a general trend of a higher abundance of gastropods than bivalves at the last regime (station PS79/175). Morphospecies from all remaining molluscan taxa occurred in low numbers and in general a high degree of putative species are only represented by singletons. So far we identified 6 morphospecies of Scaphopoda, 4 of Caudovofeata, 6 of Solenogaster and obtained one benthic cephalopod (Octopodidae) from the shallow station at a seamount close to 54°S, 52°W (AGT PS79/177-7).

The faunistic composition of Bivalvia was similar between the first two regimes with representatives of putatively the same morphospecies of the families Sareptidae Kelliidae, Limidae, Limopsidae, Montacutidae and Thyasiridae collected at all stations. Surprisingly, Nuculidae which dominated the bivalve composition at the first station (station PS79/81) was not found thereafter. First sorting from AGT samples indicate a completely different bivalve composition in the third regime (station PS79/175) with only representatives of Sareptidae and Thyasiridae co-occuring with the first two stations. In general, we noted a highly patchy distribution with considerable variation in abundance between repeated EBS drops at one station (Fig. 27.2). In the first regimes most gastropod species were only recorded from single or few specimens and thus no general trend on faunistic composition can be drawn. The high abundance of (ecto-)parasitic *Melanella* spp. (Eulimidae) at station PS79/86-25 was remarkable; a putative correlation with the abundance and diversity of holothuorids still needs to be confirmed. At the last station (PS79/175) gastropods were by far more abundant and with different morphospecies compared to the first stations. The gastropod fauna was dominated by members of the families Turridae and Buccinidae.

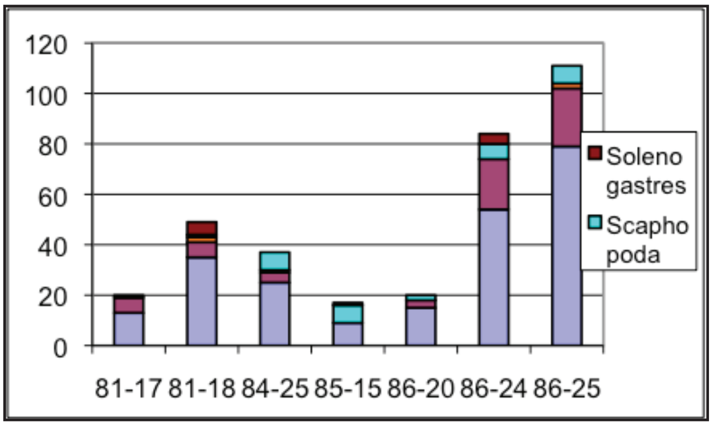

Fig. 27.1: Comparison in abundance of molluscan taxa between the different EBS stations in the first two regimes.

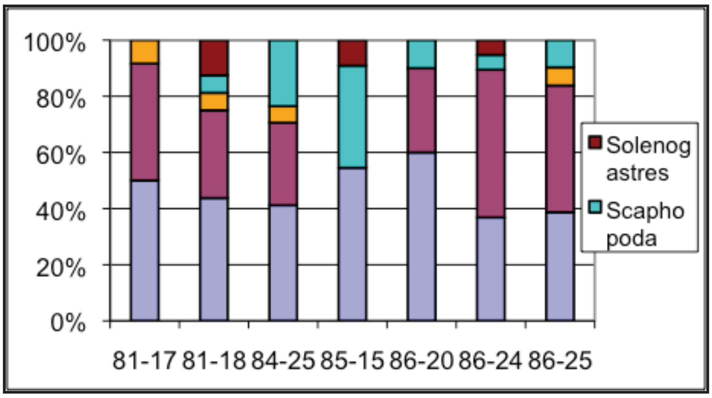

Fig. 27.2: Percentage of molluscan morphospecies from the different EBS stations in the first two regimes.

Data management

Refer to page 70.

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28. AGASSIZ TRAWL (AGT) DEPLOYMENTS

Dorte Janussen[1] , Simone Brandao[2], Tomas Cedhagen[3], Freija Hauquier[4], Charlotte Havermans[5], Katharina Jörger[6], Franck Lejzerowicz[7], Anna Meyer-Löbbecke[8], Sarah Schnurr[7], Enrico Schwabe[6], Martina Vortkamp[2], Laura Würzberg[8] Ann Christine Zinnkann[8], and Angelika Brandt[8]

[1]Senckenberg, Frankfurt/M
[2]DZMB
[3]UA
[4]UGent
[5]IRSNB
[6]ZSM
[7]DGE Geneva
[8]ZMH.

Objectives

An AGT was deployed, as done during the ANDEEP I-III and SYSTCO I expeditions, in order to sample a representative collection of animals for zoogeographical, ecological, molecular and biochemical investigations. For the purpose of comparison of our results, as far as possible we conducted the employments according to the same scheme for each expedition of the ANDEEP-SYSTCO program. As far as possible, the AGT and other benthic gears were employed within the same research areas sampled during the Eddy Pump project.

Work at sea

Sampling was conducted at the three major benthic stations by the big AGT with an inner fine-meshed (500 µm) net in the cod end of the AGT-net, in order to collect also smaller animals, including macro- and meiofauna. For the first three stations we used the new AWI-AGT, which is symmetrical and can be deployed also upside-down, which is not an advantage though, because only one of the net surfaces is equipped for sliding over the ground and sampling. Because the symmetrical AGT proved to be unstable and would easily turn around during deployment, after deployment no. 3, we decided to use the old AWI-AGT (Fig. 28.1), which is actually not a "true" Agassiz trawl, because it is asymmetrical and can glide only on one side, but for that reason has proven to be much more stable than the new trawl. As the function of the new and old trawl is identical, we here use the term AGT for both. After the second failure, deployment no. 5, we made some improvements in order to keep the net on the bottom, such as fastening a steel chain to the lower side of the net entrance and adding some extra weights onto the AGT. After the loss of the epibenthic sledge, we employed a Rauschert Dredge (RD, Figure 28.1) attached to the AGT by a long wire, in order to obtain additional material of especially the smaller animals.

Preliminary and expected results

Of the 10 deployments alltogether, two failed (AGT no. 3 and 5); after some technical improvements on the gear (see above) all deployments were successful (Table 28.1).

AGT 1-2 in the low productivity area (52°S, 10°W) contained small catches with megafauna of mainly holothurians, ophiuorids, molluscs, polychaetes and also a few sessile cnidarians.

AGT 4, 6-7 within the high chlorophyll bloom (51-51.5°S, 12°W) gave small, but comparably diverse megafauna catches including holothurians (min. 10 spp. from AGT 4), ophiuroids, polychaetes, molluscs and few sponges.

AGT 8, 9 within the high productivity area north of South Georgia (51°S, 39°W) provided lots of big stones and many animals. The megafauna catch was abundant and diverse, including big holothurians, fishes, ophiuroids, molluscs, polychaetes, and sponges. The macrofauna was rather poor, as the AGT, even with the fine-meshed inner net, is designed to catch mainly the bigger animals, less smaller ones.

AGT 10 shallow station (330 m) at 53°49'S, 52°21'W provided very abundant and diverse sponges, also the other megafauna taxa were diverse, and the macrofauna was well represented, e.g. by crustaceans.

Tab. 28.1: List of the AGT-deployments with metadata during SYSTCO II

Station PS	Date	Deploy-ment	Lat.	Lon.	Depth, [m]	Trawl. dist., calc., [m]	Catch/ remarks
79/81-19	20.01.12	AGT 1/ new	52°0.2`S	9°59.5`E	3760	1809	Small, OK
79/84-26	23.01.12	AGT 2	52°6.0`S	10°2.5`E	4100	1915	Small, OK
79/85-16	27.01.12	AGT 3	52°S	8°W	2750	1609	Failure
79/86-21	31.01.12	AGT 4	51°59.9`S	12°2.4`W	3940	2189	Diverse megafauna
79/86-23	31.01.12	AGT 5	51°59.1`S	12°4.3`W	3981	2075	Failure
79/141-7	18.02.12	AGT 6	51°15.96`S	12°30.5`W	4100	1909	Good catch
79/141-8	18.02.12	AGT 7	51°16.0`S	12°37.5`W	4110	1904	Good catch
79/175-3	03.03.12	AGT 8	51°49.95`S	39°24.0`W	4150	1894	Stones, good catch
79/175-4	03.03.12	AGT9/old	51°50.4`S	39°24.0`W	4160	1891	Stones, good catch
79/177-7	07.07.12	AGT 10/ old	53°48.5`S	52°21.0`W	330	619	Animals, best catch

Fig. 28.1: The old AWI-AGT and the Rauschert Dredge used, the latter belongs to Charlotte Havermann (photo Ann Christine Zinnkann)

Data management

Refer to page 75.

29. SPONGES - SESSILE SUSPENSION FEEDERS, A BIOLOGICAL NUTRIENTS PUMP IN THE PELAGO-BENTHIC COUPLING SYSTEM

Dorte Janussen[1]

[1] Senckenberg, Frankfurt/M

Objectives

Sessile suspension feeders play an essential role in the pelagic-benthic coupling processes, as they transfer considerable amounts of nutrients from the water column to the benthic ecosystem. In the deep-sea this role is mainly played by the Porifera and as second by the ascidians. It is known that a large hexactinellid sponge pumps several 100 l water per day retaining ca. 90 % of the picoplankton, such as bacteria, and a major part of the dissolved silica (Pile & Young 1996). During the ANT-XXIV/2 (SYSTCO I) expedition, an extensive sponge collection was achieved (Janussen & Rapp 2011; Göcke & Janussen 2011, and in prep.). So far, only few isotope-based food-web studies included the sponges, but those publications indicate that uptake of recycled particulate organic matter (POM) is responsible for high δ^{15}N-values of suspension feeders, especially sponges, in deep water, and also the highly diverse, symbiotic microbial community probably plays a major role (e.g. Mintenbeck et al. 2007, Webster et al. 2004). A first study of the feeding behaviour of Antarctic demosponges (from shallow water) has proven that niche partition between different sponge species with different microbial food sources can be revealed by stable isotopes and lipid analysis (Thurber 2007). Recent data indicate that sponges including their symbionts constitute a nutrient cycle partly separated from the general food web, but on the other hand serve as a link between the pelagic and the benthic ecosystems.

Purpose of this project is to compare the sponge diversity between regions close to the Antarctic Polar Front and between this and the high Antarctic fauna. Furthermore, we aim to investigate the feeding niches of common, Antarctic, deep-water sponge species, including their microbial symbionts, to gain a better understanding of their significance for the pelago-benthic coupling.

Work at sea

Sponges were collected from the different gears (AGT, EBS and MUC), preliminarily sorted according to taxa and photo-documented. Immediately after collection, the sponges were subsampled for stable isotopes, lipids and natural products analysis (frozen at -20°C or –80°C, respectively). Also samples were fixed in RNALater and ethanol for genetics. Furthermore, collection of surface sediment samples from the MUC was done at each major station, and the sediment was frozen for later bacteria and isotope analysis. Bottom water was collected from the CTD and filtered through 0.2 µm millipore filters, which were frozen for bacteria DNA-screening.

Preliminary (expected) results

In total, about 200 sponges were collected, preliminarily identified and classified into species or higher taxa level (Tab. 29.1, Fig. 29.1). Spicule preparation were made on board for more precise identification of the sponges, and ca. 40 Porifera species were preliminarily differentiated. According to experience from earlier deep-sea expeditions, this preliminary species number is conservative and likely to increase by about 50 % once histology, SEM and other methods for taxonomic identification are applied in the home lab. The three research areas all proved to be poor both in diversity and abundance compared with the abyssal Weddell Sea (e. g. Janussen & Tendal 2007, Janussen & Reiswig 2009, Göcke & Janusssen 2011). However, they show distinct differences with respect to their Porifera fauna:

The low productivity area (c. 52°S, 10°E, stations PS79/81, 84) was the poorest in terms of diversity, and we found here only small sponge specimens. With exception of two fragments (*Cornulum* sp. nov., Polymastiidae sp.), it contained exclusively very small representatives of the carnivorous sponge family Cladorhizidae, which were collected mainly by the EBS.

The high chlorophyll bloom (c. 51-51.5°S, 12°W, stations PS79/86, 141) showed higher diversity, including different Demospongiae and Hexactinellida. One hexactinellid sponge was found as a fragmented big specimen, preliminarily identified as *Caulophacus discohexactinus* , it is the second record of this species described by Janussen et al. (2004) from the abyssal Weddell Sea.

The high productivity area, North of South Georgia (c. 51°S, 39°W, station PS79/175) provided a typical Antarctic abyssal poriferan fauna, including smaller and larger representatives of the Demospongiae, such as *Asbestopluma*, *Chondrocladia* (Cladorhizidae) and *Radiella antartica* (Polymastiidae). The Hexactinellida were represented by three species of the Antarctic abyssal character sponge genus *Chondrocladia*.

The shallow water shelf station at 53°48'S, 52°2'W (station PS79/177, about 330 m) provided a high biomass of sponges which were the dominant phylum at this station, as it is commonly the case on the Antarctic shelf. The taxonomic composition is still only very preliminarily known (as there was no more time to make any skeletal preparations), but it can roughly be characterized as a mixture of the Antarctic and a South Atlantic (Magellan) sponge fauna. Dominant Demospongiae were *Phakellia* and *Geodia* (the latter belongs to the Magellan fauna and is very untypical for the Antarctic). The Hexactinellida were represented by at least two species of *Rossella*, which is a sponge genus characteristic for the Antarctic shelf. From this station, preliminarily 20 species were differentiated, but the true species richness will probably turn out to be much higher, once preparation has been done in the home lab.

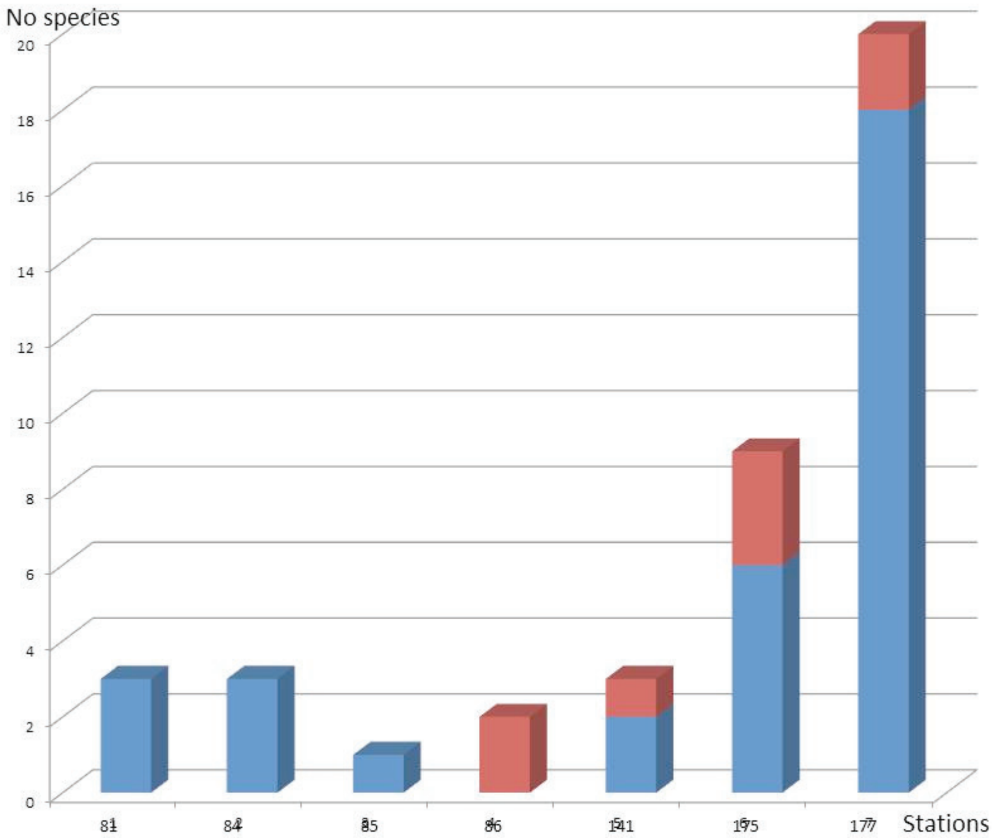

Fig. 29.1: Distribution of Porifera species on the classes Demospongiae (blue) and Hexactinellida (red) according to stations

Data management

Refer to page 75.

Tab. 29.1: Sponge taxa collected during the ANT-XXVIII/3 (SYSTCO II) expedition

Demospongiae						
Asbestopluma cf. *calyx*	v29	1	89/175-3	AGT 8	c. 4150	03.03.2012
Asbestoplun sp.	v1, v2	2/ 1, 175	79/81-17	EBS supra	c. 3760	20.01.2012
Asbestoplum sp.	v4	1/ 303	79/84-25	EBS supra	c. 4320	23.01.2012
Asbestoplum sp.	v6	1/ 463	79/84-25	EBS epi	c. 4320	23.01.2012
Asbestoplum sp.	v3	1/ 296	79/85-15	EBS epi	c. 2750	27.01.2012
Chondroclad sp.	v14, v16	2/ 1091, 1147	79/141-8	AGT 7	c. 4100	18.02.2012
Chondocladi sp.	v17	1/ 1313	79/81-19	AGT 1	c. 3760	20.01.2012
Chondrocladia sp.	v25	1	89/175-3	AGT 8	c. 4150	03.03.2012
Cladorhizidae sp.	v10	1/464	79/84-24	EBS epi	c. 4320	23.01.2012
Mycaliidae sp.	v25	1	89/175-4	AGT 9	c. 4160	03.03.2012
Cornulum sp. nov.	v7	1/ 733	79/81-19	AGT 1	c. 3760	20.01.2012
Radiella antarctica?	v21	1	79/175-3	AGT 8	c. 4150	03.03.2012
Radiella antarctica?	v22	2	79/175-4	AGT 9	c. 4160	03.03.2012
Polymastiidae sp.	v8	1/297	79/85-15	EBS	c. 2730	27.01.2012
Leiodermatium sp. ?	v15	1/1104	79/86-21	AGT4	c. 3760	31.01.2012
Geodia sp.	v21	13/1917, -23	79/177-7	AGT 10	c. 330	07.03.2012
Phakellia (?)	v23a	8 + fragment	-"-	AGT 10	c. 330	-"-
-"-	v23b	c. 7 fragmen	-"-	-"-	-"-	-"-
Myxilla sp. (?)	v24	one/1921	-"-	-"-	-"-	-"-
Haliclona sp. (?)	v25	c. 4, 1936	-"-	-"-	-"-	-"-
Mycalidae ?	v26	c. 6/1931	-"-	-"-	-"-	-"-
Tedania sp.(*or Conulum* ?	v27	one/1939	-"-	-"-	-"-	-"-
Yellowish slimy demosp.	v28	c. 3/1934	-"-	-"-	-"-	-"-
Dark blue demosp.	v29	c. 3/1938	-"-	-"-	-"-	-"-
Tubular demosponge, Poe	v30	one/1925	-"-	-"-	-"-	-"-
Green demosponge	v31	c. 4/1935	-"-	-"-	-"-	-"-
Fan-shaped, thin-walled (	v32	one/1937	-"-	-"-	-"-	-"-
Yellow, slimy demosp.	v33	c. 1/1932	-"-	-"-	-"-	-"-
Poecilosclerida (?)	v34	c. 5	-"-	-"-	-"-	-"-
Hart-textured, darker den	v35	one/1927	-"-	-"-	-"-	-"-
Fan-shaped, very soft der	v36	one/1924	-"-	-"-	-"-	-"-
Mycale cf. *acerata* (?)	v20, v37	c. 1/1941, 19	79/177-3, 7	MUC, AGT 1	-"-	-"-
Demosp. w. big osculum	v38	1/	79/177-7	AGT 10	-"-	-"-
Demospongiae sp.	v28	1	89/175-3	AGT 8	c. 4150	03.03.2012
Demospongiae sp.	v23	1	89/175-4	AGT 9	c. 4160	03.03.2012
Demospongi sp.	v12	1/984	79/141-7	AGT 6	c. 4100	18.02.2012
Hexactinellida						
Caulophacus cf. discohexc	v13	1/2002,	79/141-8	AGT 7	c. 4110	18.02.2012
Caulophacus (*Oxydiscus*)	v18a	1	79/175-3	AGT 8	c. 4150	03.03.2012
Caulophacus sp. n. ?	v18	1	79175-3	AGT 8	c. 4150	03.03.2012
Caulophacus sp. n. ?	v24	1	79/175-3	AGT 8	c. 4150	03.03.2012
Caulophacus sp.	v23a	?	79/175-4	AGT 9	c. 4160	03.03.2012
Caulophacus sp.	v9	1/ 687	79/86-20	MUC	c. 3960	
Rossella cf. *racovitzae*	v19, v22a	1, 95/ 1940, -	79/177-3,7	MUC, AGT 10	c. 330	07.03.2012
Rossella cf. Antarctica	v22b,	c. 20/1920	79/177-7	AGT 10	c. 330	07.03.2012
Hex. sp.	v11	1,565	79/86-24	EBS supra	c. 3960	23.01.2012

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30. CHANGES IN BENTHIC MICROBIAL COMMUNITY STRUCTURE WITH DIFFERENT TERRESTRIAL IRON INPUT

Ann-Christine Zinkann[1]
not on board: Katrin Knittel[2], Andreas Ellrott[2], Rudolf Amann[2]

[1]ZSM
[2]MPI for Marine Microbiology Bremen

Objectives

The marine bacterioplankton community has been shown to strongly depend on the primary production of the phytoplankton (for example see West et al., 2008; Zubkov et al., 2011). Since phytoplankton growth is stimulated by iron in high nutrient, low chlorophyll regions, iron can influence the carbon export (in terms of dead plankton and faecal matter) to the sea floor. Nothing, however, is yet known about the influence of a terrestrial iron input on the microbial community structure in sediments.

We want to study the benthic microbial community composition at sites differing in iron input and chlorophyll content. Initially, 16S rRNA gene libraries will be constructed to address the bacterial diversity and afterwards CARD-FISH will be applied to find key players in the degradation of the freshly produced organic matter. Fluorescently labelled oligonucleotide probes specific for different groups of benthic and planktonic aerobic and anaerobic bacteria will be used to follow the community composition. If successful, metagenomic approaches might be initiated to reveal the metabolic potential of the identified communities.

Work at sea

Two parallel sediment cores from five stations (Table 30.1) were obtained from the Multiple Corer (MUC) and sliced. Six different depth layers (0-1 cm, 1-2 cm, 2-3 cm, 3-5 cm, 5-10 cm, 10-20 cm) were fixed and stored at -20°C until further processing in the home laboratory. The fixed samples will be used for acridine orange direct cell counts (AODC) and catalyzed reporter deposition fluorescence *in situ* hybridization (CARD-FISH). An aliquot of each layer was directly frozen at -20°C for DNA analysis.

Tab. 30.1: Station details

Station	longitude	latitude	Depth	Regime
177	052°21.30´W	53°48.53´S	340	Shallow station Burdwood Banks
175	50°46.63´S	39°25.41´W	4153.7	South Gorgia high Chlorophyll
141	012°37.06´W	51°16.03´S	4114.2	West low high Chlorophyll boundary
86	012°02.11´W	51°58.74´S	3968.7	Full Station high Chlorophyll
81	09°59.99´E	51°59.99´S	3760.5	Full Station low Chlorophyll

Expected results

1) Community shift in diversity and abundance of benthic microorganisms along gradients of different terrestrial iron input to the oceanic waters.

2) Identification of benthic microorganisms responding to phytoplankton blooms in the Antarctic. Groups such as *Roseobacter*, *Cytophaga-Flavobacteria-Bacteroides* or *Polaribacter* shown to strongly depend on phytoplankton blooms have been globally found in marine sediments and are likely candidates.

3) Bacterial core community that do not differ between the sites.

4) Significant vertical differences in benthic microbial community structure at sites sampled during a phytoplankton bloom but only low differences for the low chlorophyll site samples

5) Correlation of benthic microbial community changes with geochemical parameters measured by others on board

Data management

Refer to page 75.

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A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTIONS

	Address
AWI	Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung Postfach 120161 27515 Bremerhaven, Germany
DWD	Deutscher Wetterdienst Geschäftsbereich Wettervorhersage Seeschifffahrtsberatung Bernhard Nocht Str. 76 20359 Hamburg, Germany
CAWCR/UTS	Centre for Australian Weather and Climate Research (CAWCR), a partnership between CSIRO and the Bureau of Meteorology, Castray Esplanade, Hobart, TAS, Australia
DGE Geneva	Department of Genetics and Evolution, University of Geneva, Sciences III, 30, Quai Ernest Ansermet CH 1211 Genève 4, Switzerland
FMK	Zoologisches Forschungsmuseum Alexander Koenig Museumsmeile Bonn Adenauerallee 160 53113 Bonn, Germany
UGent	Ghent University Marine Biology Section Krijgslaan 281, Sterrecomplex S8 B-9000 Ghent, Belgium
IFM-GEOMAR	Leibniz-Institut für Meereswissenschaften IFM-GEOMAR Düsternbrooker Weg 20 24105 Kiel, Germany
IIM-CSIC	Marine Research Institute (IIM-CSIC) Marine Biogeochemistry Department C/Eduardo Cabello, 6. 36208 Vigo, Spain
IRScNB	Institut Royal des Sciences Naturelles de Belgique Departement of Freshwater Biology Rue Vautier, 29, B-1000 Brussels, Belgium
ISW Wassermesstech.	ISW Wassermesstechnik Gartenweg 1, D-17213 Fünfseen, OT Petersdorf, Germany
LEET-UACh	Universidad Austral de Chile, Independencia 641 Casa Central, Valdivia, Chile

	Address
MARUM	MARUM GEO II, R 1050 Klagenfurter Strasse University of Bremen 28359 Bremen, Germany
NIOZ	NIOZ Koninklijk Nederlands Instituut voor Zeeonderzoek Landsdiep 4 1797 SZ 't Horntje (Texel), The Netherlands
OPTIMARE	OPTIMARE Sensorsysteme GmbH & Co. KG Am Luneort 15a D – 27572 Bremerhaven, Germany
Senckenberg/DZMB	Senckenberg am Meer Dt. Zentrum für marine Biodiversitätsforschung, German Centre for Marine Biodiversity Research (DZMB), Senckenberg Research Institute c/o Biocentrum Grindel Martin-Luther-King Platz 3 20146 Hamburg, Germany
Senckenberg/Frankfurt	Sektion Marine Evertebraten I, Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25,D- 60325 Frankfurt am Main, Germany
SoES	School of Environmental Sciences Nicholson and Thornley Buildings University of Liverpool, 4 Brownlow Street, Liverpool, L69 3GP, UK
UA	University of Aarhus Department of Biological Sciences Section of Marine Ecology Building 1135, Ole Worms allé 1 DK-8000 Aarhus C, Denmark
UAB/ICTA	Institut de Ciència i Tecnologia Ambiental (ICTA) Grup de Física de les Radiacions Facultat de Ciències, C3-348 Universitat Autònoma de Barcelona (UAB) 08193-Cerdanyola del Vallès, Spain
UBC	Department of Earth and Ocean Sciences, University of British Columbia, 6339 Stores Road, Vancouver, BC, V6T1Z4, Canada
UBO	Université de Bretagne Occidentale Laboratoire des sciences de l'Environnement Marin Institut Universitaire Européen de la Mer (IUEM) Technopôle Brest-Iroise Place Nicolas Copernic F-29280 Plouzane, France

	Address
UIB	Departamento de Química. Sección Química Analítica Universidad de las Islas Baleares Cra. de Valldemossa, km 7.5. Palma Balearic Islands, SPAIN, 07122
ZMH	Biozentrum Grindel und Zoologisches Museum Martin-Luther-King Platz 3 20146 Hamburg
ZSM	Bavarian State Collection of Zoology (ZSM) Münchhausenstrasse 21, D-81247 München, Germany

A.2 FAHRTTEILNEHMER / CRUISE PARTICIPANTS

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession
Altenburg Soppa	Mariana	AWI	Oceanographer
Altvater	Fabian	AWI	Student, biology
Bogner	Boie	GEOMAR	Technician, chemistry
Brandão	Simone Nunes	Senckenberg/DZMB & Uni. Hamburg	Biologist
Brandt	Angelika	Uni Hamburg/Zoo. Mus.	Biologist
Brenneis	Tina	AWI	Technician, biology
Cedhagen	Tomas	Aarhus University	Biologist
Cheah	Wee	AWI	Biologist
Crayford	Sharyn	NIOZ	Technician, chemistry
Donnelly	Matthew	SoES	PhD student, physical oceanography
Graupner	Rainer	OPTIMARE	Technician
Hauck	Judith	AWI	PhD student, biological oceanography
Hauquier	Freija	Ghent Univ.	Biologist
Havermans	Charlotte	IRScNB	PhD student, biology
Hoppe	Clara	AWI	PhD student, biology
Hunt	Brian	UBC	Biologist
Iversen	Morten Hvitfeldt	MARUM	Biologist
Janussen	Dorte	Senckenberg Frankfurt am Main	Biologist
Jones	Elizabeth	NIOZ	Chemist
Jörger	Katharina	ZSM	PhD student, biology
Klaas	Christine	AWI	Biologist
Kottmeier	Dorothee	AWI	Student, biology
Kottmeier	Rita	AWI	Student, biology
Krüger	Matthias	IFM-GEOMAR	Student, physical oceanography
Laglera Baquer	Luis Miguel	UIB	Chemist

Name/ Last name	**Vorname/ First name**	**Institut/ Institute**	**Beruf/ Profession**
Leach	Harry	SoES	Phys. Oceanographer
Lejzerowicz	Franck	DGE Geneva	PhD student, biology
Meyer-Löbbecke	Anna	Uni HH/Zool. Museum	Student, biologist
Müller	Felix	AWI	Student, biotechnology
Mulsow	Sandor	LEET-UACH	Geologist
Norman	Louisa	CAWCR/UTS	PhD student, biology
Pakhomov	Evgeny	UBC	Biologist
Prandke	Hartmut	ISW Wassermesstech.	Physicist
Puigcorbé Lacueva	Viena	UAB/ICTA	Environmental scientist
Roca Martí	Montserrat	UAB/ICTA	Environmental scientist
Rüger	Theresa	AWI	Student, biology
Salt	Lesley	NIOZ	PhD student, chemistry
Sander	Hendrik	OPTIMARE	Engineer
Santos-Echeandía	Juan	IIM-CSIC	Marine scientist
Schourup-Kristensen	Vibe	AWI	PhD student, biology
Schnurr	Sarah	Senckenberg/DZMB	Student, biology
Schwabe	Enrico	ZSM	Technician
Simon	Heike	AWI	PhD student, biology
Stöven	Tim	IFM-GEOMAR	PhD student, chemistry
Strass	Volker	AWI	Phys. Oceanographer
Trimborn	Scarlett	AWI	Biologist
Vortkamp	Martina	Senckenberg/DZMB	Technician, biology
Wolf-Gladrow	Dieter	AWI	Physicist
Würzberg	Laura	Uni HH/Zool. Museum	Biologist
Zinkann	Ann-Christine	ZSM	Student, biology

A.3 SCHIFFSBESATZUNG / SHIP'S CREW

Name	Rank
Pahl, Uwe	Master
Grundmann, Uwe	1. Offc.
Krohn, Günter	Ch. Eng.
Fallei, Holger	2. Offc.
Gumtow, Philipp	2. Offc.
Rackete, Carola	2. Offc.
Leichtle, Marion	Doctor
Hecht, Andreas	R. Offc.
Sümnicht, Stefan	2. Eng.
Minzlaff, Hans-Ulrich	2. Eng.
Holst, Wolfgang	3. Eng.
Scholz, Manfred	Elec. Tech.
Dimmler, Werner	ELO
Stronzek, David	ELO
Nasis, Ilias	ELO
Himmel,Frank	ELO
Voy, Bernd	Boatsw.
Reise, Lutz	Carpenter
Scheel, Sebastian	A.B.
Brickmann, Peter	A.B.
Winkler, Michael	A.B.
Hagemann, Manfred	A.B.
Schmidt, Uwe	A.B.
Guse, Hartmut	A.B.
Wende, Uwe	A.B.
Bäcker, Andreas	A.B.
Preußner, Jörg	Storek.
Teichert, Uwe	Mot-man
Elsner, Klaus	Mot-man
Schütt, Norbert	Mot-man
Pinske, Lutz	Mot-man
Plehn, Markus	Mot-man
Müller-Homburg, Ralf-Dieter	Cook
Silinski, Frank	Cooksmate
Völske, Thomas	Cooksmate
Czyborra, Bärbel	1. Stwdess

Name	Rank
Wöckener, Martina	Stwdess/KS
Gaude, Hans-Jürgen	2. Steward
Silinski, Carmen	2. Stwdess
Kraft, Henry	2. Steward
Möller, Wolfgang	2. Steward
Sun, Yong Shen	2. Steward
Yu, Kwok Yuen	Laundrym.

A4. STATIONSLISTE / STATION LIST PS79

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/056-1	10.01.12	08:15	CTD/RO	zu Wasser	40° 47,29' S	12° 45,68'E	4654
PS79/056-1	10.01.12	08:24	CTD/RO	am Grund/ auf Tiefe	40° 47,17' S	12° 45,75'E	4654,7
PS79/056-1	10.01.12	08:26	CTD/RO	Hieven	40° 47,14' S	12° 45,76'E	4654,7
PS79/056-1	10.01.12	08:34	CTD/RO	an Deck	40° 47,06' S	12° 45,84'E	4655
PS79/056-2	10.01.12	08:43	GO-FLO	zu Wasser	40° 46,96' S	12° 45,93'E	4655,2
PS79/056-2	10.01.12	09:07	GO-FLO	am Grund/ auf Tiefe	40° 46,78' S	12° 46,05'E	4656,7
PS79/056-2	10.01.12	09:12	GO-FLO	Hieven	40° 46,75' S	12° 46,10'E	4656,5
PS79/056-2	10.01.12	09:37	GO-FLO	an Deck	40° 46,61' S	12° 46,07'E	4654,2
PS79/057-1	11.01.12	10:40	CTD/RO	zu Wasser	44° 0,07' S	10° 0,21'E	4683,5
PS79/057-1	11.01.12	12:25	CTD/RO	am Grund/ auf Tiefe	44° 0,07' S	10° 0,28'E	4583,5
PS79/057-1	11.01.12	12:27	CTD/RO	Hieven	44° 0,06' S	10° 0,29'E	4670,2
PS79/057-1	11.01.12	13:58	CTD/RO	an Deck	44° 0,24' S	10° 0,72'E	4669
PS79/057-2	11.01.12	14:10	GO-FLO	zu Wasser	43° 59,93' S	10° 0,12'E	4497,5
PS79/057-2	11.01.12	14:54	GO-FLO	am Grund/ auf Tiefe	44° 0,10' S	10° 0,22'E	4675,7
PS79/057-2	11.01.12	14:54	GO-FLO	Aktion	44° 0,10' S	10° 0,22'E	4675,7
PS79/057-2	11.01.12	15:00	GO-FLO	Hieven	44° 0,12' S	10° 0,21'E	4677,5
PS79/057-2	11.01.12	15:15	GO-FLO	an Deck	44° 0,15' S	10° 0,30'E	4626,7
PS79/057-3	11.01.12	15:44	RAMSES	zu Wasser	43° 59,89' S	9° 59,72'E	4470
PS79/057-3	11.01.12	16:02	RAMSES	am Grund/ auf Tiefe	43° 59,87' S	9° 59,74'E	4472
PS79/057-3	11.01.12	16:03	RAMSES	Hieven	43° 59,87' S	9° 59,75'E	4468,5
PS79/057-3	11.01.12	16:15	RAMSES	Wasserober-fläche	43° 59,86' S	9° 59,77'E	4459
PS79/057-3	11.01.12	16:16	RAMSES	an Deck	43° 59,86' S	9° 59,77'E	4466,5
PS79/057-4	11.01.12	16:31	CTD	zu Wasser	43° 59,80' S	9° 59,74'E	4453,7
PS79/057-4	11.01.12	16:47	CTD	am Grund/ auf Tiefe	43° 59,76' S	9° 59,92'E	4443,5
PS79/057-4	11.01.12	16:49	CTD	Hieven	43° 59,76' S	9° 59,94'E	4443,5
PS79/057-4	11.01.12	17:05	CTD	Wasserober-fläche	43° 59,71' S	10° 0,00'E	4437,2
PS79/057-4	11.01.12	17:06	CTD	an Deck	43° 59,71' S	10° 0,00'E	4435,5
PS79/057-5	11.01.12	17:27	ISP	zu Wasser	43° 59,71' S	10° 0,09'E	4438,5
PS79/057-5	11.01.12	17:35	ISP	Aktion	43° 59,73' S	10° 0,07'E	4442,2
PS79/057-5	11.01.12	17:44	ISP	Aktion	43° 59,76' S	10° 0,00'E	4465,2
PS79/057-5	11.01.12	17:47	ISP	am Grund/ auf Tiefe	43° 59,77' S	9° 59,98'E	4260
PS79/057-6	11.01.12	18:36	HN	zu Wasser	43° 59,99' S	9° 59,79'E	4589,5
PS79/057-6	11.01.12	18:37	HN	am Grund/ auf Tiefe	44° 0,00' S	9° 59,79'E	4541,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/057-6	11.01.12	18:37	HN	an Deck	44° 0,00' S	9° 59,79'E	4541,7
PS79/057-5	11.01.12	20:28	ISP	Hieven	44° 0,98' S	9° 58,29'E	4510,5
PS79/057-5	11.01.12	20:37	ISP	an Deck	44° 1,14' S	9° 57,99'E	4463,5
PS79/057-5	11.01.12	20:40	ISP	an Deck	44° 1,19' S	9° 57,91'E	4775
PS79/057-5	11.01.12	20:48	ISP	an Deck	44° 1,35' S	9° 57,77'E	4774
PS79/057-5	11.01.12	20:51	ISP	an Deck	44° 1,42' S	9° 57,75'E	4771,7
PS79/057-7	11.01.12	21:25	RMT	zu Wasser	44° 1,48' S	9° 55,95'E	4771,5
PS79/057-7	11.01.12	21:40	RMT	Profil Anfang	44° 1,31' S	9° 55,22'E	4757
PS79/057-7	11.01.12	21:56	RMT	am Grund/ auf Tiefe	44° 1,09' S	9° 54,45'E	4749,7
PS79/057-7	11.01.12	21:56	RMT	Hieven	44° 1,09' S	9° 54,45'E	4749,7
PS79/057-7	11.01.12	22:31	RMT	Profil Ende	44° 2,00' S	9° 52,22'E	4630,5
PS79/057-7	11.01.12	22:31	RMT	an Deck	44° 2,00' S	9° 52,22'E	4630,5
PS79/058-1	12.01.12	01:00	CTD/RO	zu Wasser	44° 20,17' S	10° 0,13'E	4686
PS79/058-1	12.01.12	01:31	CTD/RO	am Grund/ auf Tiefe	44° 20,57' S	10° 0,23'E	4687,2
PS79/058-1	12.01.12	01:31	CTD/RO	Hieven	44° 20,57' S	10° 0,23'E	4687,2
PS79/058-1	12.01.12	02:05	CTD/RO	an Deck	44° 21,04' S	10° 0,56'E	4687,2
PS79/059-1	12.01.12	04:39	CTD	zu Wasser	44° 40,09' S	10° 0,07'E	4744,7
PS79/059-1	12.01.12	05:07	CTD	am Grund/ auf Tiefe	44° 40,39' S	10° 0,39'E	4741
PS79/059-1	12.01.12	05:09	CTD	Hieven	44° 40,41' S	10° 0,39'E	4741
PS79/059-1	12.01.12	05:32	CTD	Wasserober-fläche	44° 40,59' S	10° 0,56'E	4739
PS79/059-1	12.01.12	05:33	CTD	an Deck	44° 40,59' S	10° 0,57'E	4738,7
PS79/060-1	12.01.12	08:11	CTD/RO	zu Wasser	44° 59,92' S	9° 59,90'E	4573,5
PS79/060-1	12.01.12	09:48	CTD/RO	am Grund/ auf Tiefe	45° 0,48' S	10° 0,05'E	4600,2
PS79/060-1	12.01.12	09:49	CTD/RO	Hieven	45° 0,49' S	10° 0,05'E	4600,2
PS79/060-2	12.01.12	09:57	HN	zu Wasser	45° 0,54' S	10° 0,08'E	4604,2
PS79/060-2	12.01.12	10:00	HN	am Grund/ auf Tiefe	45° 0,55' S	10° 0,10'E	4606,2
PS79/060-2	12.01.12	10:00	HN	an Deck	45° 0,55' S	10° 0,10'E	4606,2
PS79/060-1	12.01.12	11:19	CTD/RO	an Deck	45° 1,05' S	10° 0,50'E	4635,5
PS79/060-3	12.01.12	11:36	GO-FLO	zu Wasser	45° 1,15' S	10° 0,58'E	4638,2
PS79/060-3	12.01.12	12:05	GO-FLO	am Grund/ auf Tiefe	45° 1,39' S	10° 0,63'E	4637,7
PS79/060-3	12.01.12	12:09	GO-FLO	Hieven	45° 1,43' S	10° 0,64'E	4637,7
PS79/060-3	12.01.12	12:28	GO-FLO	an Deck	45° 1,60' S	10° 0,70'E	4635,5
PS79/060-4	12.01.12	12:34	RAMSES	zu Wasser	45° 1,64' S	10° 0,70'E	4635,7
PS79/060-4	12.01.12	13:05	RAMSES	am Grund/ auf Tiefe	45° 1,92' S	10° 0,68'E	4630,5
PS79/060-4	12.01.12	13:06	RAMSES	Hieven	45° 1,93' S	10° 0,67'E	4632
PS79/060-4	12.01.12	13:17	RAMSES	an Deck	45° 2,03' S	10° 0,58'E	4627,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/060-5	12.01.12	13:31	CTD/RO	zu Wasser	45° 2,14' S	10° 0,68'E	4628,2
PS79/060-5	12.01.12	13:47	CTD/RO	am Grund/ auf Tiefe	45° 2,23' S	10° 0,83'E	4631,2
PS79/060-5	12.01.12	13:47	CTD/RO	Hieven	45° 2,23' S	10° 0,83'E	4631,2
PS79/060-5	12.01.12	14:04	CTD/RO	an Deck	45° 2,36' S	10° 0,83'E	4630
PS79/060-6	12.01.12	14:30	RMT	zu Wasser	45° 2,71' S	9° 59,55'E	4602,7
PS79/060-6	12.01.12	14:47	RMT	am Grund/ auf Tiefe	45° 2,95' S	9° 58,40'E	4591
PS79/060-6	12.01.12	14:48	RMT	Profil Anfang	45° 2,96' S	9° 58,33'E	4590,2
PS79/060-6	12.01.12	15:14	RMT	Profil Ende	45° 3,31' S	9° 56,69'E	4583,2
PS79/060-6	12.01.12	15:16	RMT	Wasserober-fläche	45° 3,33' S	9° 56,64'E	4581,5
PS79/060-6	12.01.12	15:18	RMT	an Deck	45° 3,34' S	9° 56,63'E	4446,5
PS79/061-1	12.01.12	17:27	CTD	zu Wasser	45° 20,12' S	9° 59,47'E	4685,2
PS79/061-1	12.01.12	17:55	CTD	am Grund/ auf Tiefe	45° 20,64' S	9° 59,48'E	4682
PS79/061-1	12.01.12	17:55	CTD	Hieven	45° 20,64' S	9° 59,48'E	4682
PS79/061-1	12.01.12	18:21	CTD	Wasserober-fläche	45° 21,02' S	9° 59,28'E	4679,7
PS79/061-1	12.01.12	18:22	CTD	an Deck	45° 21,04' S	9° 59,26'E	4681
PS79/062-1	12.01.12	20:54	CTD/RO	zu Wasser	45° 40,50' S	10° 0,41'E	4644
PS79/062-1	12.01.12	21:24	CTD/RO	am Grund/ auf Tiefe	45° 41,13' S	10° 1,26'E	4642,5
PS79/062-1	12.01.12	21:26	CTD/RO	Hieven	45° 41,17' S	10° 1,27'E	4642,7
PS79/062-1	12.01.12	21:57	CTD/RO	an Deck	45° 41,65' S	10° 1,45'E	4654,7
PS79/063-1	13.01.12	00:28	RMT	zu Wasser	45° 59,96' S	10° 0,60'E	4700,7
PS79/063-1	13.01.12	00:48	RMT	Profil Anfang	46° 0,10' S	9° 59,58'E	4695,2
PS79/063-1	13.01.12	01:11	RMT	Profil Ende	46° 0,25' S	9° 58,34'E	4691,2
PS79/063-1	13.01.12	01:13	RMT	Wasserober-fläche	46° 0,25' S	9° 58,30'E	4689,5
PS79/063-1	13.01.12	01:16	RMT	an Deck	46° 0,25' S	9° 58,32'E	4689,7
PS79/063-2	13.01.12	01:34	CTD/RO	zu Wasser	46° 0,23' S	9° 58,82'E	4694,2
PS79/063-2	13.01.12	01:51	CTD/RO	am Grund/ auf Tiefe	46° 0,34' S	9° 58,97'E	4695,2
PS79/063-2	13.01.12	01:52	CTD/RO	Hieven	46° 0,35' S	9° 58,98'E	4696
PS79/063-2	13.01.12	02:10	CTD/RO	an Deck	46° 0,41' S	9° 59,31'E	4695,7
PS79/063-3	13.01.12	02:56	CTD/RO	zu Wasser	46° 0,51' S	10° 0,07'E	4700,7
PS79/063-3	13.01.12	04:41	CTD/RO	am Grund/ auf Tiefe	46° 0,84' S	10° 0,77'E	4715,2
PS79/063-3	13.01.12	04:43	CTD/RO	Hieven	46° 0,85' S	10° 0,78'E	4715,5
PS79/063-3	13.01.12	06:10	CTD/RO	Wasserober-fläche	46° 1,51' S	10° 1,49'E	4719,5
PS79/063-3	13.01.12	06:11	CTD/RO	an Deck	46° 1,52' S	10° 1,50'E	4719,7
PS79/064-1	13.01.12	08:32	CTD/RO	zu Wasser	46° 20,22' S	10° 0,08'E	4893,5
PS79/064-1	13.01.12	08:59	CTD/RO	am Grund/ auf Tiefe	46° 20,56' S	10° 0,51'E	4896,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/064-1	13.01.12	09:01	CTD/RO	Hieven	46° 20,59' S	10° 0,54'E	4896
PS79/064-1	13.01.12	09:27	CTD/RO	an Deck	46° 20,91' S	10° 0,74'E	4897
PS79/065-1	13.01.12	11:49	CTD/RO	zu Wasser	46° 39,99' S	10° 0,06'E	4964,7
PS79/065-1	13.01.12	12:16	CTD/RO	am Grund/ auf Tiefe	46° 40,12' S	10° 0,44'E	4965,5
PS79/065-1	13.01.12	12:17	CTD/RO	Hieven	46° 40,13' S	10° 0,45'E	4965,7
PS79/065-1	13.01.12	12:43	CTD/RO	an Deck	46° 40,31' S	10° 0,69'E	4966,5
PS79/066-1	13.01.12	15:16	CTD/RO	zu Wasser	46° 59,92' S	10° 0,03'E	4302,5
PS79/066-1	13.01.12	15:33	CTD/RO	zu Wasser	46° 59,87' S	10° 0,12'E	4317,8
PS79/066-1	13.01.12	15:33	CTD/RO	am Grund/ auf Tiefe	46° 59,87' S	10° 0,12'E	4317,8
PS79/066-1	13.01.12	15:53	CTD/RO	an Deck	46° 59,85' S	10° 0,24'E	4340,6
PS79/066-2	13.01.12	15:59	FRRF	zu Wasser	46° 59,84' S	10° 0,33'E	4349,9
PS79/066-2	13.01.12	16:00	FRRF	Fieren	46° 59,83' S	10° 0,35'E	4350,4
PS79/066-2	13.01.12	16:19	FRRF	am Grund/ auf Tiefe	46° 59,83' S	10° 0,48'E	4364
PS79/066-2	13.01.12	16:19	FRRF	Hieven	46° 59,83' S	10° 0,48'E	4364
PS79/066-2	13.01.12	16:35	FRRF	an Deck	46° 59,87' S	10° 0,48'E	4358,1
PS79/066-3	13.01.12	16:44	HN	zu Wasser	46° 59,89' S	10° 0,48'E	4356,2
PS79/066-3	13.01.12	16:47	HN	am Grund/ auf Tiefe	46° 59,90' S	10° 0,48'E	4354,1
PS79/066-3	13.01.12	16:49	HN	an Deck	46° 59,91' S	10° 0,48'E	4350,3
PS79/066-4	13.01.12	16:57	CTD	zu Wasser	46° 59,94' S	10° 0,48'E	4351,4
PS79/066-4	13.01.12	18:29	CTD	am Grund/ auf Tiefe	47° 0,61' S	10° 0,81'E	4297
PS79/066-4	13.01.12	18:30	CTD	Hieven	47° 0,62' S	10° 0,80'E	4298,8
PS79/066-4	13.01.12	19:47	CTD	Wasserober- fläche	47° 1,56' S	10° 0,81'E	4157,4
PS79/066-4	13.01.12	19:48	CTD	an Deck	47° 1,57' S	10° 0,81'E	4151
PS79/066-5	13.01.12	20:03	RMT	zu Wasser	47° 1,55' S	10° 0,55'E	4169,8
PS79/066-5	13.01.12	20:05	RMT	Profil Anfang	47° 1,49' S	10° 0,48'E	4180,6
PS79/066-5	13.01.12	20:21	RMT	am Grund/ auf Tiefe	47° 1,04' S	10° 0,05'E	4188,4
PS79/066-5	13.01.12	20:21	RMT	Hieven	47° 1,04' S	10° 0,05'E	4188,4
PS79/066-5	13.01.12	20:50	RMT	Profil Ende	47° 0,25' S	9° 59,33'E	4217,7
PS79/066-5	13.01.12	20:55	RMT	an Deck	47° 0,14' S	9° 59,24'E	4224,3
PS79/067-1	13.01.12	23:15	CTD/RO	zu Wasser	47° 20,00' S	9° 59,87'E	4053,6
PS79/067-1	13.01.12	23:44	CTD/RO	am Grund/ auf Tiefe	47° 19,99' S	9° 59,89'E	4057
PS79/067-1	13.01.12	23:46	CTD/RO	Hieven	47° 19,99' S	9° 59,89'E	4059,5
PS79/067-1	14.01.12	00:14	CTD/RO	an Deck	47° 20,06' S	9° 59,99'E	4060,4
PS79/068-1	14.01.12	02:47	CTD/RO	zu Wasser	47° 40,03' S	9° 59,95'E	2154,2
PS79/068-1	14.01.12	03:15	CTD/RO	am Grund/ auf Tiefe	47° 40,23' S	10° 0,01'E	2095,3
PS79/068-1	14.01.12	03:15	CTD/RO	Hieven	47° 40,23' S	10° 0,01'E	2095,3

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/068-1	14.01.12	03:45	CTD/RO	an Deck	47° 40,33' S	10° 0,14'E	2100,3
PS79/069-1	15.01.12	05:03	CTD	zu Wasser	47° 59,79' S	10° 0,16'E	4242,6
PS79/069-1	15.01.12	05:20	CTD	am Grund/ auf Tiefe	47° 59,78' S	10° 0,35'E	4241,1
PS79/069-1	15.01.12	05:20	CTD	Hieven	47° 59,78' S	10° 0,35'E	4241,1
PS79/069-1	15.01.12	05:26	CTD	Wasserober-fläche	47° 59,78' S	10° 0,36'E	4239,5
PS79/069-1	15.01.12	05:27	CTD	an Deck	47° 59,78' S	10° 0,36'E	4244,6
PS79/069-1	15.01.12	05:28	CTD	Aktion	47° 59,78' S	10° 0,37'E	4241
PS79/069-1	15.01.12	05:39	CTD	Aktion	47° 59,78' S	10° 0,38'E	4234,2
PS79/069-2	15.01.12	05:44	CTD	zu Wasser	47° 59,78' S	10° 0,39'E	4242,4
PS79/069-2	15.01.12	07:16	CTD	am Grund/ auf Tiefe	47° 59,93' S	10° 0,07'E	4240,2
PS79/069-2	15.01.12	07:17	CTD	Hieven	47° 59,94' S	10° 0,07'E	4229,6
PS79/069-3	15.01.12	08:10	HN	zu Wasser	48° 0,17' S	9° 59,53'E	4212,8
PS79/069-3	15.01.12	08:13	HN	am Grund/ auf Tiefe	48° 0,17' S	9° 59,55'E	4214,9
PS79/069-3	15.01.12	08:18	HN	an Deck	48° 0,16' S	9° 59,60'E	4217,2
PS79/069-2	15.01.12	08:36	CTD	an Deck	48° 0,13' S	9° 59,63'E	0
PS79/069-4	15.01.12	08:50	ISP	zu Wasser	48° 0,16' S	9° 59,61'E	4187
PS79/069-4	15.01.12	09:13	ISP	am Grund/ auf Tiefe	48° 0,18' S	9° 59,56'E	4185
PS79/069-4	15.01.12	11:31	ISP	Hieven	48° 0,26' S	9° 59,04'E	4183,2
PS79/069-4	15.01.12	11:48	ISP	an Deck	48° 0,24' S	9° 58,97'E	4180,9
PS79/069-5	15.01.12	11:56	CTD/RO	zu Wasser	48° 0,26' S	9° 58,95'E	4181,7
PS79/069-5	15.01.12	12:13	CTD/RO	am Grund/ auf Tiefe	48° 0,36' S	9° 58,85'E	4181,3
PS79/069-5	15.01.12	12:13	CTD/RO	Hieven	48° 0,36' S	9° 58,85'E	4181,3
PS79/069-5	15.01.12	12:34	CTD/RO	an Deck	48° 0,37' S	9° 58,90'E	4186,7
PS79/069-6	15.01.12	12:45	HN	zu Wasser	48° 0,40' S	9° 58,95'E	4168,9
PS79/069-6	15.01.12	12:50	HN	am Grund/ auf Tiefe	48° 0,40' S	9° 58,95'E	4170,4
PS79/069-6	15.01.12	12:51	HN	an Deck	48° 0,39' S	9° 58,95'E	4171,9
PS79/069-7	15.01.12	12:57	RMT	zu Wasser	48° 0,18' S	9° 58,87'E	4175
PS79/069-7	15.01.12	13:16	RMT	Profil Anfang	47° 59,33' S	9° 58,27'E	4185,7
PS79/069-7	15.01.12	13:16	RMT	Hieven	47° 59,33' S	9° 58,27'E	4185,7
PS79/069-7	15.01.12	13:42	RMT	Profil Ende	47° 58,15' S	9° 57,44'E	4189,7
PS79/069-7	15.01.12	13:43	RMT	Wasserober-fläche	47° 58,11' S	9° 57,40'E	4190,3
PS79/069-7	15.01.12	13:46	RMT	an Deck	47° 58,05' S	9° 57,35'E	4190,3
PS79/070-1	15.01.12	16:17	GO-FLO	zu Wasser	48° 20,01' S	9° 59,71'E	3411,1
PS79/070-1	15.01.12	16:49	GO-FLO	am Grund/ auf Tiefe	48° 20,12' S	9° 59,81'E	3333,8
PS79/070-1	15.01.12	16:56	GO-FLO	Hieven	48° 20,12' S	9° 59,83'E	0

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/070-1	15.01.12	17:00	GO-FLO	am Grund/ auf Tiefe	48° 20,10' S	9° 59,81'E	3337,6
PS79/070-1	15.01.12	17:05	GO-FLO	Hieven	48° 20,17' S	9° 59,76'E	3326,7
PS79/070-1	15.01.12	17:18	GO-FLO	Wasserober-fläche	48° 20,20' S	9° 59,82'E	3326,8
PS79/070-1	15.01.12	17:19	GO-FLO	an Deck	48° 20,21' S	9° 59,83'E	3327,6
PS79/070-2	15.01.12	17:25	RAMSES	zu Wasser	48° 20,19' S	9° 59,83'E	0
PS79/070-2	15.01.12	17:47	RAMSES	am Grund/ auf Tiefe	48° 20,15' S	9° 59,88'E	3337
PS79/070-2	15.01.12	17:47	RAMSES	Hieven	48° 20,15' S	9° 59,88'E	3337
PS79/070-2	15.01.12	18:02	RAMSES	an Deck	48° 20,10' S	9° 59,91'E	3479,3
PS79/070-3	15.01.12	18:13	CTD/RO	zu Wasser	48° 20,07' S	10° 0,00'E	3360,6
PS79/070-3	15.01.12	18:38	CTD/RO	am Grund/ auf Tiefe	48° 20,25' S	10° 0,02'E	3323
PS79/070-3	15.01.12	18:39	CTD/RO	Hieven	48° 20,25' S	10° 0,02'E	3323,8
PS79/070-3	15.01.12	19:06	CTD/RO	Wasserober-fläche	48° 20,22' S	9° 59,91'E	3325,2
PS79/070-3	15.01.12	19:07	CTD/RO	an Deck	48° 20,22' S	9° 59,92'E	3326,9
PS79/071-1	15.01.12	21:21	CTD/RO	zu Wasser	48° 40,03' S	10° 0,27'E	3108
PS79/071-1	15.01.12	21:50	CTD/RO	am Grund/ auf Tiefe	48° 40,09' S	10° 0,29'E	3108,1
PS79/071-1	15.01.12	21:50	CTD/RO	Hieven	48° 40,09' S	10° 0,29'E	3108,1
PS79/071-1	15.01.12	22:20	CTD/RO	an Deck	48° 40,15' S	10° 0,19'E	0
PS79/072-1	16.01.12	00:36	CTD/RO	zu Wasser	48° 59,99' S	10° 0,23'E	3195,1
PS79/072-1	16.01.12	00:51	CTD/RO	am Grund/ auf Tiefe	48° 59,99' S	10° 0,42'E	0
PS79/072-1	16.01.12	00:52	CTD/RO	Hieven	48° 59,98' S	10° 0,42'E	0
PS79/072-1	16.01.12	01:13	CTD/RO	an Deck	48° 59,94' S	10° 0,67'E	3173,4
PS79/072-2	16.01.12	01:24	RMT	zu Wasser	48° 59,85' S	10° 0,45'E	3181,4
PS79/072-2	16.01.12	01:42	RMT	Profil Anfang	48° 59,71' S	9° 59,47'E	3234,1
PS79/072-2	16.01.12	01:42	RMT	Hieven	48° 59,71' S	9° 59,47'E	3234,1
PS79/072-2	16.01.12	02:06	RMT	Profil Ende	48° 59,60' S	9° 58,04'E	0
PS79/072-2	16.01.12	02:08	RMT	Wasserober-fläche	48° 59,60' S	9° 57,97'E	0
PS79/072-2	16.01.12	02:10	RMT	an Deck	48° 59,60' S	9° 57,95'E	3274,8
PS79/072-3	16.01.12	02:49	CTD/RO	zu Wasser	49° 0,00' S	10° 0,23'E	3195,6
PS79/072-3	16.01.12	04:00	CTD/RO	am Grund/ auf Tiefe	49° 0,00' S	10° 0,28'E	0
PS79/072-3	16.01.12	04:01	CTD/RO	Hieven	49° 0,01' S	10° 0,29'E	0
PS79/072-4	16.01.12	04:04	HN	zu Wasser	49° 0,03' S	10° 0,33'E	3195,2
PS79/072-4	16.01.12	04:05	HN	am Grund/ auf Tiefe	49° 0,04' S	10° 0,35'E	0
PS79/072-4	16.01.12	04:07	HN	an Deck	49° 0,05' S	10° 0,40'E	0
PS79/072-5	16.01.12	04:33	HN	zu Wasser	49° 0,24' S	10° 0,64'E	3181,4
PS79/072-5	16.01.12	04:34	HN	am Grund/ auf Tiefe	49° 0,25' S	10° 0,65'E	0

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/072-5	16.01.12	04:39	HN	an Deck	49° 0,30' S	10° 0,72'E	0
PS79/072-3	16.01.12	05:06	CTD/RO	Wasserober-fläche	49° 0,54' S	10° 0,93'E	0
PS79/072-3	16.01.12	05:07	CTD/RO	an Deck	49° 0,55' S	10° 0,94'E	0
PS79/072-6	16.01.12	05:24	MUC	zu Wasser	48° 59,98' S	10° 0,08'E	3201
PS79/072-6	16.01.12	06:17	MUC	am Grund/ auf Tiefe	48° 59,96' S	10° 0,22'E	3195,2
PS79/072-6	16.01.12	06:18	MUC	Hieven	48° 59,96' S	10° 0,22'E	3196,3
PS79/072-6	16.01.12	07:01	MUC	Wasserober-fläche	48° 59,98' S	10° 0,18'E	0
PS79/072-6	16.01.12	07:03	MUC	an Deck	48° 59,98' S	10° 0,16'E	3198
PS79/072-7	16.01.12	07:30	MUC	zu Wasser	49° 0,00' S	10° 0,28'E	0
PS79/072-7	16.01.12	08:32	MUC	am Grund/ auf Tiefe	48° 59,99' S	10° 0,16'E	0
PS79/072-7	16.01.12	09:26	MUC	an Deck	49° 0,20' S	10° 0,33'E	0
PS79/073-1	16.01.12	11:46	FRRF	zu Wasser	49° 20,44' S	9° 59,86'E	4026,2
PS79/073-1	16.01.12	12:03	FRRF	am Grund/ auf Tiefe	49° 20,48' S	10° 0,02'E	4019,7
PS79/073-1	16.01.12	12:04	FRRF	Hieven	49° 20,49' S	10° 0,06'E	4019,2
PS79/073-1	16.01.12	12:20	FRRF	an Deck	49° 20,61' S	10° 0,45'E	4005
PS79/073-2	16.01.12	12:32	CTD/RO	zu Wasser	49° 20,58' S	10° 0,43'E	4006
PS79/073-2	16.01.12	13:03	CTD/RO	am Grund/ auf Tiefe	49° 20,68' S	10° 0,81'E	3990,5
PS79/073-2	16.01.12	13:03	CTD/RO	Hieven	49° 20,68' S	10° 0,81'E	3990,5
PS79/073-2	16.01.12	13:31	CTD/RO	an Deck	49° 20,68' S	10° 1,15'E	3980,2
PS79/073-3	16.01.12	14:08	MUC	zu Wasser	49° 20,66' S	10° 1,27'E	3968,7
PS79/073-3	16.01.12	14:09	MUC	am Grund/ auf Tiefe	49° 20,66' S	10° 1,28'E	3968,7
PS79/073-3	16.01.12	14:12	MUC	Wasserober-fläche	49° 20,67' S	10° 1,31'E	3982,5
PS79/073-3	16.01.12	14:12	MUC	Fieren	49° 20,67' S	10° 1,31'E	3982,5
PS79/073-3	16.01.12	14:14	MUC	am Grund/ auf Tiefe	49° 20,69' S	10° 1,33'E	3946,5
PS79/073-3	16.01.12	14:18	MUC	an Deck	49° 20,68' S	10° 1,30'E	3967,7
PS79/074-1	16.01.12	16:35	CTD	zu Wasser	49° 40,01' S	10° 0,13'E	4084,7
PS79/074-1	16.01.12	17:00	CTD	am Grund/ auf Tiefe	49° 40,02' S	10° 0,16'E	4074,7
PS79/074-1	16.01.12	17:01	CTD	Hieven	49° 40,01' S	10° 0,15'E	4080,5
PS79/074-1	16.01.12	17:27	CTD	Wasserober-fläche	49° 40,01' S	10° 0,05'E	4093
PS79/074-1	16.01.12	17:28	CTD	an Deck	49° 40,01' S	10° 0,05'E	4118,2
PS79/075-1	16.01.12	19:46	CTD	zu Wasser	50° 0,00' S	9° 59,95'E	3650,5
PS79/075-2	16.01.12	20:44	HN	zu Wasser	50° 0,13' S	9° 59,67'E	3644,2
PS79/075-2	16.01.12	20:51	HN	am Grund/ auf Tiefe	50° 0,15' S	9° 59,74'E	3642,2
PS79/075-2	16.01.12	20:52	HN	an Deck	50° 0,15' S	9° 59,75'E	3642,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/075-1	16.01.12	21:02	CTD	am Grund/ auf Tiefe	50° 0,09' S	9° 59,69'E	3645
PS79/075-1	16.01.12	21:03	CTD	Hieven	50° 0,09' S	9° 59,69'E	3646,2
PS79/075-3	16.01.12	21:17	HN	zu Wasser	50° 0,15' S	9° 59,78'E	3656,7
PS79/075-3	16.01.12	21:27	HN	am Grund/ auf Tiefe	50° 0,12' S	9° 59,76'E	3643,7
PS79/075-3	16.01.12	21:27	HN	an Deck	50° 0,12' S	9° 59,76'E	3643,7
PS79/075-1	16.01.12	22:21	CTD	an Deck	50° 0,43' S	9° 59,59'E	3634,7
PS79/075-4	16.01.12	22:38	RMT	zu Wasser	50° 0,15' S	9° 59,30'E	3593,3
PS79/075-4	16.01.12	22:40	RMT	Profil Anfang	50° 0,10' S	9° 59,23'E	3601,7
PS79/075-4	16.01.12	22:56	RMT	am Grund/ auf Tiefe	49° 59,70' S	9° 58,85'E	3576,5
PS79/075-4	16.01.12	22:56	RMT	Hieven	49° 59,70' S	9° 58,85'E	3576,5
PS79/075-4	16.01.12	23:22	RMT	Profil Ende	49° 59,08' S	9° 58,25'E	3552,7
PS79/075-4	16.01.12	23:23	RMT	an Deck	49° 59,06' S	9° 58,25'E	3552,5
PS79/075-5	17.01.12	06:19	TEST	Aktion	50° 0,13' S	9° 59,50'E	3624,5
PS79/075-5	17.01.12	06:29	TEST	Aktion	50° 0,22' S	9° 59,67'E	3640,5
PS79/075-5	17.01.12	07:20	TEST	am Grund/ auf Tiefe	50° 0,55' S	9° 59,34'E	3619,7
PS79/075-5	17.01.12	07:26	TEST	Hieven	50° 0,61' S	9° 59,42'E	3627,2
PS79/075-5	17.01.12	08:16	TEST	an Deck	50° 0,94' S	9° 59,11'E	3608,5
PS79/075-6	17.01.12	08:31	MUC	zu Wasser	50° 1,02' S	9° 59,13'E	3604,5
PS79/075-6	17.01.12	09:22	MUC	am Grund/ auf Tiefe	50° 1,45' S	9° 58,90'E	3544,5
PS79/075-6	17.01.12	10:14	MUC	an Deck	50° 1,80' S	9° 59,02'E	3511,5
PS79/075-7	17.01.12	10:27	PUMP	zu Wasser	50° 1,88' S	9° 59,08'E	3516,2
PS79/075-7	17.01.12	10:30	PUMP	am Grund/ auf Tiefe	50° 1,90' S	9° 59,14'E	3521
PS79/075-7	17.01.12	11:56	PUMP	Hieven	50° 2,53' S	10° 0,96'E	3622,2
PS79/075-7	17.01.12	12:00	PUMP	an Deck	50° 2,56' S	10° 1,00'E	3621,5
PS79/075-8	17.01.12	12:17	RAMSES	zu Wasser	50° 2,74' S	10° 1,06'E	3608,5
PS79/075-8	17.01.12	12:40	RAMSES	am Grund/ auf Tiefe	50° 3,03' S	10° 1,20'E	3603,7
PS79/075-8	17.01.12	12:40	RAMSES	Hieven	50° 3,03' S	10° 1,20'E	3603,7
PS79/075-8	17.01.12	12:58	RAMSES	an Deck	50° 3,24' S	10° 1,14'E	3600
PS79/075-9	17.01.12	13:11	CTD/RO	zu Wasser	50° 3,34' S	10° 1,00'E	3588
PS79/075-9	17.01.12	13:33	CTD/RO	am Grund/ auf Tiefe	50° 3,57' S	10° 0,95'E	3584,5
PS79/075-9	17.01.12	13:34	CTD/RO	Hieven	50° 3,59' S	10° 0,97'E	3584,7
PS79/075-9	17.01.12	13:55	CTD/RO	an Deck	50° 3,86' S	10° 1,08'E	3582,2
PS79/075-10	17.01.12	14:38	MUC	zu Wasser	50° 3,46' S	10° 3,49'E	3672,2
PS79/075-11	17.01.12	14:55	HN	zu Wasser	50° 3,54' S	10° 3,71'E	3671,3
PS79/075-11	17.01.12	14:57	HN	am Grund/ auf Tiefe	50° 3,55' S	10° 3,70'E	3673,2
PS79/075-11	17.01.12	14:59	HN	an Deck	50° 3,55' S	10° 3,69'E	3672,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/075-10	17.01.12	15:27	MUC	am Grund/ auf Tiefe	50° 3,63' S	10° 3,69'E	3669,2
PS79/075-10	17.01.12	15:30	MUC	Hieven	50° 3,65' S	10° 3,71'E	3670,7
PS79/075-10	17.01.12	15:35	MUC	frei vom Grund	50° 3,67' S	10° 3,66'E	3668,2
PS79/075-10	17.01.12	16:22	MUC	Wasserober-fläche	50° 3,79' S	10° 4,19'E	3685,5
PS79/075-10	17.01.12	16:23	MUC	an Deck	50° 3,80' S	10° 4,22'E	3685,5
PS79/076-1	17.01.12	18:29	GO-FLO	zu Wasser	50° 19,91' S	10° 0,42'E	4367
PS79/076-1	17.01.12	18:55	GO-FLO	am Grund/ auf Tiefe	50° 19,80' S	10° 0,88'E	4362
PS79/076-1	17.01.12	18:59	GO-FLO	Hieven	50° 19,78' S	10° 0,91'E	4361,5
PS79/076-1	17.01.12	19:18	GO-FLO	Fieren	50° 19,71' S	10° 1,19'E	4359,2
PS79/076-1	17.01.12	19:29	GO-FLO	am Grund/ auf Tiefe	50° 19,70' S	10° 1,21'E	4363,5
PS79/076-1	17.01.12	19:38	GO-FLO	Hieven	50° 19,72' S	10° 1,27'E	4359,7
PS79/076-1	17.01.12	19:56	GO-FLO	an Deck	50° 19,76' S	10° 1,30'E	4359
PS79/076-2	17.01.12	20:01	CTD	zu Wasser	50° 19,78' S	10° 1,35'E	4356,3
PS79/076-2	17.01.12	20:27	CTD	am Grund/ auf Tiefe	50° 19,85' S	10° 1,44'E	4360,5
PS79/076-2	17.01.12	20:28	CTD	Hieven	50° 19,85' S	10° 1,45'E	4357,9
PS79/076-2	17.01.12	21:00	CTD	an Deck	50° 19,95' S	10° 1,34'E	4362
PS79/077-1	17.01.12	23:18	CTD/RO	zu Wasser	50° 39,87' S	9° 59,98'E	4228
PS79/077-1	17.01.12	23:43	CTD/RO	am Grund/ auf Tiefe	50° 39,90' S	9° 59,97'E	4227
PS79/077-1	17.01.12	23:45	CTD/RO	Hieven	50° 39,90' S	9° 59,97'E	4226,2
PS79/077-1	18.01.12	00:15	CTD/RO	an Deck	50° 39,88' S	9° 59,97'E	4227,5
PS79/078-1	18.01.12	02:35	CTD/RO	zu Wasser	51° 0,00' S	10° 0,03'E	3949,5
PS79/078-2	18.01.12	02:56	HN	zu Wasser	50° 59,97' S	10° 0,07'E	3951
PS79/078-1	18.01.12	02:57	CTD/RO	am Grund/ auf Tiefe	50° 59,97' S	10° 0,07'E	3951,5
PS79/078-1	18.01.12	02:58	CTD/RO	Hieven	50° 59,97' S	10° 0,07'E	3951
PS79/078-2	18.01.12	02:58	HN	am Grund/ auf Tiefe	50° 59,97' S	10° 0,07'E	3951
PS79/078-2	18.01.12	03:05	HN	an Deck	50° 59,97' S	10° 0,05'E	3951
PS79/078-1	18.01.12	03:19	CTD/RO	an Deck	50° 59,94' S	9° 59,99'E	3949
PS79/078-3	18.01.12	03:32	RMT	zu Wasser	50° 59,65' S	10° 0,18'E	3968,5
PS79/078-3	18.01.12	03:48	RMT	Profil Anfang	50° 59,20' S	10° 1,11'E	4035
PS79/078-3	18.01.12	03:48	RMT	Hieven	50° 59,20' S	10° 1,11'E	4035
PS79/078-3	18.01.12	04:12	RMT	Profil Ende	50° 58,62' S	10° 2,21'E	3955
PS79/078-3	18.01.12	04:13	RMT	Wasserober-fläche	50° 58,61' S	10° 2,24'E	3953,2
PS79/078-3	18.01.12	04:22	RMT	an Deck	50° 58,47' S	10° 2,50'E	3936,5
PS79/078-4	18.01.12	04:51	CTD	zu Wasser	51° 0,08' S	9° 59,93'E	3946
PS79/078-4	18.01.12	06:14	CTD	am Grund/ auf Tiefe	51° 1,13' S	10° 0,31'E	3905,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/078-4	18.01.12	06:15	CTD	Hieven	51° 1,15' S	10° 0,30'E	3904,2
PS79/078-4	18.01.12	07:42	CTD	Wasserober-fläche	51° 2,64' S	10° 1,40'E	0
PS79/078-4	18.01.12	07:44	CTD	an Deck	51° 2,68' S	10° 1,44'E	3941,2
PS79/078-5	18.01.12	08:18	MUC	zu Wasser	51° 0,06' S	10° 0,01'E	3944,7
PS79/078-5	18.01.12	09:13	MUC	am Grund/ auf Tiefe	51° 0,00' S	10° 0,00'E	3949,5
PS79/078-5	18.01.12	09:15	MUC	Hieven	51° 0,00' S	9° 59,99'E	3950,5
PS79/078-5	18.01.12	10:15	MUC	an Deck	51° 0,06' S	10° 0,03'E	3946,5
PS79/079-1	18.01.12	12:30	CTD/RO	zu Wasser	51° 20,13' S	10° 0,00'E	3909,6
PS79/079-1	18.01.12	13:01	CTD/RO	am Grund/ auf Tiefe	51° 20,18' S	9° 59,83'E	3901
PS79/079-1	18.01.12	13:03	CTD/RO	Hieven	51° 20,18' S	9° 59,82'E	3899,5
PS79/079-1	18.01.12	13:31	CTD/RO	an Deck	51° 20,21' S	9° 59,77'E	3896,5
PS79/079-2	18.01.12	13:41	RAMSES	zu Wasser	51° 20,22' S	9° 59,65'E	3890,5
PS79/079-2	18.01.12	14:00	RAMSES	am Grund/ auf Tiefe	51° 20,44' S	9° 59,74'E	3873,2
PS79/079-2	18.01.12	14:00	RAMSES	Hieven	51° 20,44' S	9° 59,74'E	3873,2
PS79/079-2	18.01.12	14:21	RAMSES	an Deck	51° 20,56' S	9° 59,69'E	3867,2
PS79/080-1	18.01.12	16:42	CTD	zu Wasser	51° 40,10' S	10° 0,14'E	3761,7
PS79/080-1	18.01.12	17:10	CTD	am Grund/ auf Tiefe	51° 40,27' S	10° 0,38'E	3757,7
PS79/080-1	18.01.12	17:11	CTD	Hieven	51° 40,27' S	10° 0,39'E	3768
PS79/080-1	18.01.12	17:38	CTD	Wasserober-fläche	51° 40,34' S	10° 0,53'E	3755
PS79/080-1	18.01.12	17:39	CTD	an Deck	51° 40,34' S	10° 0,54'E	3754,7
PS79/081-1	18.01.12	20:36	CTD/RO	zu Wasser	51° 59,92' S	10° 0,24'E	3752,7
PS79/081-1	18.01.12	22:06	CTD/RO	am Grund/ auf Tiefe	52° 0,07' S	10° 0,54'E	3747,7
PS79/081-1	18.01.12	22:06	CTD/RO	Hieven	52° 0,07' S	10° 0,54'E	3747,7
PS79/081-1	18.01.12	23:31	CTD/RO	an Deck	52° 0,24' S	10° 0,46'E	3752,5
PS79/081-2	18.01.12	23:54	RMT	zu Wasser	52° 0,30' S	10° 0,41'E	3753,5
PS79/081-2	19.01.12	00:12	RMT	Profil Anfang	52° 0,63' S	9° 59,35'E	3949,2
PS79/081-2	19.01.12	00:13	RMT	Hieven	52° 0,65' S	9° 59,30'E	3773,5
PS79/081-2	19.01.12	00:35	RMT	Profil Ende	52° 1,06' S	9° 58,04'E	3795
PS79/081-2	19.01.12	00:37	RMT	Wasserober-fläche	52° 1,08' S	9° 57,92'E	3788,2
PS79/081-2	19.01.12	00:40	RMT	an Deck	52° 1,10' S	9° 57,83'E	3785
PS79/081-3	19.01.12	01:13	ISP	zu Wasser	52° 0,88' S	9° 59,77'E	3767,7
PS79/081-3	19.01.12	01:39	ISP	am Grund/ auf Tiefe	52° 0,94' S	10° 0,09'E	3763
PS79/081-4	19.01.12	02:59	HN	zu Wasser	52° 1,33' S	10° 0,54'E	3759,2
PS79/081-4	19.01.12	03:07	HN	am Grund/ auf Tiefe	52° 1,38' S	10° 0,57'E	3760
PS79/081-4	19.01.12	03:11	HN	an Deck	52° 1,41' S	10° 0,57'E	3760,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/081-3	19.01.12	04:30	ISP	Hieven	52° 1,74' S	10° 0,52'E	3766,5
PS79/081-3	19.01.12	04:49	ISP	Wasserober-fläche	52° 1,85' S	10° 0,35'E	3768,7
PS79/081-3	19.01.12	04:50	ISP	an Deck	52° 1,85' S	10° 0,34'E	3768,5
PS79/081-5	19.01.12	05:20	CTD	zu Wasser	51° 59,85' S	9° 59,73'E	3753,5
PS79/081-5	19.01.12	05:35	CTD	am Grund/ auf Tiefe	51° 59,85' S	9° 59,92'E	3759,2
PS79/081-5	19.01.12	05:36	CTD	Hieven	51° 59,85' S	9° 59,93'E	3757,2
PS79/081-5	19.01.12	05:54	CTD	Wasserober-fläche	51° 59,89' S	10° 0,11'E	3764
PS79/081-5	19.01.12	05:55	CTD	an Deck	51° 59,89' S	10° 0,11'E	3756,2
PS79/081-5	19.01.12	06:02	GO-FLO	zu Wasser	51° 59,94' S	10° 0,14'E	3757,5
PS79/081-6	19.01.12	06:02	GO-FLO	zu Wasser	51° 59,94' S	10° 0,14'E	3757,5
PS79/081-6	19.01.12	06:27	GO-FLO	am Grund/ auf Tiefe	52° 0,19' S	10° 0,37'E	3756,2
PS79/081-6	19.01.12	06:33	GO-FLO	Hieven	52° 0,22' S	10° 0,40'E	3754,2
PS79/081-6	19.01.12	06:50	GO-FLO	an Deck	52° 0,38' S	10° 0,63'E	3743,7
PS79/081-7	19.01.12	07:10	MUC	zu Wasser	51° 59,51' S	9° 59,57'E	3756,5
PS79/081-7	19.01.12	07:59	MUC	am Grund/ auf Tiefe	51° 59,63' S	10° 0,24'E	3745,7
PS79/081-7	19.01.12	08:52	MUC	an Deck	51° 59,80' S	10° 0,32'E	3746,5
PS79/081-8	19.01.12	09:21	MUC	zu Wasser	51° 59,89' S	10° 0,11'E	3756,2
PS79/081-8	19.01.12	10:13	MUC	am Grund/ auf Tiefe	51° 59,99' S	9° 59,99'E	3760,5
PS79/081-8	19.01.12	10:14	MUC	Hieven	51° 59,99' S	9° 59,98'E	3760,5
PS79/081-8	19.01.12	11:05	MUC	an Deck	52° 0,02' S	10° 0,01'E	3760,7
PS79/081-9	19.01.12	11:27	MUC	zu Wasser	52° 0,00' S	10° 0,02'E	3760,7
PS79/081-9	19.01.12	12:17	MUC	am Grund/ auf Tiefe	52° 0,01' S	10° 0,05'E	3760,7
PS79/081-9	19.01.12	12:18	MUC	Hieven	52° 0,01' S	10° 0,06'E	3760,2
PS79/081-9	19.01.12	13:09	MUC	an Deck	52° 0,03' S	10° 0,29'E	3755,3
PS79/081-10	19.01.12	13:16	RAMSES	zu Wasser	52° 0,03' S	10° 0,37'E	3755,5
PS79/081-10	19.01.12	13:36	RAMSES	am Grund/ auf Tiefe	51° 59,93' S	10° 0,30'E	3754
PS79/081-10	19.01.12	13:50	RAMSES	an Deck	51° 59,89' S	10° 0,21'E	3754,5
PS79/081-11	19.01.12	14:03	CTD/RO	zu Wasser	51° 59,87' S	10° 0,13'E	3754,7
PS79/081-11	19.01.12	14:14	CTD/RO	am Grund/ auf Tiefe	51° 59,87' S	10° 0,10'E	3755,2
PS79/081-11	19.01.12	14:14	CTD/RO	Hieven	51° 59,87' S	10° 0,10'E	3755,2
PS79/081-11	19.01.12	14:27	CTD/RO	an Deck	51° 59,89' S	10° 0,10'E	3756,5
PS79/081-12	19.01.12	14:38	MUC	zu Wasser	51° 59,92' S	10° 0,15'E	3756,7
PS79/081-12	19.01.12	15:30	MUC	am Grund/ auf Tiefe	51° 59,93' S	10° 0,06'E	3757,5
PS79/081-12	19.01.12	15:31	MUC	Hieven	51° 59,93' S	10° 0,05'E	3758
PS79/081-12	19.01.12	16:23	MUC	Wasserober-fläche	52° 0,07' S	9° 59,90'E	3760,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/081-12	19.01.12	16:25	MUC	an Deck	52° 0,09' S	9° 59,90'E	3760,5
PS79/081-13	19.01.12	16:39	MUC	zu Wasser	52° 0,16' S	9° 59,91'E	3761,5
PS79/081-13	19.01.12	17:41	MUC	am Grund/ auf Tiefe	52° 0,04' S	9° 59,90'E	3760,5
PS79/081-13	19.01.12	17:42	MUC	Hieven	52° 0,03' S	9° 59,90'E	3760
PS79/081-13	19.01.12	18:40	MUC	Wasserober-fläche	51° 59,84' S	10° 0,14'E	3753,5
PS79/081-13	19.01.12	18:42	MUC	an Deck	51° 59,84' S	10° 0,17'E	3754,2
PS79/081-14	19.01.12	19:01	CTD	zu Wasser	51° 59,86' S	10° 0,19'E	3754
PS79/081-15	19.01.12	19:54	HN	zu Wasser	52° 0,25' S	10° 0,31'E	3757,2
PS79/081-15	19.01.12	19:57	HN	am Grund/ auf Tiefe	52° 0,27' S	10° 0,29'E	3758
PS79/081-15	19.01.12	19:59	HN	an Deck	52° 0,29' S	10° 0,29'E	3757,7
PS79/081-14	19.01.12	20:20	CTD	am Grund/ auf Tiefe	52° 0,52' S	10° 0,37'E	3754,7
PS79/081-14	19.01.12	20:23	CTD	Hieven	52° 0,54' S	10° 0,38'E	3754
PS79/081-14	19.01.12	21:35	CTD	an Deck	52° 1,06' S	10° 0,58'E	3757,2
PS79/081-16	19.01.12	21:39	FRRF	zu Wasser	52° 1,09' S	10° 0,63'E	3756
PS79/081-16	19.01.12	21:48	FRRF	am Grund/ auf Tiefe	52° 1,09' S	10° 0,70'E	3755,2
PS79/081-16	19.01.12	21:49	FRRF	Hieven	52° 1,09' S	10° 0,72'E	3755
PS79/081-16	19.01.12	21:58	FRRF	an Deck	52° 1,15' S	10° 0,82'E	3753,7
PS79/081-17	19.01.12	22:35	EBS	zu Wasser	52° 1,28' S	10° 4,07'E	3637,5
PS79/081-17	20.01.12	00:11	EBS	am Grund/ auf Tiefe	52° 0,18' S	10° 0,72'E	3743,7
PS79/081-17	20.01.12	01:17	EBS	Profil Anfang	51° 59,75' S	9° 59,45'E	3756
PS79/081-17	20.01.12	01:27	EBS	Profil Ende	51° 59,67' S	9° 59,27'E	3756,2
PS79/081-17	20.01.12	01:27	EBS	Hieven	51° 59,67' S	9° 59,27'E	3756,2
PS79/081-17	20.01.12	02:31	EBS	frei vom Grund	51° 59,61' S	9° 59,10'E	3763,4
PS79/081-17	20.01.12	04:07	EBS	Wasserober-fläche	51° 59,65' S	9° 58,10'E	3784
PS79/081-17	20.01.12	04:10	EBS	an Deck	51° 59,65' S	9° 58,07'E	3783,7
PS79/081-18	20.01.12	05:14	EBS	zu Wasser	52° 1,75' S	10° 5,07'E	3673,5
PS79/081-18	20.01.12	06:48	EBS	am Grund/ auf Tiefe	52° 0,36' S	10° 1,47'E	3705,7
PS79/081-18	20.01.12	07:52	EBS	am Grund/ auf Tiefe	51° 59,95' S	9° 59,87'E	3758,5
PS79/081-18	20.01.12	07:53	EBS	Profil Anfang	51° 59,95' S	9° 59,85'E	3758,2
PS79/081-18	20.01.12	08:03	EBS	Profil Ende	51° 59,88' S	9° 59,58'E	3755,7
PS79/081-18	20.01.12	08:54	EBS	Hieven	51° 59,90' S	9° 59,60'E	3756,5
PS79/081-18	20.01.12	09:10	EBS	frei vom Grund	51° 59,89' S	9° 59,55'E	3757,2
PS79/081-18	20.01.12	10:44	EBS	Wasserober-fläche	52° 0,14' S	9° 59,23'E	3764
PS79/081-18	20.01.12	10:47	EBS	an Deck	52° 0,14' S	9° 59,25'E	3763,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/081-19	20.01.12	11:48	AGT	zu Wasser	51° 58,35' S	10° 4,97'E	3691,5
PS79/081-19	20.01.12	11:50	AGT	Wasserober-fläche	51° 58,39' S	10° 4,83'E	3694
PS79/081-19	20.01.12	11:52	AGT	Fieren	51° 58,44' S	10° 4,69'E	3698
PS79/081-19	20.01.12	13:01	AGT	am Grund/ auf Tiefe	51° 59,66' S	10° 0,94'E	3720,5
PS79/081-19	20.01.12	13:30	AGT	Profil Anfang	52° 0,17' S	9° 59,62'E	3762
PS79/081-19	20.01.12	13:40	AGT	Profil Ende	52° 0,27' S	9° 59,41'E	3764
PS79/081-19	20.01.12	13:40	AGT	Hieven	52° 0,27' S	9° 59,41'E	3764
PS79/081-19	20.01.12	14:44	AGT	frei vom Grund	52° 0,47' S	9° 59,48'E	3766
PS79/081-19	20.01.12	17:01	AGT	Wasserober-fläche	52° 1,23' S	9° 58,96'E	3791
PS79/081-19	20.01.12	17:05	AGT	an Deck	52° 1,26' S	9° 58,92'E	3791,7
PS79/081-20	20.01.12	17:53	MN	zu Wasser	51° 59,96' S	10° 0,29'E	3750,7
PS79/081-20	20.01.12	19:02	MN	am Grund/ auf Tiefe	52° 0,10' S	10° 1,09'E	3711,2
PS79/081-20	20.01.12	19:04	MN	Hieven	52° 0,11' S	10° 1,10'E	3711,5
PS79/081-20	20.01.12	19:44	MN	Wasserober-fläche	52° 0,35' S	10° 1,20'E	3715,7
PS79/081-20	20.01.12	19:48	MN	an Deck	52° 0,34' S	10° 1,26'E	3711,5
PS79/081-21	20.01.12	20:09	BONGO	zu Wasser	52° 0,36' S	10° 1,49'E	3705,7
PS79/081-21	20.01.12	20:17	BONGO	am Grund/ auf Tiefe	52° 0,36' S	10° 1,59'E	3702,7
PS79/081-21	20.01.12	20:18	BONGO	Hieven	52° 0,36' S	10° 1,59'E	3702,5
PS79/081-21	20.01.12	20:25	BONGO	an Deck	52° 0,38' S	10° 1,60'E	3703,7
PS79/081-22	20.01.12	20:32	BONGO	zu Wasser	52° 0,37' S	10° 1,68'E	3701,7
PS79/081-22	20.01.12	20:40	BONGO	am Grund/ auf Tiefe	52° 0,35' S	10° 1,72'E	3700,2
PS79/081-22	20.01.12	20:40	BONGO	Hieven	52° 0,35' S	10° 1,72'E	3700,2
PS79/081-22	20.01.12	20:48	BONGO	an Deck	52° 0,36' S	10° 1,79'E	3700,2
PS79/081-23	20.01.12	21:09	TEST	zu Wasser	52° 1,96' S	10° 1,61'E	3698,4
PS79/081-23	20.01.12	22:07	TEST	am Grund/ auf Tiefe	52° 11,78' S	10° 1,29'E	3708,5
PS79/081-23	20.01.12	22:11	TEST	Hieven	52° 12,36' S	10° 1,26'E	3706,7
PS79/081-23	20.01.12	23:27	TEST	an Deck	52° 21,22' S	10° 0,50'E	3197,2
PS79/082-1	20.01.12	23:42	CTD/RO	zu Wasser	52° 20,68' S	10° 0,02'E	3142,9
PS79/082-1	21.01.12	00:08	CTD/RO	am Grund/ auf Tiefe	52° 20,81' S	10° 0,05'E	3104,5
PS79/082-1	21.01.12	00:09	CTD/RO	Hieven	52° 20,81' S	10° 0,06'E	3175,2
PS79/082-1	21.01.12	00:38	CTD/RO	an Deck	52° 20,92' S	10° 0,26'E	3049,2
PS79/083-1	21.01.12	02:44	CTD/RO	zu Wasser	52° 40,00' S	10° 0,15'E	3470,1
PS79/083-1	21.01.12	03:09	CTD/RO	am Grund/ auf Tiefe	52° 39,83' S	10° 0,25'E	0
PS79/083-1	21.01.12	03:10	CTD/RO	Hieven	52° 39,82' S	10° 0,26'E	0
PS79/083-1	21.01.12	03:41	CTD/RO	an Deck	52° 39,75' S	10° 0,17'E	0

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/084-1	21.01.12	06:02	CTD	zu Wasser	52° 59,87' S	10° 0,05'E	3961
PS79/084-1	21.01.12	07:22	CTD	am Grund/ auf Tiefe	53° 0,16' S	10° 0,56'E	4040,7
PS79/084-1	21.01.12	07:25	CTD	Hieven	53° 0,18' S	10° 0,56'E	0
PS79/084-2	21.01.12	08:10	HN	zu Wasser	53° 0,35' S	10° 0,77'E	4075,7
PS79/084-2	21.01.12	08:13	HN	am Grund/ auf Tiefe	53° 0,34' S	10° 0,79'E	4072,5
PS79/084-2	21.01.12	08:15	HN	an Deck	53° 0,34' S	10° 0,78'E	4063,5
PS79/084-1	21.01.12	08:48	CTD	an Deck	53° 0,37' S	10° 0,78'E	4053
PS79/084-3	21.01.12	08:56	TRAPS	zu Wasser	53° 0,35' S	10° 0,81'E	4069
PS79/084-3	21.01.12	09:17	TRAPS	zu Wasser	53° 0,31' S	10° 0,93'E	4086
PS79/084-3	21.01.12	09:25	TRAPS	zu Wasser	53° 0,29' S	10° 0,91'E	4082,2
PS79/084-3	21.01.12	09:28	TRAPS	zu Wasser	53° 0,30' S	10° 0,92'E	4081,7
PS79/084-3	21.01.12	09:28	TRAPS	am Grund/ auf Tiefe	53° 0,30' S	10° 0,92'E	4081,7
PS79/084-4	21.01.12	09:48	FRRF	zu Wasser	53° 0,48' S	10° 1,43'E	4301,5
PS79/084-4	21.01.12	10:04	FRRF	am Grund/ auf Tiefe	53° 0,51' S	10° 1,40'E	4148
PS79/084-4	21.01.12	10:17	FRRF	an Deck	53° 0,50' S	10° 1,40'E	4159
PS79/084-5	21.01.12	10:32	PUMP	zu Wasser	53° 0,54' S	10° 1,50'E	4162,2
PS79/084-5	21.01.12	10:48	PUMP	am Grund/ auf Tiefe	53° 0,61' S	10° 1,37'E	4158
PS79/084-6	21.01.12	12:08	HN	zu Wasser	53° 0,85' S	10° 1,33'E	4103,7
PS79/084-6	21.01.12	12:10	HN	am Grund/ auf Tiefe	53° 0,85' S	10° 1,31'E	4084,2
PS79/084-6	21.01.12	12:12	HN	an Deck	53° 0,86' S	10° 1,31'E	4105,5
PS79/084-5	21.01.12	19:55	PUMP	Hieven	53° 3,47' S	10° 3,35'E	3639
PS79/084-5	21.01.12	19:59	PUMP	an Deck	53° 3,48' S	10° 3,42'E	3640,5
PS79/084-7	21.01.12	20:10	GO-FLO	zu Wasser	53° 3,29' S	10° 3,47'E	3860,7
PS79/084-7	21.01.12	20:43	GO-FLO	am Grund/ auf Tiefe	53° 3,26' S	10° 3,80'E	3924
PS79/084-7	21.01.12	20:51	GO-FLO	Hieven	53° 3,24' S	10° 3,88'E	3920,7
PS79/084-7	21.01.12	21:15	GO-FLO	an Deck	53° 3,22' S	10° 4,03'E	0
PS79/084-8	21.01.12	21:42	TEST	zu Wasser	53° 2,60' S	10° 3,71'E	4198
PS79/084-8	21.01.12	23:32	TEST	am Grund/ auf Tiefe	53° 2,25' S	10° 3,32'E	4438,7
PS79/084-8	21.01.12	23:36	TEST	Hieven	53° 2,23' S	10° 3,30'E	4296,7
PS79/084-8	22.01.12	01:15	TEST	an Deck	53° 2,07' S	10° 2,76'E	4413,5
PS79/084-9	22.01.12	01:52	CTD/RO	zu Wasser	53° 0,11' S	10° 0,15'E	3972
PS79/084-9	22.01.12	02:13	CTD/RO	am Grund/ auf Tiefe	53° 0,11' S	10° 0,08'E	3971,5
PS79/084-9	22.01.12	02:14	CTD/RO	Hieven	53° 0,10' S	10° 0,07'E	3967,7
PS79/084-9	22.01.12	02:35	CTD/RO	an Deck	53° 0,11' S	10° 0,09'E	3972,3
PS79/084-10	22.01.12	02:48	RMT	zu Wasser	53° 0,12' S	10° 0,09'E	3973,9
PS79/084-10	22.01.12	03:05	RMT	Profil Anfang	52° 59,50' S	9° 59,35'E	4052,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/084-10	22.01.12	03:05	RMT	Hieven	52° 59,50' S	9° 59,35'E	4052,7
PS79/084-10	22.01.12	03:30	RMT	Profil Ende	52° 58,58' S	9° 58,17'E	3941,7
PS79/084-10	22.01.12	03:32	RMT	Wasserober-fläche	52° 58,52' S	9° 58,11'E	3946
PS79/084-10	22.01.12	03:35	RMT	an Deck	52° 58,46' S	9° 58,05'E	3945,7
PS79/084-11	22.01.12	04:08	ISP	zu Wasser	52° 59,31' S	9° 59,24'E	4052,7
PS79/084-11	22.01.12	04:37	ISP	am Grund/ auf Tiefe	52° 59,38' S	9° 59,39'E	4064,2
PS79/084-11	22.01.12	07:35	ISP	Hieven	52° 59,42' S	10° 0,26'E	4159,7
PS79/084-11	22.01.12	08:01	ISP	an Deck	52° 59,56' S	10° 0,40'E	4081,2
PS79/084-12	22.01.12	08:27	CTD/RO	zu Wasser	52° 59,62' S	10° 0,13'E	3960,1
PS79/084-13	22.01.12	09:45	HN	zu Wasser	52° 59,91' S	10° 0,05'E	3962
PS79/084-13	22.01.12	09:48	HN	am Grund/ auf Tiefe	52° 59,91' S	10° 0,04'E	3957,8
PS79/084-13	22.01.12	09:52	HN	an Deck	52° 59,92' S	10° 0,02'E	3848,7
PS79/084-12	22.01.12	09:55	CTD/RO	am Grund/ auf Tiefe	52° 59,92' S	10° 0,03'E	3961,6
PS79/084-12	22.01.12	09:56	CTD/RO	Hieven	52° 59,93' S	10° 0,03'E	3960
PS79/084-12	22.01.12	11:15	CTD/RO	an Deck	53° 0,11' S	10° 0,07'E	3970,7
PS79/084-14	22.01.12	12:08	TRAPS	am Grund/ auf Tiefe	52° 57,80' S	10° 12,83'E	4545
PS79/084-14	22.01.12	12:46	TRAPS	Information	52° 57,32' S	10° 14,59'E	4532,2
PS79/084-14	22.01.12	13:07	TRAPS	an Deck	52° 57,31' S	10° 15,14'E	4532,2
PS79/084-15	22.01.12	14:08	RMT	zu Wasser	53° 0,15' S	10° 4,98'E	0
PS79/084-15	22.01.12	15:14	RMT	Profil Anfang	53° 0,11' S	10° 0,15'E	3973,2
PS79/084-15	22.01.12	15:15	RMT	Hieven	53° 0,11' S	10° 0,09'E	0
PS79/084-15	22.01.12	16:56	RMT	Profil Ende	53° 0,05' S	9° 53,51'E	4089,5
PS79/084-15	22.01.12	16:57	RMT	Wasserober-fläche	53° 0,05' S	9° 53,47'E	0
PS79/084-15	22.01.12	17:00	RMT	an Deck	53° 0,05' S	9° 53,32'E	4055,7
PS79/084-16	22.01.12	17:49	RAMSES	zu Wasser	53° 0,07' S	10° 0,22'E	3968,2
PS79/084-16	22.01.12	18:11	RAMSES	am Grund/ auf Tiefe	53° 0,42' S	10° 0,45'E	4009,2
PS79/084-16	22.01.12	18:11	RAMSES	Hieven	53° 0,42' S	10° 0,45'E	4009,2
PS79/084-16	22.01.12	18:30	RAMSES	an Deck	53° 0,66' S	10° 0,60'E	0
PS79/084-17	22.01.12	18:45	CTD	zu Wasser	53° 0,10' S	10° 0,14'E	3970,7
PS79/084-17	22.01.12	20:09	CTD	am Grund/ auf Tiefe	53° 0,46' S	10° 0,79'E	4067,2
PS79/084-17	22.01.12	20:10	CTD	Hieven	53° 0,47' S	10° 0,79'E	4060,2
PS79/084-17	22.01.12	21:26	CTD	an Deck	53° 0,55' S	10° 0,79'E	4080,2
PS79/084-18	22.01.12	21:47	HN	zu Wasser	53° 0,53' S	10° 0,75'E	4073,5
PS79/084-18	22.01.12	21:56	HN	am Grund/ auf Tiefe	53° 0,53' S	10° 0,74'E	4062
PS79/084-18	22.01.12	22:01	HN	an Deck	53° 0,54' S	10° 0,75'E	4062
PS79/084-19	22.01.12	22:08	HN	zu Wasser	53° 0,55' S	10° 0,77'E	4083,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/084-19	22.01.12	22:11	HN	am Grund/ auf Tiefe	53° 0,55' S	10° 0,77'E	4067,7
PS79/084-19	22.01.12	22:15	HN	an Deck	53° 0,55' S	10° 0,77'E	4073,5
PS79/084-20	22.01.12	22:21	HN	zu Wasser	53° 0,54' S	10° 0,74'E	4082,5
PS79/084-20	22.01.12	22:25	HN	am Grund/ auf Tiefe	53° 0,53' S	10° 0,73'E	4077
PS79/084-20	22.01.12	22:28	HN	an Deck	53° 0,52' S	10° 0,73'E	4081,2
PS79/084-21	22.01.12	22:38	BONGO	zu Wasser	53° 0,52' S	10° 0,76'E	4084,5
PS79/084-21	22.01.12	22:47	BONGO	am Grund/ auf Tiefe	53° 0,53' S	10° 0,83'E	4082,7
PS79/084-21	22.01.12	22:47	BONGO	Hieven	53° 0,53' S	10° 0,83'E	4082,7
PS79/084-21	22.01.12	22:56	BONGO	an Deck	53° 0,54' S	10° 0,82'E	0
PS79/084-22	22.01.12	23:01	BONGO	zu Wasser	53° 0,54' S	10° 0,82'E	4078,3
PS79/084-22	22.01.12	23:05	BONGO	am Grund/ auf Tiefe	53° 0,54' S	10° 0,81'E	4083,7
PS79/084-22	22.01.12	23:05	BONGO	Hieven	53° 0,54' S	10° 0,81'E	4083,7
PS79/084-22	22.01.12	23:08	BONGO	an Deck	53° 0,54' S	10° 0,81'E	4079,9
PS79/084-23	22.01.12	23:22	GO-FLO	zu Wasser	53° 0,55' S	10° 0,76'E	4083,2
PS79/084-23	22.01.12	23:54	GO-FLO	am Grund/ auf Tiefe	53° 0,53' S	10° 0,80'E	4081
PS79/084-23	23.01.12	00:01	GO-FLO	Hieven	53° 0,52' S	10° 0,78'E	4076,2
PS79/084-23	23.01.12	00:26	GO-FLO	an Deck	53° 0,55' S	10° 0,96'E	4094,7
PS79/084-24	23.01.12	00:55	MUC	zu Wasser	53° 0,69' S	10° 3,07'E	4323,7
PS79/084-24	23.01.12	01:53	MUC	am Grund/ auf Tiefe	53° 0,67' S	10° 3,00'E	4320,2
PS79/084-24	23.01.12	01:54	MUC	Hieven	53° 0,66' S	10° 3,00'E	4331,2
PS79/084-24	23.01.12	01:55	MUC	frei vom Grund	53° 0,67' S	10° 3,00'E	4287,2
PS79/084-24	23.01.12	02:53	MUC	an Deck	53° 0,67' S	10° 2,94'E	4315,7
PS79/084-25	23.01.12	03:30	EBS	zu Wasser	53° 2,67' S	10° 7,14'E	4006,5
PS79/084-25	23.01.12	05:30	EBS	am Grund/ auf Tiefe	53° 0,89' S	10° 3,55'E	4326,7
PS79/084-25	23.01.12	06:32	EBS	Profil Anfang	53° 0,34' S	10° 2,35'E	4106,2
PS79/084-25	23.01.12	06:43	EBS	Profil Ende	53° 0,22' S	10° 2,12'E	4046,1
PS79/084-25	23.01.12	06:43	EBS	Hieven	53° 0,22' S	10° 2,12'E	4046,1
PS79/084-25	23.01.12	09:54	EBS	an Deck	52° 59,29' S	10° 1,57'E	4344,2
PS79/084-26	23.01.12	11:09	AGT	zu Wasser	53° 4,30' S	10° 5,87'E	3444,2
PS79/084-26	23.01.12	12:32	AGT	am Grund/ auf Tiefe	53° 1,18' S	10° 3,32'E	4309
PS79/084-26	23.01.12	13:06	AGT	Profil Anfang	53° 0,13' S	10° 2,55'E	4101,4
PS79/084-26	23.01.12	13:16	AGT	Profil Ende	52° 59,98' S	10° 2,43'E	4118,3
PS79/084-26	23.01.12	13:16	AGT	Hieven	52° 59,98' S	10° 2,43'E	4118,3
PS79/084-26	23.01.12	14:39	AGT	frei vom Grund	52° 59,96' S	10° 2,60'E	4113,7
PS79/084-26	23.01.12	17:05	AGT	Wasserober-fläche	52° 59,03' S	10° 4,42'E	4434,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/084-26	23.01.12	17:06	AGT	an Deck	52° 59,02' S	10° 4,48'E	0
PS79/084-27	23.01.12	17:15	CTD	zu Wasser	52° 59,00' S	10° 4,76'E	0
PS79/084-27	23.01.12	17:19	CTD	am Grund/ auf Tiefe	52° 59,00' S	10° 4,86'E	0
PS79/084-27	23.01.12	17:22	CTD	Hieven	52° 58,99' S	10° 4,95'E	4313,3
PS79/084-27	23.01.12	17:24	CTD	Wasserober-fläche	52° 58,99' S	10° 5,01'E	4314,9
PS79/084-27	23.01.12	17:25	CTD	an Deck	52° 58,99' S	10° 5,04'E	4302,6
PS79/085-1	26.01.12	13:30	RAMSES	zu Wasser	52° 0,01' S	7° 59,99'W	2750
PS79/085-1	26.01.12	13:52	RAMSES	am Grund/ auf Tiefe	52° 0,04' S	8° 0,03'W	2749,7
PS79/085-1	26.01.12	13:53	RAMSES	Hieven	52° 0,04' S	8° 0,03'W	2749,2
PS79/085-2	26.01.12	14:06	HN	zu Wasser	52° 0,05' S	8° 0,00'W	2750,5
PS79/085-2	26.01.12	14:11	HN	am Grund/ auf Tiefe	52° 0,04' S	7° 59,98'W	2750,5
PS79/085-2	26.01.12	14:12	HN	an Deck	52° 0,04' S	7° 59,97'W	2750,7
PS79/085-1	26.01.12	14:14	RAMSES	an Deck	52° 0,03' S	7° 59,95'W	2751
PS79/085-3	26.01.12	14:28	CTD/RO	zu Wasser	52° 0,04' S	7° 59,93'W	2751,7
PS79/085-3	26.01.12	14:45	CTD/RO	am Grund/ auf Tiefe	52° 0,06' S	7° 59,88'W	2752,5
PS79/085-3	26.01.12	14:45	CTD/RO	Hieven	52° 0,06' S	7° 59,88'W	2752,5
PS79/085-4	26.01.12	14:47	HN	zu Wasser	52° 0,07' S	7° 59,88'W	2752,5
PS79/085-4	26.01.12	14:50	HN	am Grund/ auf Tiefe	52° 0,08' S	7° 59,88'W	2752,2
PS79/085-4	26.01.12	14:51	HN	an Deck	52° 0,08' S	7° 59,88'W	2752,7
PS79/085-3	26.01.12	15:03	CTD/RO	an Deck	52° 0,10' S	7° 59,84'W	2753
PS79/085-5	26.01.12	15:31	MSS	zu Wasser	52° 0,08' S	7° 59,98'W	2751
PS79/085-5	26.01.12	15:40	MSS	am Grund/ auf Tiefe	52° 0,08' S	8° 0,16'W	2747,7
PS79/085-5	26.01.12	16:51	MSS	an Deck	52° 0,00' S	8° 1,56'W	2709,2
PS79/085-6	26.01.12	17:11	GO-FLO	zu Wasser	52° 0,04' S	8° 1,61'W	2710,7
PS79/085-6	26.01.12	17:32	GO-FLO	am Grund/ auf Tiefe	51° 59,98' S	8° 1,77'W	2713,7
PS79/085-6	26.01.12	17:39	GO-FLO	Hieven	51° 59,96' S	8° 1,77'W	2714
PS79/085-6	26.01.12	18:00	GO-FLO	an Deck	51° 59,91' S	8° 1,93'W	2717,2
PS79/085-7	26.01.12	18:28	CTD/RO	zu Wasser	52° 0,03' S	8° 0,19'W	2744,7
PS79/085-7	26.01.12	18:36	CTD/RO	Wasserober-fläche	52° 0,02' S	8° 0,12'W	2746,7
PS79/085-7	26.01.12	18:37	CTD/RO	an Deck	52° 0,01' S	8° 0,12'W	2746,7
PS79/085-7	26.01.12	18:59	CTD/RO	zu Wasser	51° 59,97' S	8° 0,19'W	2742,7
PS79/085-7	26.01.12	19:14	CTD/RO	am Grund/ auf Tiefe	51° 59,96' S	8° 0,15'W	2743,2
PS79/085-7	26.01.12	19:16	CTD/RO	Hieven	51° 59,96' S	8° 0,16'W	2743
PS79/085-7	26.01.12	19:20	CTD/RO	Wasserober-fläche	51° 59,95' S	8° 0,15'W	2743
PS79/085-7	26.01.12	19:22	CTD/RO	an Deck	51° 59,94' S	8° 0,16'W	2742,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/085-8	26.01.12	19:42	CTD	zu Wasser	51° 59,90' S	8° 0,31'W	2735,5
PS79/085-8	26.01.12	19:50	CTD	am Grund/ auf Tiefe	51° 59,89' S	8° 0,38'W	2734
PS79/085-8	26.01.12	19:53	CTD	Wasserober-fläche	51° 59,90' S	8° 0,39'W	2741,7
PS79/085-8	26.01.12	19:54	CTD	an Deck	51° 59,91' S	8° 0,40'W	2734,2
PS79/085-9	26.01.12	20:07	CTD/RO	zu Wasser	51° 59,90' S	8° 0,27'W	2736
PS79/085-9	26.01.12	21:11	CTD/RO	am Grund/ auf Tiefe	52° 0,00' S	7° 59,97'W	2749,5
PS79/085-9	26.01.12	21:12	CTD/RO	Hieven	51° 59,99' S	7° 59,95'W	2750,7
PS79/085-9	26.01.12	22:07	CTD/RO	an Deck	52° 0,04' S	8° 0,04'W	2748,7
PS79/085-10	26.01.12	22:23	RMT	zu Wasser	52° 0,08' S	8° 0,19'W	2746,5
PS79/085-10	26.01.12	22:24	RMT	Profil Anfang	52° 0,11' S	8° 0,25'W	2742,2
PS79/085-10	26.01.12	22:40	RMT	am Grund/ auf Tiefe	52° 0,38' S	8° 1,27'W	2708
PS79/085-10	26.01.12	22:40	RMT	Hieven	52° 0,38' S	8° 1,27'W	2708
PS79/085-10	26.01.12	23:10	RMT	Profil Ende	52° 0,86' S	8° 2,79'W	2695,6
PS79/085-10	26.01.12	23:10	RMT	an Deck	52° 0,86' S	8° 2,79'W	2695,6
PS79/085-11	26.01.12	23:42	FLOAT	am Grund/ auf Tiefe	52° 0,28' S	8° 0,58'W	2731,5
PS79/085-11	26.01.12	23:43	FLOAT	zu Wasser	52° 0,25' S	8° 0,53'W	2735,5
PS79/085-12	26.01.12	23:59	BONGO	zu Wasser	51° 59,87' S	8° 0,33'W	2735
PS79/085-12	27.01.12	00:08	BONGO	am Grund/ auf Tiefe	51° 59,89' S	8° 0,29'W	2735,5
PS79/085-12	27.01.12	00:08	BONGO	Hieven	51° 59,89' S	8° 0,29'W	2735,5
PS79/085-12	27.01.12	00:16	BONGO	an Deck	51° 59,90' S	8° 0,28'W	2736,7
PS79/085-13	27.01.12	00:25	FRRF	zu Wasser	51° 59,84' S	7° 59,99'W	2743,7
PS79/085-13	27.01.12	00:38	FRRF	am Grund/ auf Tiefe	51° 59,90' S	8° 0,03'W	2744,7
PS79/085-13	27.01.12	00:38	FRRF	Hieven	51° 59,90' S	8° 0,03'W	2744,7
PS79/085-13	27.01.12	00:50	FRRF	an Deck	51° 59,91' S	7° 59,97'W	2748
PS79/085-14	27.01.12	01:14	MUC	zu Wasser	51° 59,95' S	7° 59,95'W	2749,5
PS79/085-14	27.01.12	01:54	MUC	am Grund/ auf Tiefe	51° 59,98' S	7° 59,99'W	2749,2
PS79/085-14	27.01.12	01:55	MUC	Hieven	51° 59,98' S	7° 59,99'W	2748,5
PS79/085-14	27.01.12	02:39	MUC	an Deck	52° 0,10' S	7° 59,97'W	2751,2
PS79/085-15	27.01.12	03:41	EBS	zu Wasser	51° 58,91' S	7° 57,58'W	2807
PS79/085-15	27.01.12	04:57	EBS	am Grund/ auf Tiefe	51° 59,88' S	7° 59,73'W	2752
PS79/085-15	27.01.12	05:38	EBS	am Grund/ auf Tiefe	52° 0,23' S	8° 0,48'W	2735,5
PS79/085-15	27.01.12	05:38	EBS	Profil Anfang	52° 0,23' S	8° 0,48'W	2735,5
PS79/085-15	27.01.12	05:48	EBS	Hieven	52° 0,29' S	8° 0,59'W	2730
PS79/085-15	27.01.12	05:48	EBS	Profil Ende	52° 0,29' S	8° 0,59'W	2730
PS79/085-15	27.01.12	06:32	EBS	frei vom Grund	52° 0,56' S	8° 0,55'W	2732

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/085-15	27.01.12	07:41	EBS	Wasserober-fläche	52° 1,05' S	8° 0,66'W	2719,2
PS79/085-15	27.01.12	07:42	EBS	an Deck	52° 1,06' S	8° 0,67'W	2716,5
PS79/085-16	27.01.12	08:41	AGT	zu Wasser	51° 59,58' S	7° 54,88'W	2871,5
PS79/085-16	27.01.12	09:36	AGT	am Grund/ auf Tiefe	51° 59,99' S	7° 59,29'W	2751,5
PS79/085-16	27.01.12	10:01	AGT	Profil Anfang	52° 0,02' S	7° 59,85'W	2751,7
PS79/085-16	27.01.12	10:11	AGT	Profil Ende	51° 59,97' S	8° 0,08'W	2745,5
PS79/085-16	27.01.12	10:11	AGT	Hieven	51° 59,97' S	8° 0,08'W	2745,5
PS79/085-16	27.01.12	11:08	AGT	frei vom Grund	51° 59,88' S	8° 0,41'W	2732,5
PS79/085-16	27.01.12	12:46	AGT	Wasserober-fläche	51° 58,67' S	8° 0,77'W	2734,5
PS79/085-16	27.01.12	12:49	AGT	an Deck	51° 58,59' S	8° 0,80'W	2743
PS79/086-1	29.01.12	06:10	RAMSES	zu Wasser	51° 59,94' S	11° 59,79'W	3950,8
PS79/086-1	29.01.12	06:40	RAMSES	am Grund/ auf Tiefe	51° 59,82' S	11° 59,59'W	3952,4
PS79/086-1	29.01.12	06:40	RAMSES	Hieven	51° 59,82' S	11° 59,59'W	3952,4
PS79/086-1	29.01.12	06:56	RAMSES	Wasserober-fläche	51° 59,78' S	11° 59,58'W	3953,1
PS79/086-1	29.01.12	06:57	RAMSES	an Deck	51° 59,78' S	11° 59,59'W	3954,2
PS79/086-2	29.01.12	07:09	CTD	zu Wasser	51° 59,80' S	11° 59,79'W	3954,8
PS79/086-2	29.01.12	07:23	CTD	am Grund/ auf Tiefe	51° 59,76' S	11° 59,55'W	3953,9
PS79/086-2	29.01.12	07:23	CTD	Hieven	51° 59,76' S	11° 59,55'W	3953,9
PS79/086-2	29.01.12	07:42	CTD	Wasserober-fläche	51° 59,71' S	11° 59,46'W	3953,9
PS79/086-2	29.01.12	07:43	CTD	an Deck	51° 59,71' S	11° 59,46'W	3954,9
PS79/086-3	29.01.12	08:29	MSS	zu Wasser	51° 59,76' S	11° 59,35'W	3953,1
PS79/086-3	29.01.12	09:20	MSS	am Grund/ auf Tiefe	51° 59,93' S	11° 59,71'W	3952,3
PS79/086-3	29.01.12	09:45	MSS	an Deck	51° 59,89' S	11° 59,85'W	3953,9
PS79/086-4	29.01.12	09:53	TRAPS	zu Wasser	51° 59,89' S	11° 59,85'W	3953,9
PS79/086-4	29.01.12	10:10	TRAPS	zu Wasser	51° 59,97' S	11° 59,57'W	3950,8
PS79/086-4	29.01.12	10:19	TRAPS	zu Wasser	51° 59,97' S	11° 59,40'W	3950,8
PS79/086-4	29.01.12	10:21	TRAPS	am Grund/ auf Tiefe	51° 59,98' S	11° 59,37'W	3950,8
PS79/086-5	29.01.12	10:30	GO-FLO	zu Wasser	51° 59,92' S	11° 58,86'W	3949,3
PS79/086-5	29.01.12	10:52	GO-FLO	am Grund/ auf Tiefe	51° 59,88' S	11° 58,62'W	3950,4
PS79/086-5	29.01.12	10:57	GO-FLO	Hieven	51° 59,85' S	11° 58,57'W	3950,8
PS79/086-5	29.01.12	11:12	GO-FLO	an Deck	51° 59,88' S	11° 58,27'W	3950,8
PS79/086-6	29.01.12	11:21	CTD/RO	zu Wasser	51° 59,83' S	11° 58,55'W	3950,8
PS79/086-7	29.01.12	12:22	HN	zu Wasser	51° 59,78' S	11° 58,40'W	3952,4
PS79/086-7	29.01.12	12:26	HN	am Grund/ auf Tiefe	51° 59,79' S	11° 58,36'W	3949,9

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/086-7	29.01.12	12:28	HN	an Deck	51° 59,80' S	11° 58,33'W	3949,3
PS79/086-6	29.01.12	12:48	CTD/RO	am Grund/ auf Tiefe	51° 59,81' S	11° 58,22'W	3952,4
PS79/086-6	29.01.12	12:49	CTD/RO	Hieven	51° 59,81' S	11° 58,21'W	3952
PS79/086-8	29.01.12	13:38	HN	zu Wasser	51° 59,86' S	11° 58,10'W	3951,4
PS79/086-8	29.01.12	13:40	HN	am Grund/ auf Tiefe	51° 59,88' S	11° 58,10'W	3949,3
PS79/086-8	29.01.12	13:41	HN	an Deck	51° 59,88' S	11° 58,09'W	3952,4
PS79/086-6	29.01.12	14:12	CTD/RO	an Deck	51° 59,91' S	11° 57,92'W	3949,3
PS79/086-9	29.01.12	16:05	MN	zu Wasser	51° 59,66' S	11° 56,29'W	3958,5
PS79/086-9	29.01.12	17:13	MN	am Grund/ auf Tiefe	51° 59,66' S	11° 55,40'W	4050,2
PS79/086-9	29.01.12	17:14	MN	Hieven	51° 59,66' S	11° 55,39'W	4047,7
PS79/086-9	29.01.12	17:57	MN	Wasserober-fläche	51° 59,83' S	11° 54,84'W	4065,7
PS79/086-9	29.01.12	18:00	MN	an Deck	51° 59,84' S	11° 54,80'W	4065,5
PS79/086-10	29.01.12	18:35	RMT	zu Wasser	51° 59,86' S	11° 55,75'W	3986,5
PS79/086-10	29.01.12	18:39	RMT	Profil Anfang	51° 59,86' S	11° 55,99'W	3971,5
PS79/086-10	29.01.12	18:39	RMT	Profil Ende	51° 59,86' S	11° 55,99'W	3971,5
PS79/086-10	29.01.12	18:40	RMT	Hieven	51° 59,86' S	11° 56,05'W	4123
PS79/086-10	29.01.12	18:46	RMT	an Deck	51° 59,85' S	11° 56,41'W	3955,7
PS79/086-11	29.01.12	22:10	FLOAT	zu Wasser	52° 0,04' S	12° 0,24'W	3954,7
PS79/086-11	29.01.12	22:10	FLOAT	am Grund/ auf Tiefe	52° 0,04' S	12° 0,24'W	3954,7
PS79/086-12	29.01.12	23:19	FRRF	zu Wasser	52° 0,99' S	11° 52,83'W	4056,7
PS79/086-12	29.01.12	23:32	FRRF	am Grund/ auf Tiefe	52° 1,10' S	11° 52,56'W	3771,7
PS79/086-12	29.01.12	23:32	FRRF	Hieven	52° 1,10' S	11° 52,56'W	3771,7
PS79/086-12	29.01.12	23:47	FRRF	an Deck	52° 1,24' S	11° 52,25'W	3686,2
PS79/086-13	30.01.12	00:08	BONGO	zu Wasser	52° 1,10' S	11° 51,81'W	3586
PS79/086-13	30.01.12	00:18	BONGO	am Grund/ auf Tiefe	52° 1,00' S	11° 51,68'W	3564,5
PS79/086-13	30.01.12	00:18	BONGO	Hieven	52° 1,00' S	11° 51,68'W	3564,5
PS79/086-13	30.01.12	00:25	BONGO	an Deck	52° 0,95' S	11° 51,62'W	3462,4
PS79/086-14	30.01.12	01:19	BONGO	zu Wasser	52° 0,01' S	11° 59,83'W	3954,7
PS79/086-14	30.01.12	01:30	BONGO	am Grund/ auf Tiefe	51° 59,96' S	11° 59,67'W	4097,5
PS79/086-14	30.01.12	01:30	BONGO	Hieven	51° 59,96' S	11° 59,67'W	4097,5
PS79/086-14	30.01.12	01:36	BONGO	an Deck	51° 59,94' S	11° 59,56'W	3954,5
PS79/086-15	30.01.12	09:04	TRAPS	Wasserober-fläche	51° 56,82' S	11° 43,40'W	3686,6
PS79/086-15	30.01.12	09:05	TRAPS	an Deck	51° 56,81' S	11° 43,42'W	3686,6
PS79/086-15	30.01.12	09:11	TRAPS	an Deck	51° 56,78' S	11° 43,30'W	3692,5
PS79/086-15	30.01.12	09:17	TRAPS	an Deck	51° 56,82' S	11° 43,18'W	3692,8

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/086-15	30.01.12	09:29	TRAPS	am Grund/ auf Tiefe	51° 56,81' S	11° 43,01'W	3693,2
PS79/086-15	30.01.12	09:29	TRAPS	an Deck	51° 56,81' S	11° 43,01'W	3693,2
PS79/086-16	30.01.12	10:00	CTD/RO	zu Wasser	51° 56,73' S	11° 42,31'W	3596,2
PS79/086-16	30.01.12	10:21	CTD/RO	am Grund/ auf Tiefe	51° 56,70' S	11° 42,25'W	3592
PS79/086-16	30.01.12	10:23	CTD/RO	Hieven	51° 56,69' S	11° 42,22'W	3586,7
PS79/086-16	30.01.12	10:40	CTD/RO	an Deck	51° 56,68' S	11° 42,19'W	3586,8
PS79/086-17	30.01.12	10:49	TEST	zu Wasser	51° 56,69' S	11° 42,22'W	3590,5
PS79/086-17	30.01.12	11:17	TEST	am Grund/ auf Tiefe	51° 56,76' S	11° 42,20'W	3590,2
PS79/086-17	30.01.12	11:17	TEST	an Deck	51° 56,76' S	11° 42,20'W	3590,2
PS79/086-18	30.01.12	23:10	CTD/RO	zu Wasser	52° 0,25' S	11° 58,93'W	3945,1
PS79/086-18	30.01.12	23:25	CTD/RO	Hieven	52° 0,23' S	11° 58,70'W	3945,8
PS79/086-18	30.01.12	23:33	CTD/RO	Fieren	52° 0,28' S	11° 58,61'W	3946,2
PS79/086-18	31.01.12	00:32	CTD/RO	am Grund/ auf Tiefe	52° 0,40' S	11° 58,45'W	3940,1
PS79/086-18	31.01.12	00:32	CTD/RO	Hieven	52° 0,40' S	11° 58,45'W	3940,1
PS79/086-18	31.01.12	01:36	CTD/RO	an Deck	52° 0,68' S	11° 58,06'W	3935,5
PS79/086-19	31.01.12	01:46	RMT	zu Wasser	52° 0,54' S	11° 58,44'W	3938,6
PS79/086-19	31.01.12	02:03	RMT	Profil Anfang	52° 0,16' S	11° 59,40'W	3950,8
PS79/086-19	31.01.12	02:03	RMT	Hieven	52° 0,16' S	11° 59,40'W	3950,8
PS79/086-19	31.01.12	02:26	RMT	Profil Ende	51° 59,72' S	12° 0,72'W	3957,3
PS79/086-19	31.01.12	02:27	RMT	Wasserober- fläche	51° 59,70' S	12° 0,77'W	3960,1
PS79/086-19	31.01.12	02:29	RMT	an Deck	51° 59,66' S	12° 0,84'W	3958,1
PS79/086-20	31.01.12	02:45	EBS	zu Wasser	51° 59,71' S	12° 1,26'W	3957,8
PS79/086-20	31.01.12	04:30	EBS	am Grund/ auf Tiefe	51° 59,83' S	12° 3,17'W	3935
PS79/086-20	31.01.12	05:41	EBS	Profil Anfang	51° 59,70' S	12° 4,28'W	3964,7
PS79/086-20	31.01.12	05:51	EBS	Profil Ende	51° 59,69' S	12° 4,40'W	3969,6
PS79/086-20	31.01.12	05:51	EBS	Hieven	51° 59,69' S	12° 4,40'W	3969,6
PS79/086-20	31.01.12	07:06	EBS	frei vom Grund	51° 59,58' S	12° 4,13'W	3959,4
PS79/086-20	31.01.12	08:52	EBS	an Deck	51° 59,66' S	12° 4,23'W	3963,1
PS79/086-21	31.01.12	09:44	AGT	zu Wasser	51° 59,05' S	12° 10,16'W	3840,2
PS79/086-21	31.01.12	10:58	AGT	am Grund/ auf Tiefe	51° 59,68' S	12° 4,26'W	3963,1
PS79/086-21	31.01.12	11:34	AGT	Profil Anfang	51° 59,92' S	12° 2,43'W	3933,4
PS79/086-21	31.01.12	12:56	AGT	Profil Ende	52° 0,09' S	12° 1,49'W	3947,8
PS79/086-21	31.01.12	12:57	AGT	frei vom Grund	52° 0,09' S	12° 1,48'W	3950,8
PS79/086-22	31.01.12	15:03	TD	zu Wasser	51° 59,07' S	12° 0,08'W	3963,2
PS79/086-22	31.01.12	15:04	TD	am Grund/ auf Tiefe	51° 59,05' S	12° 0,06'W	3963,6

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/086-21	31.01.12	15:26	AGT	Wasserober-fläche	51° 58,78' S	11° 59,72'W	3964,3
PS79/086-21	31.01.12	15:28	AGT	an Deck	51° 58,76' S	11° 59,69'W	3964,7
PS79/086-23	31.01.12	16:11	AGT	Aktion	52° 3,41' S	12° 1,43'W	3875,1
PS79/086-23	31.01.12	16:12	AGT	zu Wasser	52° 3,37' S	12° 1,43'W	3875,6
PS79/086-23	31.01.12	17:25	AGT	am Grund/ auf Tiefe	52° 0,38' S	12° 3,21'W	3932,4
PS79/086-23	31.01.12	18:00	AGT	Profil Anfang	51° 59,12' S	12° 4,27'W	3981,6
PS79/086-23	31.01.12	18:10	AGT	Profil Ende	51° 58,98' S	12° 4,34'W	3990,4
PS79/086-23	31.01.12	18:10	AGT	Hieven	51° 58,98' S	12° 4,34'W	3990,4
PS79/086-23	31.01.12	19:24	AGT	frei vom Grund	51° 58,57' S	12° 3,81'W	3995,4
PS79/086-23	31.01.12	21:51	AGT	an Deck	51° 57,80' S	12° 3,45'W	3998,5
PS79/086-24	31.01.12	22:45	EBS	zu Wasser	52° 1,62' S	12° 0,13'W	3920,1
PS79/086-24	01.02.12	00:28	EBS	am Grund/ auf Tiefe	52° 0,07' S	12° 2,94'W	3933,9
PS79/086-24	01.02.12	01:36	EBS	Profil Anfang	51° 59,37' S	12° 4,35'W	3980
PS79/086-24	01.02.12	01:46	EBS	Hieven	51° 59,23' S	12° 4,57'W	3995,4
PS79/086-24	01.02.12	03:00	EBS	Profil Ende	51° 59,21' S	12° 4,52'W	3993,9
PS79/086-24	01.02.12	03:00	EBS	frei vom Grund	51° 59,21' S	12° 4,52'W	3993,9
PS79/086-24	01.02.12	04:47	EBS	Wasserober-fläche	51° 58,68' S	12° 4,26'W	3999,9
PS79/086-24	01.02.12	04:49	EBS	an Deck	51° 58,67' S	12° 4,24'W	4006,1
PS79/086-25	01.02.12	05:34	EBS	zu Wasser	52° 1,74' S	11° 59,80'W	3917,1
PS79/086-25	01.02.12	07:10	EBS	am Grund/ auf Tiefe	52° 0,49' S	12° 2,05'W	3935,5
PS79/086-25	01.02.12	08:23	EBS	Profil Anfang	51° 59,68' S	12° 3,43'W	3938,3
PS79/086-25	01.02.12	08:33	EBS	Profil Ende	51° 59,56' S	12° 3,65'W	3940,1
PS79/086-25	01.02.12	08:33	EBS	Hieven	51° 59,56' S	12° 3,65'W	3940,1
PS79/086-25	01.02.12	09:46	EBS	frei vom Grund	51° 59,31' S	12° 3,70'W	3944,7
PS79/086-25	01.02.12	11:26	EBS	an Deck	51° 58,80' S	12° 4,68'W	4009,2
PS79/086-26	01.02.12	12:00	MUC	zu Wasser	51° 58,90' S	12° 3,81'W	3963,1
PS79/086-26	01.02.12	13:16	MUC	am Grund/ auf Tiefe	51° 58,87' S	12° 3,76'W	3966,2
PS79/086-26	01.02.12	13:17	MUC	Hieven	51° 58,87' S	12° 3,77'W	3963,1
PS79/086-26	01.02.12	14:35	MUC	an Deck	51° 59,03' S	12° 3,54'W	3946,2
PS79/086-27	01.02.12	14:53	MUC	zu Wasser	51° 59,08' S	12° 3,15'W	3952,4
PS79/086-27	01.02.12	16:06	MUC	am Grund/ auf Tiefe	51° 58,97' S	12° 2,83'W	3943,2
PS79/086-27	01.02.12	16:07	MUC	Hieven	51° 58,97' S	12° 2,83'W	3943,2
PS79/086-27	01.02.12	17:25	MUC	Wasserober-fläche	51° 58,76' S	12° 2,50'W	3957,1
PS79/086-27	01.02.12	17:28	MUC	an Deck	51° 58,75' S	12° 2,48'W	3957
PS79/086-28	01.02.12	17:43	MUC	zu Wasser	51° 58,70' S	12° 2,47'W	3957

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/086-28	01.02.12	18:59	MUC	am Grund/ auf Tiefe	51° 58,74' S	12° 2,11'W	0
PS79/086-28	01.02.12	19:00	MUC	Hieven	51° 58,74' S	12° 2,10'W	3968,7
PS79/086-28	01.02.12	20:17	MUC	an Deck	51° 58,70' S	12° 1,88'W	0
PS79/086-29	01.02.12	20:36	MUC	zu Wasser	51° 58,70' S	12° 1,85'W	0
PS79/086-29	01.02.12	21:51	MUC	am Grund/ auf Tiefe	51° 58,78' S	12° 1,95'W	3970,8
PS79/086-29	01.02.12	21:52	MUC	Hieven	51° 58,78' S	12° 1,94'W	3970,5
PS79/086-29	01.02.12	23:07	MUC	an Deck	51° 58,84' S	12° 2,08'W	3968,1
PS79/086-30	01.02.12	23:22	MUC	zu Wasser	51° 58,84' S	12° 2,22'W	3965,1
PS79/086-30	02.02.12	00:35	MUC	am Grund/ auf Tiefe	51° 58,91' S	12° 2,16'W	3965,4
PS79/086-30	02.02.12	00:37	MUC	Hieven	51° 58,91' S	12° 2,18'W	3965,8
PS79/086-30	02.02.12	01:58	MUC	an Deck	51° 59,04' S	12° 2,45'W	3956,6
PS79/086-31	02.02.12	02:20	CTD/RO	zu Wasser	51° 59,97' S	11° 59,89'W	3952
PS79/086-31	02.02.12	02:37	CTD/RO	am Grund/ auf Tiefe	52° 0,13' S	11° 59,84'W	3949,3
PS79/086-31	02.02.12	02:38	CTD/RO	Hieven	52° 0,14' S	11° 59,82'W	3949,3
PS79/086-31	02.02.12	02:58	CTD/RO	an Deck	52° 0,26' S	11° 59,65'W	3947
PS79/087-1	02.02.12	10:21	TRAPS	zu Wasser	50° 50,11' S	13° 9,88'W	3723,5
PS79/087-1	02.02.12	10:34	TRAPS	zu Wasser	50° 50,11' S	13° 9,80'W	3725,8
PS79/087-1	02.02.12	10:42	TRAPS	am Grund/ auf Tiefe	50° 50,11' S	13° 9,75'W	3728,4
PS79/087-1	02.02.12	10:43	TRAPS	zu Wasser	50° 50,11' S	13° 9,75'W	3728,4
PS79/087-2	02.02.12	10:53	CTD/RO	zu Wasser	50° 50,21' S	13° 9,35'W	3733,5
PS79/087-2	02.02.12	11:23	CTD/RO	am Grund/ auf Tiefe	50° 50,20' S	13° 9,25'W	3735,4
PS79/087-2	02.02.12	11:25	CTD/RO	Hieven	50° 50,20' S	13° 9,25'W	3735,4
PS79/087-2	02.02.12	11:54	CTD/RO	an Deck	50° 50,31' S	13° 9,18'W	3730,8
PS79/088-1	02.02.12	15:25	CTD/RO	zu Wasser	50° 20,00' S	13° 9,99'W	3864,1
PS79/088-2	02.02.12	15:33	HN	zu Wasser	50° 20,00' S	13° 9,96'W	3883,3
PS79/088-2	02.02.12	15:39	HN	am Grund/ auf Tiefe	50° 19,97' S	13° 10,01'W	3803
PS79/088-2	02.02.12	15:41	HN	an Deck	50° 19,97' S	13° 10,02'W	3791,5
PS79/088-1	02.02.12	15:53	CTD/RO	am Grund/ auf Tiefe	50° 19,93' S	13° 10,10'W	3786,9
PS79/088-1	02.02.12	15:53	CTD/RO	Hieven	50° 19,93' S	13° 10,10'W	3786,9
PS79/088-1	02.02.12	16:19	CTD/RO	Wasserober- fläche	50° 20,04' S	13° 9,86'W	3963
PS79/088-1	02.02.12	16:20	CTD/RO	an Deck	50° 20,04' S	13° 9,86'W	3963,1
PS79/089-1	02.02.12	16:41	ADCP	Profil Anfang	50° 20,94' S	13° 9,14'W	4009,2
PS79/089-1	03.02.12	00:11	ADCP	Kurs- änderung	51° 29,80' S	12° 49,39'W	3560,5
PS79/089-1	03.02.12	02:18	ADCP	Kurs- änderung	51° 10,35' S	13° 9,63'W	0
PS79/089-1	03.02.12	04:03	ADCP	Profil Ende	50° 59,74' S	12° 39,84'W	3914,4

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/089-2	03.02.12	06:23	TRAPS	Aktion	50° 45,39' S	13° 5,74'W	3530,7
PS79/089-2	03.02.12	06:24	TRAPS	am Grund/ auf Tiefe	50° 45,37' S	13° 5,72'W	3529,2
PS79/089-2	03.02.12	06:34	TRAPS	an Deck	50° 45,32' S	13° 5,62'W	3522,7
PS79/089-2	03.02.12	06:48	TRAPS	an Deck	50° 45,32' S	13° 5,62'W	3523
PS79/091-1	03.02.12	10:08	CTD/RO	zu Wasser	51° 12,00' S	12° 40,04'W	3926,6
PS79/091-1	03.02.12	11:37	CTD/RO	am Grund/ auf Tiefe	51° 12,13' S	12° 40,05'W	4016,1
PS79/091-1	03.02.12	11:38	CTD/RO	Hieven	51° 12,13' S	12° 40,05'W	4018
PS79/091-2	03.02.12	12:44	HN	zu Wasser	51° 12,20' S	12° 40,14'W	4018
PS79/091-2	03.02.12	12:48	HN	am Grund/ auf Tiefe	51° 12,20' S	12° 40,15'W	4018,8
PS79/091-2	03.02.12	12:51	HN	an Deck	51° 12,21' S	12° 40,15'W	4017,7
PS79/091-1	03.02.12	13:05	CTD/RO	an Deck	51° 12,22' S	12° 40,15'W	4017,7
PS79/091-3	03.02.12	13:14	TRAPS	zu Wasser	51° 12,25' S	12° 40,20'W	4019,6
PS79/091-3	03.02.12	13:27	TRAPS	zu Wasser	51° 12,32' S	12° 40,24'W	4016,9
PS79/091-3	03.02.12	13:34	TRAPS	zu Wasser	51° 12,36' S	12° 40,21'W	4026,1
PS79/091-3	03.02.12	13:36	TRAPS	am Grund/ auf Tiefe	51° 12,37' S	12° 40,20'W	4029,2
PS79/091-4	03.02.12	13:47	FRRF	zu Wasser	51° 12,41' S	12° 40,36'W	4028,4
PS79/091-4	03.02.12	14:06	FRRF	am Grund/ auf Tiefe	51° 12,54' S	12° 40,39'W	4063,7
PS79/091-4	03.02.12	14:34	FRRF	an Deck	51° 12,66' S	12° 40,32'W	4066,8
PS79/091-5	03.02.12	15:07	CTD/RO	zu Wasser	51° 12,75' S	12° 40,41'W	4067,6
PS79/091-6	03.02.12	15:16	HN	zu Wasser	51° 12,79' S	12° 40,38'W	4069,9
PS79/091-6	03.02.12	15:21	HN	am Grund/ auf Tiefe	51° 12,83' S	12° 40,37'W	4071,8
PS79/091-5	03.02.12	15:23	CTD/RO	am Grund/ auf Tiefe	51° 12,84' S	12° 40,36'W	4069,5
PS79/091-5	03.02.12	15:24	CTD/RO	Hieven	51° 12,85' S	12° 40,36'W	4069,5
PS79/091-6	03.02.12	15:24	HN	an Deck	51° 12,85' S	12° 40,36'W	4069,5
PS79/091-5	03.02.12	15:43	CTD/RO	an Deck	51° 12,96' S	12° 40,40'W	4075,6
PS79/091-7	03.02.12	15:50	GO-FLO	zu Wasser	51° 12,99' S	12° 40,44'W	4075,6
PS79/091-7	03.02.12	16:20	GO-FLO	am Grund/ auf Tiefe	51° 13,09' S	12° 40,43'W	4078,3
PS79/091-7	03.02.12	16:40	GO-FLO	Hieven	51° 13,17' S	12° 40,54'W	4079,5
PS79/091-7	03.02.12	16:57	GO-FLO	an Deck	51° 13,21' S	12° 40,67'W	4075,3
PS79/091-8	03.02.12	17:06	MSS	zu Wasser	51° 13,22' S	12° 40,79'W	4063
PS79/091-8	03.02.12	17:15	MSS	am Grund/ auf Tiefe	51° 13,20' S	12° 40,89'W	4035,7
PS79/091-8	03.02.12	18:10	MSS	an Deck	51° 13,07' S	12° 41,90'W	4066
PS79/091-9	03.02.12	18:47	MN	zu Wasser	51° 11,87' S	12° 39,61'W	3883,6
PS79/091-9	03.02.12	19:36	MN	am Grund/ auf Tiefe	51° 11,98' S	12° 40,00'W	3974,3
PS79/091-9	03.02.12	19:38	MN	Hieven	51° 11,99' S	12° 40,03'W	3970,8

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/091-9	03.02.12	19:59	MN	an Deck	51° 11,98' S	12° 40,04'W	3986,9
PS79/091-10	03.02.12	20:23	ISP	zu Wasser	51° 11,95' S	12° 40,03'W	3920,5
PS79/091-10	03.02.12	20:50	ISP	am Grund/ auf Tiefe	51° 11,94' S	12° 40,04'W	3956,2
PS79/091-10	03.02.12	23:01	ISP	Hieven	51° 12,05' S	12° 40,01'W	4014,2
PS79/091-10	03.02.12	23:17	ISP	an Deck	51° 12,06' S	12° 39,97'W	4025,3
PS79/091-11	03.02.12	23:24	FRRF	zu Wasser	51° 12,05' S	12° 40,00'W	3996,1
PS79/091-11	03.02.12	23:34	FRRF	am Grund/ auf Tiefe	51° 12,04' S	12° 39,99'W	4024,9
PS79/091-11	03.02.12	23:35	FRRF	Hieven	51° 12,04' S	12° 39,99'W	4008,8
PS79/091-11	03.02.12	23:44	FRRF	an Deck	51° 12,07' S	12° 40,04'W	4013,4
PS79/091-12	03.02.12	23:51	CTD/RO	zu Wasser	51° 12,06' S	12° 39,99'W	4012,3
PS79/091-12	04.02.12	00:57	CTD/RO	am Grund/ auf Tiefe	51° 12,22' S	12° 40,01'W	4033,4
PS79/091-12	04.02.12	00:57	CTD/RO	Hieven	51° 12,22' S	12° 40,01'W	4033,4
PS79/091-12	04.02.12	01:57	CTD/RO	an Deck	51° 12,46' S	12° 40,14'W	4047,6
PS79/091-13	04.02.12	02:18	RMT	zu Wasser	51° 12,77' S	12° 40,68'W	4072,6
PS79/091-13	04.02.12	02:34	RMT	Profil Anfang	51° 13,29' S	12° 41,61'W	4041,9
PS79/091-13	04.02.12	02:34	RMT	Hieven	51° 13,29' S	12° 41,61'W	4041,9
PS79/091-13	04.02.12	02:56	RMT	Profil Ende	51° 13,99' S	12° 42,86'W	4132,5
PS79/091-13	04.02.12	02:57	RMT	Wasserober- fläche	51° 14,02' S	12° 42,91'W	4133,2
PS79/091-13	04.02.12	03:00	RMT	an Deck	51° 14,11' S	12° 43,07'W	4135,5
PS79/092-1	04.02.12	04:47	CTD	zu Wasser	51° 0,01' S	12° 40,06'W	3924
PS79/092-1	04.02.12	06:13	CTD	am Grund/ auf Tiefe	51° 0,15' S	12° 39,13'W	3880,9
PS79/092-1	04.02.12	06:14	CTD	Hieven	51° 0,15' S	12° 39,12'W	3880,2
PS79/092-1	04.02.12	07:36	CTD	Wasserober- fläche	51° 0,19' S	12° 38,28'W	3844,9
PS79/092-1	04.02.12	07:37	CTD	an Deck	51° 0,19' S	12° 38,26'W	3844,1
PS79/092-2	04.02.12	07:42	MSS	zu Wasser	51° 0,20' S	12° 38,22'W	3841,8
PS79/092-2	04.02.12	08:48	MSS	am Grund/ auf Tiefe	51° 0,86' S	12° 38,66'W	3663,2
PS79/092-2	04.02.12	08:48	MSS	an Deck	51° 0,86' S	12° 38,66'W	3663,2
PS79/093-1	04.02.12	10:12	CTD/RO	zu Wasser	50° 47,92' S	12° 39,88'W	3580,3
PS79/093-1	04.02.12	11:29	CTD/RO	am Grund/ auf Tiefe	50° 48,03' S	12° 39,97'W	3605,1
PS79/093-1	04.02.12	11:31	CTD/RO	Hieven	50° 48,03' S	12° 39,98'W	3606,4
PS79/093-2	04.02.12	11:46	HN	zu Wasser	50° 48,03' S	12° 39,99'W	3605,9
PS79/093-2	04.02.12	11:51	HN	am Grund/ auf Tiefe	50° 48,01' S	12° 39,97'W	3604,9
PS79/093-1	04.02.12	12:54	CTD/RO	an Deck	50° 47,92' S	12° 39,72'W	3574,1
PS79/093-3	04.02.12	13:03	MSS	zu Wasser	50° 47,88' S	12° 39,63'W	3566,1
PS79/093-3	04.02.12	13:22	MSS	am Grund/ auf Tiefe	50° 48,09' S	12° 39,88'W	3609,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/093-3	04.02.12	14:08	MSS	an Deck	50° 48,51' S	12° 40,21'W	3627,4
PS79/093-4	04.02.12	14:20	CTD/RO	zu Wasser	50° 48,50' S	12° 40,17'W	3627,6
PS79/093-5	04.02.12	14:42	HN	zu Wasser	50° 48,51' S	12° 40,09'W	3628,6
PS79/093-5	04.02.12	14:46	HN	am Grund/ auf Tiefe	50° 48,51' S	12° 40,08'W	3629,1
PS79/093-5	04.02.12	14:49	HN	an Deck	50° 48,51' S	12° 40,07'W	3629,4
PS79/093-4	04.02.12	14:56	CTD/RO	am Grund/ auf Tiefe	50° 48,54' S	12° 40,07'W	3630,8
PS79/093-4	04.02.12	14:57	CTD/RO	Hieven	50° 48,55' S	12° 40,07'W	3630,5
PS79/093-4	04.02.12	15:33	CTD/RO	an Deck	50° 48,80' S	12° 40,13'W	3639,6
PS79/094-1	04.02.12	17:55	ADCP	Profil Anfang	50° 59,85' S	12° 0,63'W	3668,6
PS79/094-1	05.02.12	05:49	ADCP	Profil Ende	51° 12,11' S	11° 59,78'W	4205
PS79/095-1	05.02.12	06:00	CTD	zu Wasser	51° 11,90' S	12° 0,08'W	4199,2
PS79/095-1	05.02.12	07:28	CTD	am Grund/ auf Tiefe	51° 11,54' S	11° 59,85'W	4211,9
PS79/095-1	05.02.12	07:29	CTD	Hieven	51° 11,54' S	11° 59,84'W	4212,1
PS79/095-1	05.02.12	08:50	CTD	an Deck	51° 11,53' S	11° 59,90'W	4199,9
PS79/095-2	05.02.12	08:59	MSS	zu Wasser	51° 11,52' S	11° 59,93'W	4200,1
PS79/095-2	05.02.12	10:05	MSS	am Grund/ auf Tiefe	51° 11,26' S	12° 1,24'W	4167
PS79/095-2	05.02.12	10:06	MSS	an Deck	51° 11,26' S	12° 1,25'W	4167,7
PS79/095-3	05.02.12	10:39	CTD/RO	zu Wasser	51° 11,45' S	11° 59,83'W	4201,6
PS79/095-4	05.02.12	10:47	HN	zu Wasser	51° 11,49' S	11° 59,83'W	4212,6
PS79/095-3	05.02.12	11:00	CTD/RO	am Grund/ auf Tiefe	51° 11,46' S	11° 59,87'W	4200,4
PS79/095-4	05.02.12	11:01	HN	am Grund/ auf Tiefe	51° 11,46' S	11° 59,87'W	4200,7
PS79/095-4	05.02.12	11:01	HN	an Deck	51° 11,46' S	11° 59,87'W	4200,7
PS79/095-3	05.02.12	11:02	CTD/RO	Hieven	51° 11,46' S	11° 59,88'W	4200,8
PS79/095-3	05.02.12	11:19	CTD/RO	an Deck	51° 11,44' S	11° 59,83'W	4203,1
PS79/096-1	05.02.12	13:07	CTD/RO	zu Wasser	51° 12,00' S	12° 19,83'W	4075,3
PS79/096-1	05.02.12	14:33	CTD/RO	am Grund/ auf Tiefe	51° 12,05' S	12° 20,14'W	4074,1
PS79/096-1	05.02.12	14:33	CTD/RO	Hieven	51° 12,05' S	12° 20,14'W	4074,1
PS79/096-2	05.02.12	15:42	HN	zu Wasser	51° 12,07' S	12° 19,84'W	4077,1
PS79/096-2	05.02.12	15:46	HN	am Grund/ auf Tiefe	51° 12,07' S	12° 19,83'W	4077,2
PS79/096-2	05.02.12	15:48	HN	an Deck	51° 12,08' S	12° 19,83'W	4077,1
PS79/096-1	05.02.12	15:59	CTD/RO	an Deck	51° 12,09' S	12° 19,81'W	4078,3
PS79/096-3	05.02.12	16:08	MSS	zu Wasser	51° 12,09' S	12° 19,83'W	4077,2
PS79/096-3	05.02.12	16:09	MSS	am Grund/ auf Tiefe	51° 12,09' S	12° 19,86'W	4077,2
PS79/096-3	05.02.12	17:11	MSS	an Deck	51° 11,98' S	12° 20,52'W	4069,5
PS79/097-1	05.02.12	18:13	TRAPS	zu Wasser	51° 10,56' S	12° 31,31'W	3958,1

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/097-1	05.02.12	18:14	TRAPS	am Grund/ auf Tiefe	51° 10,56' S	12° 31,31'W	0
PS79/097-1	05.02.12	18:35	TRAPS	Wasserober-fläche	51° 10,57' S	12° 31,21'W	3951,2
PS79/097-1	05.02.12	18:36	TRAPS	an Deck	51° 10,58' S	12° 31,21'W	0
PS79/098-1	05.02.12	19:24	TRAPS	zu Wasser	51° 11,97' S	12° 39,91'W	0
PS79/098-1	05.02.12	19:37	TRAPS	zu Wasser	51° 12,00' S	12° 39,95'W	3976,2
PS79/098-1	05.02.12	19:46	TRAPS	zu Wasser	51° 12,05' S	12° 39,97'W	4006,1
PS79/098-1	05.02.12	19:49	TRAPS	am Grund/ auf Tiefe	51° 12,07' S	12° 39,97'W	0
PS79/098-1	05.02.12	19:50	TRAPS	an Deck	51° 12,08' S	12° 39,96'W	0
PS79/098-2	05.02.12	20:00	TD	zu Wasser	51° 12,37' S	12° 39,59'W	0
PS79/098-2	05.02.12	20:02	TD	am Grund/ auf Tiefe	51° 12,36' S	12° 39,62'W	4031,1
PS79/098-3	05.02.12	20:14	CTD/RO	zu Wasser	51° 12,36' S	12° 39,80'W	0
PS79/098-3	05.02.12	21:43	CTD/RO	am Grund/ auf Tiefe	51° 12,30' S	12° 39,72'W	4031,1
PS79/098-3	05.02.12	23:03	CTD/RO	an Deck	51° 12,31' S	12° 39,77'W	4033,4
PS79/098-4	05.02.12	23:10	GO-FLO	zu Wasser	51° 12,31' S	12° 39,78'W	4034,6
PS79/098-4	05.02.12	23:28	GO-FLO	am Grund/ auf Tiefe	51° 12,34' S	12° 39,77'W	4035,7
PS79/098-4	05.02.12	23:35	GO-FLO	Hieven	51° 12,34' S	12° 39,76'W	4034,9
PS79/098-4	05.02.12	23:52	GO-FLO	an Deck	51° 12,37' S	12° 39,81'W	4034,6
PS79/098-5	05.02.12	23:58	BONGO	zu Wasser	51° 12,38' S	12° 39,80'W	4039,2
PS79/098-5	06.02.12	00:09	BONGO	am Grund/ auf Tiefe	51° 12,34' S	12° 39,78'W	4034,6
PS79/098-5	06.02.12	00:09	BONGO	Hieven	51° 12,34' S	12° 39,78'W	4034,6
PS79/098-5	06.02.12	00:14	BONGO	an Deck	51° 12,32' S	12° 39,77'W	4040,7
PS79/098-6	06.02.12	00:33	RMT	zu Wasser	51° 11,92' S	12° 39,88'W	3905,2
PS79/098-6	06.02.12	00:50	RMT	Profil Anfang	51° 11,20' S	12° 40,26'W	3823,7
PS79/098-6	06.02.12	00:50	RMT	Hieven	51° 11,20' S	12° 40,26'W	3823,7
PS79/098-6	06.02.12	01:15	RMT	Profil Ende	51° 10,22' S	12° 40,81'W	3661,2
PS79/098-6	06.02.12	01:16	RMT	Wasserober-fläche	51° 10,17' S	12° 40,84'W	3652,2
PS79/098-6	06.02.12	01:19	RMT	an Deck	51° 10,05' S	12° 40,91'W	3652,5
PS79/098-7	06.02.12	01:50	CTD/RO	zu Wasser	51° 12,07' S	12° 39,95'W	4011,5
PS79/098-7	06.02.12	02:08	CTD/RO	am Grund/ auf Tiefe	51° 12,16' S	12° 39,81'W	4046
PS79/098-7	06.02.12	02:09	CTD/RO	Hieven	51° 12,17' S	12° 39,80'W	4044,2
PS79/098-7	06.02.12	02:27	CTD/RO	an Deck	51° 12,18' S	12° 39,82'W	4049,7
PS79/098-8	06.02.12	02:33	MSS	zu Wasser	51° 12,18' S	12° 39,80'W	4046,7
PS79/098-8	06.02.12	02:52	MSS	am Grund/ auf Tiefe	51° 12,05' S	12° 39,66'W	4024,2
PS79/098-8	06.02.12	03:45	MSS	an Deck	51° 11,85' S	12° 39,36'W	3815,7
PS79/098-9	06.02.12	04:03	CTD	zu Wasser	51° 12,00' S	12° 39,51'W	3983,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/098-9	06.02.12	05:08	CTD	am Grund/ auf Tiefe	51° 12,23' S	12° 40,01'W	4037,7
PS79/098-9	06.02.12	05:09	CTD	Hieven	51° 12,23' S	12° 40,01'W	4040,7
PS79/098-9	06.02.12	06:10	CTD	Wasserober-fläche	51° 12,33' S	12° 39,65'W	4034
PS79/098-9	06.02.12	06:11	CTD	an Deck	51° 12,33' S	12° 39,64'W	4036,5
PS79/098-10	06.02.12	06:22	MN	zu Wasser	51° 12,33' S	12° 39,66'W	4036,2
PS79/098-10	06.02.12	07:14	MN	am Grund/ auf Tiefe	51° 12,47' S	12° 39,79'W	4048,5
PS79/098-10	06.02.12	07:14	MN	Hieven	51° 12,47' S	12° 39,79'W	4048,5
PS79/098-10	06.02.12	07:40	MN	Wasserober-fläche	51° 12,53' S	12° 39,85'W	4048,5
PS79/098-10	06.02.12	07:45	MN	an Deck	51° 12,55' S	12° 39,84'W	4044,7
PS79/098-11	06.02.12	08:01	PUMP	zu Wasser	51° 12,34' S	12° 39,94'W	4045
PS79/098-11	06.02.12	08:07	PUMP	an Deck	51° 12,33' S	12° 39,95'W	4041,2
PS79/098-11	06.02.12	08:11	PUMP	zu Wasser	51° 12,28' S	12° 39,98'W	4044
PS79/098-11	06.02.12	08:25	PUMP	am Grund/ auf Tiefe	51° 12,24' S	12° 39,94'W	4049
PS79/098-11	06.02.12	13:04	PUMP	Hieven	51° 11,33' S	12° 40,26'W	3829
PS79/098-11	06.02.12	13:10	PUMP	an Deck	51° 11,28' S	12° 40,39'W	3844,2
PS79/099-1	06.02.12	13:43	TRAPS	am Grund/ auf Tiefe	51° 13,35' S	12° 36,67'W	4030,5
PS79/099-1	06.02.12	13:45	TRAPS	Aktion	51° 13,37' S	12° 36,65'W	4030,7
PS79/099-1	06.02.12	14:18	TRAPS	an Deck	51° 13,48' S	12° 36,56'W	4027,7
PS79/100-1	06.02.12	14:50	TRAPS	zu Wasser	51° 12,12' S	12° 40,04'W	4040,2
PS79/100-1	06.02.12	15:03	TRAPS	zu Wasser	51° 12,24' S	12° 40,05'W	4044
PS79/100-1	06.02.12	15:12	TRAPS	am Grund/ auf Tiefe	51° 12,28' S	12° 39,99'W	4043,2
PS79/101-1	06.02.12	16:30	CTD	zu Wasser	51° 23,92' S	12° 40,00'W	3919
PS79/101-1	06.02.12	17:57	CTD	am Grund/ auf Tiefe	51° 24,43' S	12° 39,16'W	4133,2
PS79/101-2	06.02.12	18:35	HN	zu Wasser	51° 24,61' S	12° 38,68'W	4149,5
PS79/101-2	06.02.12	18:38	HN	am Grund/ auf Tiefe	51° 24,63' S	12° 38,64'W	4129
PS79/101-2	06.02.12	18:42	HN	an Deck	51° 24,64' S	12° 38,57'W	4125,5
PS79/101-1	06.02.12	19:11	CTD	Wasserober-fläche	51° 24,72' S	12° 38,08'W	4121,7
PS79/101-1	06.02.12	19:12	CTD	an Deck	51° 24,72' S	12° 38,06'W	4122,5
PS79/101-3	06.02.12	19:18	MSS	zu Wasser	51° 24,76' S	12° 37,97'W	4125,2
PS79/101-3	06.02.12	20:23	MSS	am Grund/ auf Tiefe	51° 26,00' S	12° 37,30'W	4065,2
PS79/101-3	06.02.12	20:23	MSS	an Deck	51° 26,00' S	12° 37,30'W	4065,2
PS79/102-1	06.02.12	21:33	CTD/RO	zu Wasser	51° 35,78' S	12° 39,97'W	3786
PS79/102-1	06.02.12	22:52	CTD/RO	am Grund/ auf Tiefe	51° 36,10' S	12° 39,18'W	3796,7
PS79/102-1	06.02.12	22:54	CTD/RO	Hieven	51° 36,11' S	12° 39,16'W	3796,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/102-1	07.02.12	00:11	CTD/RO	an Deck	51° 36,43' S	12° 38,48'W	3813,5
PS79/102-2	07.02.12	00:22	MSS	zu Wasser	51° 36,55' S	12° 38,51'W	3810,5
PS79/102-2	07.02.12	00:44	MSS	am Grund/ auf Tiefe	51° 36,83' S	12° 38,64'W	3800,7
PS79/102-2	07.02.12	01:30	MSS	an Deck	51° 37,43' S	12° 38,91'W	3807
PS79/102-3	07.02.12	02:02	CTD/RO	zu Wasser	51° 36,04' S	12° 39,92'W	3788,2
PS79/102-3	07.02.12	02:18	CTD/RO	am Grund/ auf Tiefe	51° 36,10' S	12° 39,84'W	3788,7
PS79/102-3	07.02.12	02:19	CTD/RO	Hieven	51° 36,10' S	12° 39,84'W	3788,7
PS79/102-3	07.02.12	02:36	CTD/RO	an Deck	51° 36,21' S	12° 39,90'W	3788,7
PS79/103-1	07.02.12	04:25	CTD	zu Wasser	51° 36,08' S	12° 59,87'W	3824,2
PS79/103-1	07.02.12	04:41	CTD	am Grund/ auf Tiefe	51° 36,20' S	12° 59,83'W	3825
PS79/103-1	07.02.12	04:42	CTD	Hieven	51° 36,20' S	12° 59,83'W	3824,7
PS79/103-1	07.02.12	04:57	CTD	Wasserober-fläche	51° 36,30' S	12° 59,81'W	3826
PS79/103-1	07.02.12	04:59	CTD	an Deck	51° 36,31' S	12° 59,81'W	3826
PS79/104-1	07.02.12	06:41	CTD	zu Wasser	51° 36,02' S	13° 19,98'W	3909,4
PS79/104-1	07.02.12	08:05	CTD	am Grund/ auf Tiefe	51° 36,46' S	13° 19,76'W	3969,3
PS79/104-1	07.02.12	08:06	CTD	Hieven	51° 36,46' S	13° 19,76'W	3971,6
PS79/104-1	07.02.12	09:29	CTD	an Deck	51° 36,42' S	13° 19,13'W	4178,2
PS79/104-2	07.02.12	09:33	MSS	zu Wasser	51° 36,40' S	13° 19,15'W	4175,1
PS79/104-2	07.02.12	10:42	MSS	am Grund/ auf Tiefe	51° 35,85' S	13° 19,83'W	3937
PS79/104-2	07.02.12	10:43	MSS	an Deck	51° 35,85' S	13° 19,85'W	3884
PS79/105-1	07.02.12	12:10	CTD/RO	zu Wasser	51° 24,00' S	13° 19,92'W	4150,5
PS79/105-1	07.02.12	12:27	CTD/RO	am Grund/ auf Tiefe	51° 23,98' S	13° 19,85'W	4154
PS79/105-1	07.02.12	12:27	CTD/RO	Hieven	51° 23,98' S	13° 19,85'W	4154
PS79/105-1	07.02.12	12:43	CTD/RO	an Deck	51° 24,00' S	13° 19,75'W	4156,2
PS79/106-1	07.02.12	14:42	CTD/RO	zu Wasser	51° 12,05' S	13° 19,89'W	3478
PS79/106-1	07.02.12	15:56	CTD/RO	am Grund/ auf Tiefe	51° 11,95' S	13° 19,89'W	3495,5
PS79/106-1	07.02.12	15:56	CTD/RO	Hieven	51° 11,95' S	13° 19,89'W	3495,5
PS79/106-2	07.02.12	16:46	HN	zu Wasser	51° 12,02' S	13° 19,62'W	3419
PS79/106-2	07.02.12	16:48	HN	am Grund/ auf Tiefe	51° 12,02' S	13° 19,61'W	3415,7
PS79/106-2	07.02.12	16:51	HN	an Deck	51° 12,04' S	13° 19,58'W	3415,5
PS79/106-1	07.02.12	17:08	CTD/RO	Wasserober-fläche	51° 12,15' S	13° 19,38'W	3430,5
PS79/106-1	07.02.12	17:09	CTD/RO	an Deck	51° 12,15' S	13° 19,37'W	3420,5
PS79/106-3	07.02.12	17:20	MSS	zu Wasser	51° 12,01' S	13° 19,46'W	3418,2
PS79/106-3	07.02.12	18:31	MSS	am Grund/ auf Tiefe	51° 11,07' S	13° 19,05'W	3442,5
PS79/106-3	07.02.12	18:32	MSS	an Deck	51° 11,05' S	13° 19,04'W	3430,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/106-4	07.02.12	18:50	CTD	zu Wasser	51° 10,95' S	13° 18,84'W	3398,7
PS79/106-4	07.02.12	19:12	CTD	am Grund/ auf Tiefe	51° 11,23' S	13° 18,82'W	3419,7
PS79/106-4	07.02.12	19:13	CTD	Hieven	51° 11,23' S	13° 18,82'W	3419,2
PS79/106-4	07.02.12	19:29	CTD	Wasserober- fläche	51° 11,19' S	13° 18,51'W	3439,7
PS79/106-4	07.02.12	19:30	CTD	an Deck	51° 11,20' S	13° 18,47'W	3444
PS79/107-1	07.02.12	21:08	CTD/RO	zu Wasser	51° 0,12' S	13° 19,78'W	4067
PS79/107-1	07.02.12	21:28	CTD/RO	am Grund/ auf Tiefe	51° 0,16' S	13° 19,70'W	4063,5
PS79/107-1	07.02.12	21:29	CTD/RO	Hieven	51° 0,16' S	13° 19,72'W	4064
PS79/107-1	07.02.12	21:47	CTD/RO	an Deck	51° 0,18' S	13° 19,75'W	4060,3
PS79/108-1	07.02.12	23:22	CTD/RO	zu Wasser	50° 47,89' S	13° 19,84'W	3703,5
PS79/108-2	08.02.12	00:13	HN	zu Wasser	50° 47,96' S	13° 19,74'W	3855
PS79/108-2	08.02.12	00:15	HN	am Grund/ auf Tiefe	50° 47,95' S	13° 19,72'W	3705,5
PS79/108-2	08.02.12	00:17	HN	an Deck	50° 47,94' S	13° 19,70'W	3705,5
PS79/108-1	08.02.12	00:46	CTD/RO	am Grund/ auf Tiefe	50° 47,90' S	13° 19,74'W	3707,2
PS79/108-1	08.02.12	00:47	CTD/RO	Hieven	50° 47,90' S	13° 19,76'W	3704,2
PS79/108-1	08.02.12	01:58	CTD/RO	an Deck	50° 48,05' S	13° 19,97'W	3710,2
PS79/109-1	08.02.12	03:43	CTD/RO	zu Wasser	50° 47,99' S	12° 59,93'W	3731
PS79/109-1	08.02.12	03:59	CTD/RO	am Grund/ auf Tiefe	50° 47,99' S	13° 0,01'W	3729,7
PS79/109-1	08.02.12	04:15	CTD/RO	Wasserober- fläche	50° 48,04' S	12° 59,97'W	3730,7
PS79/109-1	08.02.12	04:16	CTD/RO	an Deck	50° 48,04' S	12° 59,95'W	3732
PS79/110-1	08.02.12	06:00	CTD	zu Wasser	50° 59,94' S	12° 59,88'W	4032,7
PS79/110-1	08.02.12	06:16	CTD	am Grund/ auf Tiefe	51° 0,11' S	12° 59,69'W	4043
PS79/110-1	08.02.12	06:18	CTD	Hieven	51° 0,13' S	12° 59,64'W	4041,2
PS79/110-1	08.02.12	06:35	CTD	Wasserober- fläche	51° 0,30' S	12° 59,63'W	4053,2
PS79/110-1	08.02.12	06:36	CTD	an Deck	51° 0,30' S	12° 59,64'W	4053,5
PS79/111-1	08.02.12	08:06	CTD/RO	zu Wasser	51° 11,85' S	12° 59,96'W	3861,2
PS79/111-1	08.02.12	09:30	CTD/RO	am Grund/ auf Tiefe	51° 12,13' S	12° 59,85'W	3883,7
PS79/111-1	08.02.12	09:31	CTD/RO	Hieven	51° 12,14' S	12° 59,85'W	3884
PS79/111-2	08.02.12	10:13	HN	zu Wasser	51° 12,07' S	12° 59,88'W	3877
PS79/111-2	08.02.12	10:19	HN	am Grund/ auf Tiefe	51° 12,06' S	12° 59,91'W	3876,2
PS79/111-2	08.02.12	10:19	HN	an Deck	51° 12,06' S	12° 59,91'W	3876,2
PS79/111-1	08.02.12	10:52	CTD/RO	an Deck	51° 11,92' S	12° 59,86'W	3870
PS79/111-3	08.02.12	11:07	MSS	zu Wasser	51° 11,89' S	12° 59,98'W	3864,7
PS79/111-3	08.02.12	12:19	MSS	am Grund/ auf Tiefe	51° 11,84' S	13° 0,20'W	3849

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/111-3	08.02.12	12:19	MSS	an Deck	51° 11,84' S	13° 0,20'W	3849
PS79/112-1	08.02.12	14:06	CTD/RO	zu Wasser	51° 24,03' S	12° 59,70'W	3599,1
PS79/112-1	08.02.12	14:26	CTD/RO	am Grund/ auf Tiefe	51° 23,98' S	12° 59,71'W	3606
PS79/112-1	08.02.12	14:26	CTD/RO	Hieven	51° 23,98' S	12° 59,71'W	3606
PS79/112-1	08.02.12	14:48	CTD/RO	an Deck	51° 23,91' S	12° 59,85'W	3609,2
PS79/113-1	08.02.12	17:26	TRAPS	Aktion	51° 12,67' S	12° 30,01'W	3681,3
PS79/113-1	08.02.12	17:27	TRAPS	am Grund/ auf Tiefe	51° 12,67' S	12° 29,98'W	4045,7
PS79/113-1	08.02.12	17:33	TRAPS	an Deck	51° 12,68' S	12° 29,87'W	4043,4
PS79/113-1	08.02.12	17:47	TRAPS	an Deck	51° 12,80' S	12° 29,88'W	4042,6
PS79/114-1	08.02.12	18:59	TRAPS	zu Wasser	51° 12,16' S	12° 39,31'W	3910,1
PS79/114-1	08.02.12	19:09	TRAPS	zu Wasser	51° 12,21' S	12° 39,29'W	3927,8
PS79/114-1	08.02.12	19:18	TRAPS	am Grund/ auf Tiefe	51° 12,25' S	12° 39,22'W	3857,9
PS79/114-1	08.02.12	19:19	TRAPS	an Deck	51° 12,26' S	12° 39,22'W	3896,3
PS79/114-2	08.02.12	19:37	CTD	zu Wasser	51° 11,96' S	12° 40,09'W	0
PS79/114-2	08.02.12	21:08	CTD	am Grund/ auf Tiefe	51° 12,22' S	12° 40,04'W	0
PS79/114-2	08.02.12	21:09	CTD	Hieven	51° 12,22' S	12° 40,03'W	0
PS79/114-3	08.02.12	22:02	HN	zu Wasser	51° 12,27' S	12° 40,05'W	4036,5
PS79/114-3	08.02.12	22:09	HN	am Grund/ auf Tiefe	51° 12,28' S	12° 39,99'W	0
PS79/114-3	08.02.12	22:09	HN	an Deck	51° 12,28' S	12° 39,99'W	0
PS79/114-2	08.02.12	22:33	CTD	an Deck	51° 12,27' S	12° 39,98'W	0
PS79/114-4	08.02.12	22:44	MN	zu Wasser	51° 12,28' S	12° 40,05'W	3979,6
PS79/114-4	08.02.12	23:43	MN	am Grund/ auf Tiefe	51° 12,42' S	12° 40,17'W	4047,2
PS79/114-4	08.02.12	23:43	MN	Hieven	51° 12,42' S	12° 40,17'W	4047,2
PS79/114-4	09.02.12	00:18	MN	an Deck	51° 12,40' S	12° 40,00'W	4039,2
PS79/114-5	09.02.12	00:34	RMT	zu Wasser	51° 12,15' S	12° 40,48'W	3988,9
PS79/114-5	09.02.12	00:52	RMT	Profil Anfang	51° 11,74' S	12° 41,43'W	4027,3
PS79/114-5	09.02.12	00:53	RMT	Hieven	51° 11,71' S	12° 41,49'W	0
PS79/114-5	09.02.12	01:17	RMT	Profil Ende	51° 11,15' S	12° 42,68'W	3783
PS79/114-5	09.02.12	01:19	RMT	Wasserober- fläche	51° 11,10' S	12° 42,76'W	3876,7
PS79/114-5	09.02.12	01:22	RMT	an Deck	51° 11,03' S	12° 42,90'W	3862,5
PS79/114-6	09.02.12	02:09	BONGO	zu Wasser	51° 11,97' S	12° 39,80'W	4000,5
PS79/114-6	09.02.12	02:18	BONGO	am Grund/ auf Tiefe	51° 11,94' S	12° 39,74'W	3918,7
PS79/114-6	09.02.12	02:19	BONGO	Hieven	51° 11,93' S	12° 39,74'W	3938
PS79/114-6	09.02.12	02:25	BONGO	an Deck	51° 11,92' S	12° 39,72'W	3907,7
PS79/114-7	09.02.12	02:34	CTD/RO	zu Wasser	51° 11,94' S	12° 39,70'W	3933,5
PS79/114-7	09.02.12	03:39	CTD/RO	am Grund/ auf Tiefe	51° 11,95' S	12° 39,81'W	3938,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/114-7	09.02.12	03:40	CTD/RO	Hieven	51° 11,95' S	12° 39,80'W	3983,5
PS79/114-7	09.02.12	04:42	CTD/RO	Wasserober-fläche	51° 11,86' S	12° 40,19'W	3943,7
PS79/114-7	09.02.12	04:43	CTD/RO	an Deck	51° 11,86' S	12° 40,20'W	3947
PS79/114-8	09.02.12	04:47	MSS	zu Wasser	51° 11,83' S	12° 40,28'W	3938,2
PS79/114-8	09.02.12	04:48	MSS	am Grund/ auf Tiefe	51° 11,82' S	12° 40,30'W	3897,2
PS79/114-8	09.02.12	05:58	MSS	an Deck	51° 10,79' S	12° 41,48'W	3937,5
PS79/114-9	09.02.12	06:28	GO-FLO	zu Wasser	51° 12,08' S	12° 39,79'W	4041,2
PS79/114-9	09.02.12	06:49	GO-FLO	am Grund/ auf Tiefe	51° 12,02' S	12° 39,71'W	4044,2
PS79/114-9	09.02.12	06:55	GO-FLO	Hieven	51° 11,99' S	12° 39,69'W	4033,7
PS79/114-9	09.02.12	07:12	GO-FLO	Aktion	51° 11,98' S	12° 39,75'W	3983,2
PS79/114-9	09.02.12	07:13	GO-FLO	an Deck	51° 11,98' S	12° 39,76'W	4007,2
PS79/114-10	09.02.12	07:20	RAMSES	zu Wasser	51° 11,99' S	12° 39,78'W	4023,5
PS79/114-10	09.02.12	07:36	RAMSES	am Grund/ auf Tiefe	51° 11,99' S	12° 39,84'W	3999,2
PS79/114-10	09.02.12	07:36	RAMSES	Hieven	51° 11,99' S	12° 39,84'W	3999,2
PS79/114-10	09.02.12	07:53	RAMSES	Wasserober-fläche	51° 11,99' S	12° 40,03'W	4026,5
PS79/114-10	09.02.12	07:54	RAMSES	an Deck	51° 12,00' S	12° 40,03'W	3977,2
PS79/114-11	09.02.12	08:08	CTD/RO	zu Wasser	51° 12,02' S	12° 40,05'W	4032,2
PS79/114-12	09.02.12	08:11	BUCKET	zu Wasser	51° 12,03' S	12° 40,05'W	4024
PS79/114-12	09.02.12	08:17	BUCKET	am Grund/ auf Tiefe	51° 12,06' S	12° 40,01'W	4019,2
PS79/114-12	09.02.12	08:18	BUCKET	an Deck	51° 12,06' S	12° 40,00'W	4020,5
PS79/114-11	09.02.12	08:26	CTD/RO	am Grund/ auf Tiefe	51° 12,09' S	12° 39,95'W	4011,2
PS79/114-11	09.02.12	08:27	CTD/RO	Hieven	51° 12,09' S	12° 39,96'W	4017,5
PS79/114-11	09.02.12	08:46	CTD/RO	an Deck	51° 12,12' S	12° 40,03'W	4026,2
PS79/115-1	09.02.12	10:47	CTD/RO	zu Wasser	50° 59,92' S	12° 39,86'W	3917
PS79/115-1	09.02.12	12:10	CTD/RO	am Grund/ auf Tiefe	51° 0,10' S	12° 39,91'W	3929,2
PS79/115-1	09.02.12	12:10	CTD/RO	Hieven	51° 0,10' S	12° 39,91'W	3929,2
PS79/115-2	09.02.12	13:01	HN	zu Wasser	50° 59,96' S	12° 39,83'W	3916,5
PS79/115-2	09.02.12	13:02	HN	am Grund/ auf Tiefe	50° 59,96' S	12° 39,83'W	3919
PS79/115-2	09.02.12	13:03	HN	an Deck	50° 59,96' S	12° 39,83'W	3926,2
PS79/115-1	09.02.12	13:27	CTD/RO	an Deck	50° 59,97' S	12° 39,75'W	3914
PS79/115-3	09.02.12	13:38	MSS	zu Wasser	50° 59,88' S	12° 39,68'W	3912,5
PS79/115-3	09.02.12	14:02	MSS	am Grund/ auf Tiefe	50° 59,77' S	12° 39,71'W	3913,2
PS79/115-3	09.02.12	14:51	MSS	an Deck	50° 59,39' S	12° 39,92'W	3922,7
PS79/115-4	09.02.12	15:07	CTD/RO	zu Wasser	50° 59,61' S	12° 39,99'W	3922,7
PS79/115-4	09.02.12	15:30	CTD/RO	am Grund/ auf Tiefe	50° 59,44' S	12° 39,90'W	3921,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/115-4	09.02.12	15:30	CTD/RO	Hieven	50° 59,44' S	12° 39,90'W	3921,7
PS79/115-4	09.02.12	15:48	CTD/RO	an Deck	50° 59,44' S	12° 39,85'W	3921,7
PS79/116-1	09.02.12	17:57	CTD	zu Wasser	50° 47,94' S	12° 39,69'W	3594,2
PS79/116-1	09.02.12	19:19	CTD	am Grund/ auf Tiefe	50° 47,63' S	12° 39,09'W	3565,2
PS79/116-1	09.02.12	19:20	CTD	Hieven	50° 47,62' S	12° 39,09'W	3567,7
PS79/116-2	09.02.12	19:59	HN	zu Wasser	50° 47,37' S	12° 38,81'W	3543,7
PS79/116-2	09.02.12	20:06	HN	am Grund/ auf Tiefe	50° 47,28' S	12° 38,73'W	3538,2
PS79/116-2	09.02.12	20:07	HN	an Deck	50° 47,28' S	12° 38,71'W	3537,7
PS79/116-1	09.02.12	20:27	CTD	an Deck	50° 47,12' S	12° 38,56'W	3523,7
PS79/116-3	09.02.12	20:35	MSS	zu Wasser	50° 47,02' S	12° 38,57'W	3517,2
PS79/116-3	09.02.12	21:50	MSS	am Grund/ auf Tiefe	50° 45,83' S	12° 40,17'W	3111,5
PS79/116-3	09.02.12	21:50	MSS	an Deck	50° 45,83' S	12° 40,17'W	3111,5
PS79/117-1	09.02.12	23:31	CTD/RO	zu Wasser	50° 47,99' S	12° 19,97'W	3721,2
PS79/117-1	09.02.12	23:49	CTD/RO	am Grund/ auf Tiefe	50° 48,06' S	12° 20,04'W	3714,5
PS79/117-1	09.02.12	23:50	CTD/RO	Hieven	50° 48,07' S	12° 20,04'W	3714,7
PS79/117-1	10.02.12	00:10	CTD/RO	an Deck	50° 48,09' S	12° 20,03'W	3729,7
PS79/118-1	10.02.12	01:59	CTD/RO	zu Wasser	51° 0,02' S	12° 19,92'W	3575,7
PS79/118-1	10.02.12	02:18	CTD/RO	am Grund/ auf Tiefe	51° 0,11' S	12° 19,96'W	3400,2
PS79/118-1	10.02.12	02:18	CTD/RO	Hieven	51° 0,11' S	12° 19,96'W	3400,2
PS79/118-1	10.02.12	02:38	CTD/RO	an Deck	51° 0,20' S	12° 20,05'W	3345,5
PS79/119-1	10.02.12	04:31	CTD	zu Wasser	51° 12,14' S	12° 20,05'W	4076
PS79/119-1	10.02.12	05:54	CTD	am Grund/ auf Tiefe	51° 12,43' S	12° 19,79'W	4084,9
PS79/119-1	10.02.12	05:54	CTD	Hieven	51° 12,43' S	12° 19,79'W	4084,9
PS79/119-1	10.02.12	07:12	CTD	Wasserober- fläche	51° 12,51' S	12° 19,82'W	4085,2
PS79/119-1	10.02.12	07:13	CTD	an Deck	51° 12,51' S	12° 19,82'W	4085,5
PS79/119-2	10.02.12	07:20	MSS	zu Wasser	51° 12,52' S	12° 19,89'W	4085,8
PS79/119-2	10.02.12	08:29	MSS	am Grund/ auf Tiefe	51° 12,95' S	12° 21,34'W	4070,6
PS79/119-2	10.02.12	08:30	MSS	an Deck	51° 12,95' S	12° 21,37'W	4069,5
PS79/119-3	10.02.12	08:50	CTD/RO	zu Wasser	51° 11,94' S	12° 20,00'W	4073,7
PS79/119-3	10.02.12	09:10	CTD/RO	am Grund/ auf Tiefe	51° 12,09' S	12° 19,84'W	4077,6
PS79/119-3	10.02.12	09:11	CTD/RO	Hieven	51° 12,10' S	12° 19,84'W	4078,3
PS79/119-3	10.02.12	09:30	CTD/RO	an Deck	51° 12,29' S	12° 19,74'W	4081,8
PS79/120-1	10.02.12	11:14	CTD/RO	zu Wasser	51° 24,09' S	12° 19,97'W	3737,3
PS79/120-1	10.02.12	11:30	CTD/RO	am Grund/ auf Tiefe	51° 24,07' S	12° 19,82'W	3741,9
PS79/120-1	10.02.12	11:31	CTD/RO	Hieven	51° 24,06' S	12° 19,81'W	3742,8

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/120-1	10.02.12	11:48	CTD/RO	an Deck	51° 24,04' S	12° 19,90'W	3739,2
PS79/121-1	10.02.12	13:38	CTD/RO	zu Wasser	51° 35,97' S	12° 19,84'W	3820,5
PS79/121-1	10.02.12	13:59	CTD/RO	am Grund/ auf Tiefe	51° 35,95' S	12° 19,85'W	3820,2
PS79/121-1	10.02.12	13:59	CTD/RO	Hieven	51° 35,95' S	12° 19,85'W	3820,2
PS79/121-1	10.02.12	14:17	CTD/RO	an Deck	51° 35,94' S	12° 19,82'W	3820,7
PS79/122-1	10.02.12	16:04	BUOY	zu Wasser	51° 35,95' S	11° 58,58'W	3774,2
PS79/122-1	10.02.12	16:04	BUOY	am Grund/ auf Tiefe	51° 35,95' S	11° 58,58'W	3774,2
PS79/122-2	10.02.12	16:17	CTD/RO	zu Wasser	51° 35,88' S	11° 59,76'W	3778
PS79/122-2	10.02.12	17:34	CTD/RO	am Grund/ auf Tiefe	51° 35,89' S	12° 0,22'W	0
PS79/122-2	10.02.12	17:35	CTD/RO	Hieven	51° 35,89' S	12° 0,22'W	3730,8
PS79/122-3	10.02.12	18:22	HN	zu Wasser	51° 36,18' S	12° 0,28'W	0
PS79/122-3	10.02.12	18:23	HN	am Grund/ auf Tiefe	51° 36,19' S	12° 0,27'W	0
PS79/122-3	10.02.12	18:24	HN	an Deck	51° 36,21' S	12° 0,27'W	0
PS79/122-2	10.02.12	18:47	CTD/RO	Wasserober-fläche	51° 36,35' S	12° 0,50'W	0
PS79/122-2	10.02.12	18:47	CTD/RO	an Deck	51° 36,35' S	12° 0,50'W	0
PS79/122-4	10.02.12	18:54	MSS	zu Wasser	51° 36,35' S	12° 0,68'W	3754,2
PS79/122-4	10.02.12	20:07	MSS	am Grund/ auf Tiefe	51° 36,36' S	12° 2,58'W	3687,3
PS79/122-4	10.02.12	20:07	MSS	an Deck	51° 36,36' S	12° 2,58'W	3687,3
PS79/122-5	10.02.12	20:55	BUOY	am Grund/ auf Tiefe	51° 37,71' S	11° 54,35'W	3784,6
PS79/122-5	10.02.12	20:55	BUOY	an Deck	51° 37,71' S	11° 54,35'W	3784,6
PS79/123-1	10.02.12	23:49	CTD/RO	zu Wasser	51° 24,05' S	11° 59,95'W	3775,7
PS79/123-1	11.02.12	00:10	CTD/RO	am Grund/ auf Tiefe	51° 24,15' S	11° 59,94'W	3772,3
PS79/123-1	11.02.12	00:10	CTD/RO	Hieven	51° 24,15' S	11° 59,94'W	3772,3
PS79/123-1	11.02.12	00:29	CTD/RO	an Deck	51° 24,29' S	11° 59,71'W	3779,6
PS79/124-1	11.02.12	02:41	CTD/RO	zu Wasser	51° 11,99' S	11° 59,88'W	4207
PS79/124-1	11.02.12	04:15	CTD/RO	am Grund/ auf Tiefe	51° 12,04' S	11° 59,97'W	4203,2
PS79/124-1	11.02.12	04:15	CTD/RO	Hieven	51° 12,04' S	11° 59,97'W	4203,2
PS79/124-1	11.02.12	05:27	CTD/RO	Wasserober-fläche	51° 12,02' S	12° 0,41'W	4192,5
PS79/124-1	11.02.12	05:28	CTD/RO	an Deck	51° 12,02' S	12° 0,42'W	4189,2
PS79/124-2	11.02.12	05:38	MSS	zu Wasser	51° 12,01' S	12° 0,37'W	4190,2
PS79/124-2	11.02.12	05:39	MSS	am Grund/ auf Tiefe	51° 12,01' S	12° 0,37'W	4192,2
PS79/124-2	11.02.12	06:54	MSS	an Deck	51° 11,88' S	12° 2,01'W	4142
PS79/125-1	11.02.12	08:37	CTD/RO	zu Wasser	50° 59,99' S	11° 59,98'W	3634,5
PS79/125-1	11.02.12	08:56	CTD/RO	am Grund/ auf Tiefe	51° 0,07' S	12° 0,05'W	3632

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/125-1	11.02.12	08:58	CTD/RO	Hieven	51° 0,07' S	12° 0,07'W	3632
PS79/125-1	11.02.12	09:16	CTD/RO	an Deck	51° 0,09' S	12° 0,05'W	3632,2
PS79/126-1	11.02.12	11:05	CTD/RO	zu Wasser	50° 47,99' S	11° 59,96'W	3882,5
PS79/126-1	11.02.12	12:28	CTD/RO	am Grund/ auf Tiefe	50° 48,07' S	11° 59,96'W	3885,5
PS79/126-1	11.02.12	12:28	CTD/RO	Hieven	50° 48,07' S	11° 59,96'W	3885,5
PS79/126-2	11.02.12	13:01	HN	zu Wasser	50° 48,14' S	12° 0,10'W	3888,2
PS79/126-2	11.02.12	13:02	HN	am Grund/ auf Tiefe	50° 48,14' S	12° 0,10'W	3889
PS79/126-2	11.02.12	13:03	HN	an Deck	50° 48,14' S	12° 0,09'W	3889
PS79/126-1	11.02.12	13:44	CTD/RO	an Deck	50° 48,11' S	11° 59,97'W	3886,7
PS79/126-3	11.02.12	13:55	MSS	zu Wasser	50° 48,10' S	12° 0,19'W	3887
PS79/126-3	11.02.12	14:20	MSS	am Grund/ auf Tiefe	50° 48,10' S	12° 0,60'W	3889,2
PS79/126-3	11.02.12	15:10	MSS	an Deck	50° 48,09' S	12° 1,26'W	3890,5
PS79/127-1	11.02.12	18:51	TRAPS	zu Wasser	51° 13,62' S	12° 24,94'W	0
PS79/127-1	11.02.12	18:51	TRAPS	am Grund/ auf Tiefe	51° 13,62' S	12° 24,94'W	0
PS79/127-1	11.02.12	18:52	TRAPS	Aktion	51° 13,63' S	12° 24,92'W	4058,7
PS79/127-1	11.02.12	19:00	TRAPS	Wasserober- fläche	51° 13,70' S	12° 24,84'W	4059,9
PS79/127-1	11.02.12	19:01	TRAPS	an Deck	51° 13,70' S	12° 24,83'W	4060,3
PS79/127-1	11.02.12	19:05	TRAPS	Hieven	51° 13,73' S	12° 24,82'W	4058,7
PS79/127-1	11.02.12	19:11	TRAPS	Wasserober- fläche	51° 13,79' S	12° 24,71'W	4319,5
PS79/127-1	11.02.12	19:12	TRAPS	an Deck	51° 13,80' S	12° 24,70'W	3845,2
PS79/127-2	11.02.12	19:54	CTD	zu Wasser	51° 13,80' S	12° 24,74'W	4061,1
PS79/127-2	11.02.12	20:21	CTD	am Grund/ auf Tiefe	51° 13,82' S	12° 24,76'W	4060,3
PS79/127-2	11.02.12	20:30	CTD	Hieven	51° 13,85' S	12° 24,82'W	4055,3
PS79/127-2	11.02.12	20:48	CTD	an Deck	51° 14,05' S	12° 24,62'W	0
PS79/128-1	11.02.12	22:35	BONGO	zu Wasser	51° 12,06' S	12° 39,86'W	4040,3
PS79/128-1	11.02.12	22:43	BONGO	am Grund/ auf Tiefe	51° 12,05' S	12° 39,84'W	4042,2
PS79/128-1	11.02.12	22:44	BONGO	Hieven	51° 12,06' S	12° 39,83'W	4042,2
PS79/128-1	11.02.12	22:50	BONGO	an Deck	51° 12,07' S	12° 39,86'W	4039,2
PS79/128-2	11.02.12	22:56	FRRF	zu Wasser	51° 12,08' S	12° 39,91'W	4043
PS79/128-2	11.02.12	23:08	FRRF	am Grund/ auf Tiefe	51° 12,07' S	12° 39,92'W	4007,7
PS79/128-2	11.02.12	23:08	FRRF	Hieven	51° 12,07' S	12° 39,92'W	4007,7
PS79/128-2	11.02.12	23:16	FRRF	an Deck	51° 12,05' S	12° 40,02'W	4172,8
PS79/128-3	11.02.12	23:23	MN	zu Wasser	51° 12,01' S	12° 40,09'W	3988,5
PS79/128-3	12.02.12	00:16	MN	am Grund/ auf Tiefe	51° 12,06' S	12° 40,11'W	4008,1
PS79/128-3	12.02.12	00:16	MN	Hieven	51° 12,06' S	12° 40,11'W	4008,1

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/128-3	12.02.12	00:54	MN	an Deck	51° 12,16' S	12° 40,04'W	4163,6
PS79/128-4	12.02.12	01:06	RMT	zu Wasser	51° 12,08' S	12° 40,44'W	3984,6
PS79/128-4	12.02.12	01:25	RMT	Profil Anfang	51° 12,14' S	12° 41,81'W	3965,4
PS79/128-4	12.02.12	01:26	RMT	Hieven	51° 12,15' S	12° 41,86'W	3910,1
PS79/128-4	12.02.12	01:50	RMT	Profil Ende	51° 12,37' S	12° 43,45'W	4067,2
PS79/128-4	12.02.12	01:51	RMT	Wasserober-fläche	51° 12,39' S	12° 43,51'W	4069,1
PS79/128-4	12.02.12	01:55	RMT	an Deck	51° 12,44' S	12° 43,76'W	4072,6
PS79/128-5	12.02.12	02:50	CTD/RO	zu Wasser	51° 12,01' S	12° 39,75'W	3905,5
PS79/128-5	12.02.12	04:17	CTD/RO	am Grund/ auf Tiefe	51° 11,95' S	12° 39,81'W	3994
PS79/128-5	12.02.12	04:18	CTD/RO	Hieven	51° 11,94' S	12° 39,79'W	3980,5
PS79/128-5	12.02.12	05:37	CTD/RO	Wasserober-fläche	51° 12,07' S	12° 38,93'W	3779,7
PS79/128-5	12.02.12	05:38	CTD/RO	an Deck	51° 12,08' S	12° 38,93'W	3784
PS79/128-6	12.02.12	05:45	MSS	zu Wasser	51° 12,14' S	12° 38,92'W	3789,7
PS79/128-6	12.02.12	06:00	MSS	am Grund/ auf Tiefe	51° 12,28' S	12° 38,96'W	3984,5
PS79/128-6	12.02.12	06:59	MSS	an Deck	51° 13,34' S	12° 38,81'W	0
PS79/128-7	12.02.12	07:27	CTD/RO	zu Wasser	51° 12,02' S	12° 39,61'W	4044
PS79/128-7	12.02.12	08:30	CTD/RO	am Grund/ auf Tiefe	51° 12,33' S	12° 39,30'W	3946
PS79/128-7	12.02.12	08:31	CTD/RO	Hieven	51° 12,33' S	12° 39,27'W	3889,2
PS79/128-7	12.02.12	09:36	CTD/RO	an Deck	51° 12,27' S	12° 39,40'W	4037,2
PS79/128-8	12.02.12	09:52	GO-FLO	zu Wasser	51° 12,23' S	12° 39,51'W	4019
PS79/128-8	12.02.12	10:14	GO-FLO	am Grund/ auf Tiefe	51° 12,12' S	12° 39,30'W	4020,5
PS79/128-8	12.02.12	10:21	GO-FLO	Hieven	51° 12,17' S	12° 39,23'W	4001
PS79/128-8	12.02.12	10:37	GO-FLO	an Deck	51° 12,26' S	12° 39,13'W	3969,5
PS79/128-9	12.02.12	10:42	FRRF	zu Wasser	51° 12,27' S	12° 39,02'W	3977,7
PS79/128-9	12.02.12	10:57	FRRF	am Grund/ auf Tiefe	51° 12,27' S	12° 38,75'W	3831,7
PS79/128-9	12.02.12	10:57	FRRF	Hieven	51° 12,27' S	12° 38,75'W	3831,7
PS79/128-9	12.02.12	11:13	FRRF	an Deck	51° 12,36' S	12° 38,82'W	3934,5
PS79/128-10	12.02.12	11:26	CTD/RO	zu Wasser	51° 12,44' S	12° 38,89'W	4042,7
PS79/128-10	12.02.12	11:47	CTD/RO	am Grund/ auf Tiefe	51° 12,43' S	12° 38,83'W	4051,7
PS79/128-10	12.02.12	11:47	CTD/RO	Hieven	51° 12,43' S	12° 38,83'W	4051,7
PS79/128-10	12.02.12	12:09	CTD/RO	an Deck	51° 12,48' S	12° 38,89'W	4016
PS79/128-11	12.02.12	12:20	MN	zu Wasser	51° 12,49' S	12° 38,90'W	4027
PS79/128-11	12.02.12	13:28	MN	am Grund/ auf Tiefe	51° 12,53' S	12° 38,65'W	3962,5
PS79/128-11	12.02.12	13:28	MN	Hieven	51° 12,53' S	12° 38,65'W	3962,5
PS79/128-11	12.02.12	13:54	MN	an Deck	51° 12,50' S	12° 38,43'W	3908,7
PS79/128-12	12.02.12	14:00	TRAPS	zu Wasser	51° 12,51' S	12° 38,39'W	3921,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/128-12	12.02.12	14:13	TRAPS	zu Wasser	51° 12,51' S	12° 38,30'W	3924,2
PS79/128-12	12.02.12	14:23	TRAPS	zu Wasser	51° 12,49' S	12° 38,24'W	3904,7
PS79/128-12	12.02.12	14:26	TRAPS	am Grund/ auf Tiefe	51° 12,48' S	12° 38,20'W	3903,5
PS79/128-13	12.02.12	14:36	RMT	zu Wasser	51° 12,69' S	12° 38,26'W	3953,7
PS79/128-13	12.02.12	14:55	RMT	Profil Anfang	51° 13,10' S	12° 39,48'W	4060
PS79/128-13	12.02.12	14:55	RMT	Hieven	51° 13,10' S	12° 39,48'W	4060
PS79/128-13	12.02.12	15:19	RMT	Profil Ende	51° 13,57' S	12° 40,95'W	4064,5
PS79/128-13	12.02.12	15:22	RMT	Wasserober-fläche	51° 13,63' S	12° 41,14'W	4064,5
PS79/128-13	12.02.12	15:25	RMT	an Deck	51° 13,67' S	12° 41,28'W	4062,5
PS79/128-14	12.02.12	15:56	CTD/RO	zu Wasser	51° 12,00' S	12° 39,93'W	4032
PS79/128-14	12.02.12	17:20	CTD/RO	am Grund/ auf Tiefe	51° 12,04' S	12° 39,50'W	4017
PS79/128-14	12.02.12	17:21	CTD/RO	Hieven	51° 12,05' S	12° 39,50'W	4046,7
PS79/128-14	12.02.12	18:39	CTD/RO	Wasserober-fläche	51° 12,34' S	12° 39,39'W	4039,7
PS79/128-14	12.02.12	18:40	CTD/RO	an Deck	51° 12,35' S	12° 39,39'W	4041
PS79/129-1	12.02.12	22:45	CTD/RO	zu Wasser	50° 35,95' S	13° 0,08'W	3534,6
PS79/129-1	12.02.12	23:21	CTD/RO	am Grund/ auf Tiefe	50° 35,76' S	13° 0,24'W	3526,5
PS79/129-1	12.02.12	23:29	CTD/RO	Hieven	50° 35,74' S	13° 0,31'W	3511,5
PS79/129-1	13.02.12	00:10	CTD/RO	an Deck	50° 35,69' S	13° 0,43'W	3501,6
PS79/130-1	13.02.12	01:41	CTD/RO	zu Wasser	50° 24,03' S	12° 59,93'W	3897
PS79/130-1	13.02.12	02:18	CTD/RO	am Grund/ auf Tiefe	50° 23,81' S	13° 0,10'W	3893,2
PS79/130-1	13.02.12	02:18	CTD/RO	Hieven	50° 23,81' S	13° 0,10'W	3893,2
PS79/130-1	13.02.12	02:55	CTD/RO	an Deck	50° 23,77' S	13° 0,45'W	3889,8
PS79/131-1	13.02.12	04:29	CTD	zu Wasser	50° 12,10' S	13° 0,36'W	3545,6
PS79/131-1	13.02.12	05:03	CTD	am Grund/ auf Tiefe	50° 11,90' S	13° 0,43'W	3556,5
PS79/131-1	13.02.12	05:04	CTD	Hieven	50° 11,90' S	13° 0,44'W	3556,5
PS79/131-1	13.02.12	05:38	CTD	Wasserober-fläche	50° 11,83' S	13° 0,41'W	3559,5
PS79/131-1	13.02.12	05:39	CTD	an Deck	50° 11,83' S	13° 0,40'W	3558,4
PS79/132-1	13.02.12	07:21	CTD	zu Wasser	50° 12,01' S	13° 20,04'W	3524,2
PS79/132-2	13.02.12	07:47	HN	zu Wasser	50° 11,91' S	13° 20,10'W	3524,8
PS79/132-2	13.02.12	07:55	HN	am Grund/ auf Tiefe	50° 11,88' S	13° 20,09'W	3524,2
PS79/132-2	13.02.12	07:55	HN	an Deck	50° 11,88' S	13° 20,09'W	3524,2
PS79/132-1	13.02.12	07:56	CTD	am Grund/ auf Tiefe	50° 11,87' S	13° 20,09'W	3523,7
PS79/132-1	13.02.12	08:34	CTD	an Deck	50° 11,75' S	13° 20,02'W	3520,7
PS79/132-3	13.02.12	08:35	FLOAT	zu Wasser	50° 11,75' S	13° 20,02'W	3520,6
PS79/132-3	13.02.12	08:41	FLOAT	am Grund/ auf Tiefe	50° 11,75' S	13° 20,05'W	3521,6

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/133-1	13.02.12	10:23	CTD/RO	zu Wasser	50° 23,99' S	13° 19,97'W	4017,3
PS79/133-1	13.02.12	11:12	CTD/RO	am Grund/ auf Tiefe	50° 23,99' S	13° 20,05'W	4020,7
PS79/133-1	13.02.12	11:13	CTD/RO	Hieven	50° 23,98' S	13° 20,05'W	4021,1
PS79/133-1	13.02.12	11:44	CTD/RO	an Deck	50° 23,93' S	13° 19,90'W	4022,3
PS79/134-1	13.02.12	13:41	CTD/RO	zu Wasser	50° 35,91' S	13° 20,01'W	3459,7
PS79/134-1	13.02.12	14:15	CTD/RO	am Grund/ auf Tiefe	50° 36,01' S	13° 20,03'W	3444,5
PS79/134-1	13.02.12	14:15	CTD/RO	Hieven	50° 36,01' S	13° 20,03'W	3444,5
PS79/134-1	13.02.12	14:49	CTD/RO	an Deck	50° 36,09' S	13° 19,88'W	3453,6
PS79/134-2	13.02.12	14:53	FLOAT	zu Wasser	50° 36,07' S	13° 19,87'W	3470,5
PS79/134-2	13.02.12	14:54	FLOAT	am Grund/ auf Tiefe	50° 36,06' S	13° 19,88'W	3464,3
PS79/135-1	13.02.12	19:20	TRAPS	Aktion	51° 10,97' S	12° 29,67'W	4041,1
PS79/135-1	13.02.12	19:20	TRAPS	am Grund/ auf Tiefe	51° 10,97' S	12° 29,67'W	4041,1
PS79/135-1	13.02.12	19:27	TRAPS	an Deck	51° 10,97' S	12° 29,65'W	4043
PS79/135-1	13.02.12	19:37	TRAPS	an Deck	51° 10,94' S	12° 29,62'W	4044,5
PS79/136-1	13.02.12	20:46	CTD/RO	zu Wasser	51° 11,94' S	12° 39,93'W	3964,3
PS79/136-1	13.02.12	21:54	CTD/RO	am Grund/ auf Tiefe	51° 11,97' S	12° 39,89'W	3985,4
PS79/136-1	13.02.12	21:55	CTD/RO	Hieven	51° 11,97' S	12° 39,89'W	4021,5
PS79/136-1	13.02.12	22:57	CTD/RO	an Deck	51° 12,06' S	12° 39,95'W	4031,5
PS79/136-2	13.02.12	23:08	MN	zu Wasser	51° 12,04' S	12° 40,03'W	0
PS79/136-2	13.02.12	23:56	MN	am Grund/ auf Tiefe	51° 11,94' S	12° 40,01'W	3976,5
PS79/136-2	13.02.12	23:59	MN	Hieven	51° 11,94' S	12° 39,98'W	3999,5
PS79/136-2	14.02.12	00:20	MN	an Deck	51° 11,95' S	12° 39,83'W	4017,7
PS79/136-3	14.02.12	00:31	RMT	zu Wasser	51° 11,73' S	12° 40,37'W	3882,5
PS79/136-3	14.02.12	00:50	RMT	Profil Anfang	51° 11,37' S	12° 41,41'W	3996,7
PS79/136-3	14.02.12	00:50	RMT	Hieven	51° 11,37' S	12° 41,41'W	3996,7
PS79/136-3	14.02.12	01:13	RMT	Profil Ende	51° 10,87' S	12° 42,54'W	3787,5
PS79/136-3	14.02.12	01:15	RMT	Wasserober- fläche	51° 10,82' S	12° 42,63'W	3778,5
PS79/136-3	14.02.12	01:18	RMT	an Deck	51° 10,76' S	12° 42,72'W	3834,7
PS79/136-5	14.02.12	05:08	CTD	zu Wasser	51° 12,02' S	12° 39,96'W	3984
PS79/136-5	14.02.12	06:29	CTD	am Grund/ auf Tiefe	51° 11,77' S	12° 39,31'W	0
PS79/136-5	14.02.12	06:30	CTD	Hieven	51° 11,77' S	12° 39,30'W	0
PS79/136-5	14.02.12	07:45	CTD	Wasserober- fläche	51° 11,88' S	12° 39,40'W	3875,2
PS79/136-5	14.02.12	07:46	CTD	an Deck	51° 11,88' S	12° 39,40'W	3807,2
PS79/136-6	14.02.12	07:54	GO-FLO	zu Wasser	51° 11,86' S	12° 39,45'W	3906
PS79/136-6	14.02.12	08:10	GO-FLO	am Grund/ auf Tiefe	51° 11,81' S	12° 39,49'W	3852,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/136-6	14.02.12	08:16	GO-FLO	Hieven	51° 11,78' S	12° 39,47'W	3854
PS79/136-6	14.02.12	08:30	GO-FLO	an Deck	51° 11,71' S	12° 39,39'W	3821,2
PS79/136-7	14.02.12	08:41	FRRF	zu Wasser	51° 11,61' S	12° 39,39'W	3774,7
PS79/136-7	14.02.12	08:56	FRRF	am Grund/ auf Tiefe	51° 11,52' S	12° 39,21'W	3806,7
PS79/136-7	14.02.12	08:58	FRRF	Hieven	51° 11,52' S	12° 39,21'W	3787,7
PS79/136-7	14.02.12	09:08	FRRF	an Deck	51° 11,52' S	12° 39,21'W	3812,5
PS79/136-8	14.02.12	09:25	CTD/RO	zu Wasser	51° 11,84' S	12° 39,68'W	3880,6
PS79/136-8	14.02.12	09:45	CTD/RO	am Grund/ auf Tiefe	51° 11,96' S	12° 39,54'W	0
PS79/136-8	14.02.12	10:01	CTD/RO	an Deck	51° 11,99' S	12° 39,39'W	4052,2
PS79/136-9	14.02.12	10:33	MSS	zu Wasser	51° 12,15' S	12° 39,15'W	3898,7
PS79/136-9	14.02.12	11:47	MSS	am Grund/ auf Tiefe	51° 12,69' S	12° 38,65'W	3986,7
PS79/136-9	14.02.12	11:47	MSS	an Deck	51° 12,69' S	12° 38,65'W	3986,7
PS79/136-10	14.02.12	11:58	RMT	zu Wasser	51° 12,87' S	12° 38,68'W	0
PS79/136-10	14.02.12	12:16	RMT	Profil Anfang	51° 13,48' S	12° 39,10'W	4063,5
PS79/136-10	14.02.12	12:16	RMT	Hieven	51° 13,48' S	12° 39,10'W	4063,5
PS79/136-10	14.02.12	12:39	RMT	Profil Ende	51° 14,29' S	12° 39,62'W	0
PS79/136-10	14.02.12	12:41	RMT	Wasserober-fläche	51° 14,36' S	12° 39,67'W	4081,7
PS79/136-10	14.02.12	12:43	RMT	an Deck	51° 14,43' S	12° 39,75'W	4089,7
PS79/136-11	14.02.12	13:30	TRAPS	zu Wasser	51° 11,89' S	12° 39,88'W	3994,5
PS79/136-11	14.02.12	13:41	TRAPS	zu Wasser	51° 11,85' S	12° 39,75'W	0
PS79/136-11	14.02.12	13:50	TRAPS	zu Wasser	51° 11,81' S	12° 39,67'W	3881,2
PS79/136-11	14.02.12	13:53	TRAPS	am Grund/ auf Tiefe	51° 11,78' S	12° 39,62'W	3872,9
PS79/137-1	14.02.12	16:47	TRAPS	Aktion	51° 0,86' S	12° 10,01'W	3133,3
PS79/137-1	14.02.12	16:50	TRAPS	zu Wasser	51° 0,86' S	12° 9,97'W	3136
PS79/137-1	14.02.12	17:04	TRAPS	zu Wasser	51° 0,88' S	12° 10,00'W	3140,2
PS79/137-1	14.02.12	17:13	TRAPS	am Grund/ auf Tiefe	51° 0,91' S	12° 9,87'W	3439,7
PS79/137-1	14.02.12	17:14	TRAPS	an Deck	51° 0,91' S	12° 9,87'W	3503,1
PS79/137-2	14.02.12	17:34	CTD/RO	zu Wasser	51° 0,60' S	12° 9,44'W	3170,2
PS79/137-2	14.02.12	17:48	CTD/RO	am Grund/ auf Tiefe	51° 0,66' S	12° 9,41'W	3222,7
PS79/137-2	14.02.12	17:50	CTD/RO	an Deck	51° 0,66' S	12° 9,36'W	3215,5
PS79/137-3	14.02.12	18:13	RMT	zu Wasser	51° 0,97' S	12° 9,46'W	3192,8
PS79/137-3	14.02.12	19:20	RMT	am Grund/ auf Tiefe	51° 2,88' S	12° 10,92'W	3371,6
PS79/137-3	14.02.12	19:20	RMT	Hieven	51° 2,88' S	12° 10,92'W	3371,6
PS79/137-3	14.02.12	21:09	RMT	Profil Anfang	51° 5,41' S	12° 12,25'W	3545,5
PS79/137-3	14.02.12	21:09	RMT	Profil Ende	51° 5,41' S	12° 12,25'W	3545,5
PS79/137-3	14.02.12	21:09	RMT	an Deck	51° 5,41' S	12° 12,25'W	3545,5
PS79/137-4	14.02.12	22:05	CTD/RO	zu Wasser	51° 2,19' S	12° 10,40'W	3467

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/137-4	14.02.12	23:27	CTD/RO	am Grund/ auf Tiefe	51° 2,19' S	12° 10,51'W	3441,2
PS79/137-4	14.02.12	23:29	CTD/RO	Hieven	51° 2,19' S	12° 10,53'W	3433
PS79/137-5	14.02.12	23:53	HN	zu Wasser	51° 2,16' S	12° 10,54'W	3430,5
PS79/137-5	15.02.12	00:00	HN	am Grund/ auf Tiefe	51° 2,16' S	12° 10,56'W	3471,8
PS79/137-5	15.02.12	00:01	HN	an Deck	51° 2,16' S	12° 10,57'W	3474,7
PS79/137-4	15.02.12	00:42	CTD/RO	an Deck	51° 2,05' S	12° 10,44'W	3461,7
PS79/137-6	15.02.12	00:51	MN	zu Wasser	51° 2,01' S	12° 10,35'W	3455,1
PS79/137-6	15.02.12	01:51	MN	am Grund/ auf Tiefe	51° 1,99' S	12° 10,34'W	3452,5
PS79/137-6	15.02.12	01:51	MN	Hieven	51° 1,99' S	12° 10,34'W	3452,5
PS79/137-6	15.02.12	02:15	MN	an Deck	51° 2,06' S	12° 10,32'W	3459,7
PS79/137-7	15.02.12	02:28	CTD/RO	zu Wasser	51° 2,11' S	12° 10,35'W	3463,5
PS79/137-7	15.02.12	02:44	CTD/RO	am Grund/ auf Tiefe	51° 2,13' S	12° 10,40'W	3460
PS79/137-7	15.02.12	02:45	CTD/RO	Hieven	51° 2,14' S	12° 10,40'W	3474,4
PS79/137-7	15.02.12	03:03	CTD/RO	an Deck	51° 2,16' S	12° 10,48'W	3474,2
PS79/137-8	15.02.12	03:08	BONGO	zu Wasser	51° 2,15' S	12° 10,52'W	3472,2
PS79/137-8	15.02.12	03:17	BONGO	am Grund/ auf Tiefe	51° 2,15' S	12° 10,51'W	3451,5
PS79/137-8	15.02.12	03:17	BONGO	Hieven	51° 2,15' S	12° 10,51'W	3451,5
PS79/137-8	15.02.12	03:25	BONGO	an Deck	51° 2,13' S	12° 10,55'W	3447,7
PS79/137-9	15.02.12	03:33	MSS	zu Wasser	51° 2,10' S	12° 10,67'W	3395,2
PS79/137-9	15.02.12	03:43	MSS	am Grund/ auf Tiefe	51° 2,04' S	12° 10,88'W	3283,5
PS79/137-9	15.02.12	04:50	MSS	an Deck	51° 1,74' S	12° 12,52'W	3003,7
PS79/137-10	15.02.12	05:30	CTD	zu Wasser	51° 1,34' S	12° 9,38'W	3275,2
PS79/137-10	15.02.12	06:32	CTD	am Grund/ auf Tiefe	51° 1,19' S	12° 8,90'W	3286,5
PS79/137-10	15.02.12	06:33	CTD	Hieven	51° 1,19' S	12° 8,90'W	3301
PS79/137-10	15.02.12	07:30	CTD	Wasserober- fläche	51° 1,23' S	12° 8,84'W	3322,5
PS79/137-10	15.02.12	07:31	CTD	an Deck	51° 1,23' S	12° 8,83'W	3313,7
PS79/137-11	15.02.12	08:23	TRAPS	an Deck	50° 59,93' S	12° 7,60'W	3213,7
PS79/137-11	15.02.12	08:30	TRAPS	an Deck	50° 59,93' S	12° 7,57'W	3216
PS79/137-11	15.02.12	08:38	TRAPS	an Deck	50° 59,94' S	12° 7,52'W	3221,5
PS79/137-11	15.02.12	08:44	TRAPS	am Grund/ auf Tiefe	50° 59,96' S	12° 7,50'W	3224
PS79/137-11	15.02.12	08:46	TRAPS	an Deck	50° 59,97' S	12° 7,48'W	3226,7
PS79/137-12	15.02.12	09:04	FLOAT	am Grund/ auf Tiefe	50° 59,99' S	12° 8,69'W	3233
PS79/137-12	15.02.12	09:04	FLOAT	zu Wasser	50° 59,99' S	12° 8,69'W	3233
PS79/138-1	15.02.12	12:00	TRAPS	am Grund/ auf Tiefe	51° 6,59' S	12° 30,46'W	3412,9
PS79/138-1	15.02.12	12:01	TRAPS	Aktion	51° 6,59' S	12° 30,46'W	0

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/138-1	15.02.12	12:16	TRAPS	an Deck	51° 6,58' S	12° 30,12'W	3208,2
PS79/138-1	15.02.12	12:26	TRAPS	an Deck	51° 6,61' S	12° 29,97'W	0
PS79/138-2	15.02.12	12:38	CTD/RO	zu Wasser	51° 6,58' S	12° 29,79'W	3535,4
PS79/138-2	15.02.12	12:58	CTD/RO	am Grund/ auf Tiefe	51° 6,59' S	12° 29,59'W	3550,7
PS79/138-2	15.02.12	12:58	CTD/RO	Hieven	51° 6,59' S	12° 29,59'W	3550,7
PS79/138-2	15.02.12	13:16	CTD/RO	an Deck	51° 6,62' S	12° 29,39'W	0
PS79/139-1	15.02.12	16:45	TRAPS	zu Wasser	51° 0,17' S	12° 59,77'W	4041,5
PS79/139-1	15.02.12	16:55	TRAPS	zu Wasser	51° 0,12' S	12° 59,62'W	4037,2
PS79/139-1	15.02.12	17:02	TRAPS	zu Wasser	51° 0,08' S	12° 59,55'W	4035,3
PS79/139-1	15.02.12	17:03	TRAPS	am Grund/ auf Tiefe	51° 0,08' S	12° 59,53'W	4034,6
PS79/139-1	15.02.12	17:03	TRAPS	an Deck	51° 0,08' S	12° 59,53'W	4034,6
PS79/139-2	15.02.12	17:32	RAMSES	zu Wasser	50° 59,88' S	12° 58,67'W	4021,5
PS79/139-2	15.02.12	18:00	RAMSES	am Grund/ auf Tiefe	50° 59,89' S	12° 58,25'W	0
PS79/139-2	15.02.12	18:16	RAMSES	Wasserober-fläche	50° 59,94' S	12° 58,00'W	0
PS79/139-2	15.02.12	18:17	RAMSES	an Deck	50° 59,94' S	12° 57,98'W	4024,1
PS79/139-3	15.02.12	18:32	CTD/RO	zu Wasser	51° 0,00' S	12° 59,29'W	0
PS79/139-3	15.02.12	18:48	CTD/RO	am Grund/ auf Tiefe	50° 59,93' S	12° 59,34'W	0
PS79/139-3	15.02.12	18:49	CTD/RO	Hieven	50° 59,92' S	12° 59,34'W	0
PS79/139-3	15.02.12	19:04	CTD/RO	Wasserober-fläche	50° 59,85' S	12° 59,31'W	4024,4
PS79/139-3	15.02.12	19:05	CTD/RO	an Deck	50° 59,85' S	12° 59,31'W	0
PS79/139-4	15.02.12	19:11	GO-FLO	zu Wasser	50° 59,82' S	12° 59,32'W	4022,3
PS79/139-4	15.02.12	19:33	GO-FLO	am Grund/ auf Tiefe	50° 59,72' S	12° 59,32'W	0
PS79/139-4	15.02.12	19:39	GO-FLO	Hieven	50° 59,70' S	12° 59,34'W	4018,4
PS79/139-4	15.02.12	19:44	GO-FLO	Fieren	50° 59,69' S	12° 59,33'W	4018,9
PS79/139-4	15.02.12	19:48	GO-FLO	am Grund/ auf Tiefe	50° 59,67' S	12° 59,34'W	0
PS79/139-4	15.02.12	19:51	GO-FLO	Hieven	50° 59,65' S	12° 59,34'W	4018
PS79/139-5	15.02.12	19:57	HN	zu Wasser	50° 59,62' S	12° 59,33'W	0
PS79/139-5	15.02.12	20:05	HN	am Grund/ auf Tiefe	50° 59,61' S	12° 59,33'W	0
PS79/139-4	15.02.12	20:05	GO-FLO	an Deck	50° 59,61' S	12° 59,33'W	0
PS79/139-5	15.02.12	20:05	HN	an Deck	50° 59,61' S	12° 59,33'W	0
PS79/139-6	15.02.12	20:12	CTD/RO	zu Wasser	50° 59,59' S	12° 59,34'W	4016,5
PS79/139-6	15.02.12	21:39	CTD/RO	am Grund/ auf Tiefe	50° 59,44' S	12° 59,52'W	0
PS79/139-6	15.02.12	21:40	CTD/RO	Hieven	50° 59,43' S	12° 59,51'W	4014,2
PS79/139-7	15.02.12	21:55	HN	zu Wasser	50° 59,38' S	12° 59,46'W	0
PS79/139-7	15.02.12	22:09	HN	am Grund/ auf Tiefe	50° 59,31' S	12° 59,50'W	4011,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/139-7	15.02.12	22:09	HN	an Deck	50° 59,31' S	12° 59,50'W	4011,5
PS79/139-6	15.02.12	23:00	CTD/RO	an Deck	50° 59,15' S	12° 59,69'W	4006,1
PS79/139-8	15.02.12	23:05	RMT	zu Wasser	50° 59,11' S	12° 59,86'W	4005,4
PS79/139-8	15.02.12	23:23	RMT	am Grund/ auf Tiefe	50° 58,37' S	13° 0,89'W	3972,3
PS79/139-8	15.02.12	23:23	RMT	Hieven	50° 58,37' S	13° 0,89'W	3972,3
PS79/139-8	15.02.12	23:23	RMT	Profil Anfang	50° 58,37' S	13° 0,89'W	3972,3
PS79/139-8	15.02.12	23:54	RMT	Profil Ende	50° 57,30' S	13° 2,33'W	3921,3
PS79/139-8	15.02.12	23:59	RMT	an Deck	50° 57,28' S	13° 2,25'W	3921,7
PS79/139-9	16.02.12	00:37	MN	zu Wasser	50° 59,97' S	12° 59,92'W	4033
PS79/139-9	16.02.12	01:42	MN	am Grund/ auf Tiefe	50° 59,87' S	13° 0,06'W	4029
PS79/139-9	16.02.12	01:42	MN	Hieven	50° 59,87' S	13° 0,06'W	4029
PS79/139-9	16.02.12	02:08	MN	an Deck	50° 59,90' S	13° 0,09'W	4030,7
PS79/139-10	16.02.12	02:18	RMT	zu Wasser	50° 59,55' S	13° 0,51'W	4025,7
PS79/139-10	16.02.12	02:35	RMT	Profil Anfang	50° 58,86' S	13° 1,32'W	3998,5
PS79/139-10	16.02.12	02:36	RMT	Hieven	50° 58,81' S	13° 1,37'W	3995,2
PS79/139-10	16.02.12	02:59	RMT	Profil Ende	50° 57,99' S	13° 2,30'W	3931,2
PS79/139-10	16.02.12	03:01	RMT	Wasserober- fläche	50° 57,93' S	13° 2,38'W	3923,7
PS79/139-10	16.02.12	03:05	RMT	an Deck	50° 57,79' S	13° 2,55'W	3915,5
PS79/139-11	16.02.12	03:49	MSS	zu Wasser	50° 59,99' S	12° 59,88'W	4034,5
PS79/139-11	16.02.12	03:58	MSS	am Grund/ auf Tiefe	50° 59,82' S	12° 59,82'W	4027,5
PS79/139-11	16.02.12	04:58	MSS	an Deck	50° 58,86' S	12° 59,54'W	4003,5
PS79/139-12	16.02.12	05:30	CTD	zu Wasser	51° 0,05' S	12° 59,74'W	4037
PS79/139-12	16.02.12	06:32	CTD	am Grund/ auf Tiefe	50° 59,99' S	12° 59,95'W	4033,7
PS79/139-12	16.02.12	06:33	CTD	Hieven	50° 59,99' S	12° 59,94'W	4034,5
PS79/139-12	16.02.12	07:28	CTD	Wasserober- fläche	50° 59,99' S	12° 59,98'W	4033,2
PS79/139-12	16.02.12	07:29	CTD	an Deck	50° 59,99' S	12° 59,98'W	4034
PS79/139-13	16.02.12	07:39	ISP	zu Wasser	50° 59,99' S	12° 59,97'W	4033,2
PS79/139-13	16.02.12	08:05	ISP	am Grund/ auf Tiefe	50° 59,87' S	12° 59,95'W	4029,7
PS79/139-13	16.02.12	10:46	ISP	Hieven	50° 59,31' S	12° 59,08'W	4012,7
PS79/139-13	16.02.12	11:09	ISP	an Deck	50° 59,06' S	12° 58,98'W	4007
PS79/139-14	16.02.12	11:51	TRAPS	am Grund/ auf Tiefe	50° 56,31' S	12° 53,78'W	3866,7
PS79/139-14	16.02.12	12:05	TRAPS	Aktion	50° 56,12' S	12° 54,01'W	3854,5
PS79/139-14	16.02.12	12:15	TRAPS	an Deck	50° 56,09' S	12° 54,09'W	3854,5
PS79/139-14	16.02.12	12:26	TRAPS	an Deck	50° 56,09' S	12° 54,07'W	3855,2
PS79/140-1	16.02.12	16:38	TRAPS	zu Wasser	51° 11,94' S	12° 40,43'W	3949,3
PS79/140-1	16.02.12	16:48	TRAPS	zu Wasser	51° 11,92' S	12° 40,25'W	3953,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/140-1	16.02.12	16:56	TRAPS	am Grund/ auf Tiefe	51° 11,89' S	12° 40,18'W	4032,2
PS79/140-1	16.02.12	16:58	TRAPS	an Deck	51° 11,87' S	12° 40,14'W	3903,2
PS79/140-2	16.02.12	17:11	CTD	zu Wasser	51° 12,02' S	12° 39,92'W	4042,2
PS79/140-2	16.02.12	18:38	CTD	am Grund/ auf Tiefe	51° 12,02' S	12° 39,57'W	3965,2
PS79/140-2	16.02.12	18:39	CTD	Hieven	51° 12,02' S	12° 39,57'W	3960,5
PS79/140-3	16.02.12	18:42	HN	zu Wasser	51° 12,03' S	12° 39,55'W	4039,2
PS79/140-3	16.02.12	18:45	HN	am Grund/ auf Tiefe	51° 12,04' S	12° 39,55'W	4038,5
PS79/140-3	16.02.12	18:45	HN	an Deck	51° 12,04' S	12° 39,55'W	4038,5
PS79/140-2	16.02.12	19:54	CTD	an Deck	51° 12,29' S	12° 39,40'W	4041,7
PS79/140-4	16.02.12	20:03	MN	zu Wasser	51° 12,34' S	12° 39,37'W	4046
PS79/140-5	16.02.12	20:38	HN	zu Wasser	51° 12,40' S	12° 39,29'W	4031,7
PS79/140-5	16.02.12	20:45	HN	am Grund/ auf Tiefe	51° 12,42' S	12° 39,30'W	4040,7
PS79/140-5	16.02.12	20:45	HN	an Deck	51° 12,42' S	12° 39,30'W	4040,7
PS79/140-4	16.02.12	20:51	MN	am Grund/ auf Tiefe	51° 12,44' S	12° 39,28'W	4045,7
PS79/140-4	16.02.12	20:51	MN	Hieven	51° 12,44' S	12° 39,28'W	4045,7
PS79/140-4	16.02.12	21:15	MN	an Deck	51° 12,49' S	12° 39,22'W	4039,5
PS79/140-6	16.02.12	21:25	MSS	zu Wasser	51° 12,51' S	12° 39,18'W	4045,5
PS79/140-6	16.02.12	22:38	MSS	am Grund/ auf Tiefe	51° 13,11' S	12° 40,47'W	4080,2
PS79/140-6	16.02.12	22:39	MSS	an Deck	51° 13,12' S	12° 40,47'W	4082,2
PS79/140-7	16.02.12	23:00	CTD/RO	zu Wasser	51° 12,65' S	12° 39,96'W	4055,2
PS79/140-7	17.02.12	00:06	CTD/RO	am Grund/ auf Tiefe	51° 12,70' S	12° 39,89'W	4055
PS79/140-7	17.02.12	00:07	CTD/RO	Hieven	51° 12,70' S	12° 39,89'W	4054,2
PS79/140-7	17.02.12	01:11	CTD/RO	an Deck	51° 12,74' S	12° 39,87'W	4062
PS79/140-8	17.02.12	01:18	RMT	zu Wasser	51° 12,68' S	12° 39,90'W	4051,8
PS79/140-8	17.02.12	01:36	RMT	Profil Anfang	51° 12,35' S	12° 41,02'W	4080,7
PS79/140-8	17.02.12	01:37	RMT	Hieven	51° 12,33' S	12° 41,09'W	4077,7
PS79/140-8	17.02.12	02:00	RMT	Profil Ende	51° 11,89' S	12° 42,60'W	3905,7
PS79/140-8	17.02.12	02:01	RMT	Wasserober-fläche	51° 11,87' S	12° 42,67'W	3937,7
PS79/140-8	17.02.12	02:05	RMT	an Deck	51° 11,81' S	12° 42,91'W	3947,5
PS79/140-9	17.02.12	02:13	RMT	zu Wasser	51° 11,68' S	12° 43,13'W	3966,5
PS79/140-9	17.02.12	03:34	RMT	Profil Anfang	51° 10,04' S	12° 48,00'W	3254
PS79/140-9	17.02.12	03:34	RMT	Hieven	51° 10,04' S	12° 48,00'W	3254
PS79/140-9	17.02.12	05:43	RMT	Profil Ende	51° 7,33' S	12° 53,12'W	3603,2
PS79/140-9	17.02.12	05:44	RMT	Wasserober-fläche	51° 7,31' S	12° 53,17'W	3623
PS79/140-9	17.02.12	05:46	RMT	an Deck	51° 7,27' S	12° 53,27'W	3677,2
PS79/140-10	17.02.12	07:10	GO-FLO	zu Wasser	51° 12,04' S	12° 39,70'W	4025,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/140-10	17.02.12	07:29	GO-FLO	am Grund/ auf Tiefe	51° 11,93' S	12° 39,55'W	3903
PS79/140-10	17.02.12	07:36	GO-FLO	Hieven	51° 11,92' S	12° 39,49'W	3915,5
PS79/140-10	17.02.12	07:50	GO-FLO	an Deck	51° 11,85' S	12° 39,44'W	3881
PS79/140-11	17.02.12	08:01	FRRF	zu Wasser	51° 11,76' S	12° 39,60'W	3873,2
PS79/140-11	17.02.12	08:24	FRRF	am Grund/ auf Tiefe	51° 11,63' S	12° 39,67'W	3868
PS79/140-11	17.02.12	08:24	FRRF	Hieven	51° 11,63' S	12° 39,67'W	3868
PS79/140-11	17.02.12	08:47	FRRF	an Deck	51° 11,57' S	12° 39,58'W	3871,7
PS79/140-12	17.02.12	09:07	CTD/RO	zu Wasser	51° 11,53' S	12° 39,52'W	3787
PS79/140-12	17.02.12	09:14	CTD/RO	Hieven	51° 11,52' S	12° 39,46'W	3764,5
PS79/140-12	17.02.12	09:18	CTD/RO	Fieren	51° 11,51' S	12° 39,45'W	3721
PS79/140-12	17.02.12	09:37	CTD/RO	am Grund/ auf Tiefe	51° 11,46' S	12° 39,59'W	3789,7
PS79/140-12	17.02.12	09:38	CTD/RO	Hieven	51° 11,46' S	12° 39,61'W	3791
PS79/140-12	17.02.12	09:55	CTD/RO	an Deck	51° 11,44' S	12° 39,59'W	3786,2
PS79/140-13	17.02.12	10:02	FLOAT	am Grund/ auf Tiefe	51° 11,40' S	12° 39,68'W	3779,7
PS79/140-13	17.02.12	10:03	FLOAT	zu Wasser	51° 11,39' S	12° 39,76'W	3839,2
PS79/140-14	17.02.12	10:59	TRAPS	an Deck	51° 7,55' S	12° 32,56'W	3424,4
PS79/140-14	17.02.12	11:04	TRAPS	an Deck	51° 7,53' S	12° 32,47'W	3427,1
PS79/140-14	17.02.12	11:20	TRAPS	am Grund/ auf Tiefe	51° 7,60' S	12° 32,45'W	3426,3
PS79/140-14	17.02.12	11:20	TRAPS	an Deck	51° 7,60' S	12° 32,45'W	3426,3
PS79/141-1	17.02.12	12:41	CTD/RO	zu Wasser	51° 11,98' S	12° 36,69'W	3940,1
PS79/141-2	17.02.12	13:48	HN	zu Wasser	51° 11,98' S	12° 36,95'W	3919,7
PS79/141-2	17.02.12	13:50	HN	am Grund/ auf Tiefe	51° 11,99' S	12° 36,92'W	3929
PS79/141-2	17.02.12	13:51	HN	an Deck	51° 11,99' S	12° 36,90'W	3926
PS79/141-1	17.02.12	14:07	CTD/RO	am Grund/ auf Tiefe	51° 11,98' S	12° 37,02'W	3921,7
PS79/141-1	17.02.12	14:08	CTD/RO	Hieven	51° 11,99' S	12° 37,00'W	3915,2
PS79/141-1	17.02.12	15:26	CTD/RO	an Deck	51° 11,98' S	12° 36,81'W	3928,9
PS79/141-3	17.02.12	15:35	MUC	zu Wasser	51° 11,96' S	12° 36,81'W	3931,5
PS79/141-3	17.02.12	16:33	MUC	am Grund/ auf Tiefe	51° 11,93' S	12° 36,87'W	3925,5
PS79/141-3	17.02.12	16:34	MUC	Hieven	51° 11,93' S	12° 36,88'W	3922,4
PS79/141-3	17.02.12	17:29	MUC	Wasserober- fläche	51° 11,89' S	12° 36,76'W	4376,3
PS79/141-3	17.02.12	17:30	MUC	an Deck	51° 11,89' S	12° 36,76'W	3922,8
PS79/141-4	17.02.12	18:30	EBS	zu Wasser	51° 12,48' S	12° 31,44'W	4088,2
PS79/141-4	17.02.12	20:15	EBS	am Grund/ auf Tiefe	51° 12,06' S	12° 35,41'W	0
PS79/141-4	17.02.12	21:24	EBS	Profil Anfang	51° 11,97' S	12° 37,06'W	3913,7
PS79/141-4	17.02.12	21:35	EBS	Profil Ende	51° 11,97' S	12° 37,29'W	3861,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/141-4	17.02.12	21:35	EBS	Hieven	51° 11,97' S	12° 37,29'W	3861,2
PS79/141-4	17.02.12	23:02	EBS	frei vom Grund	51° 12,08' S	12° 37,81'W	3825
PS79/141-4	17.02.12	23:02	EBS	Hieven	51° 12,08' S	12° 37,81'W	3825
PS79/141-4	18.02.12	00:41	EBS	Wasserober-fläche	51° 11,55' S	12° 38,39'W	3685
PS79/141-4	18.02.12	00:41	EBS	an Deck	51° 11,55' S	12° 38,39'W	3685
PS79/141-5	18.02.12	02:58	MUC	zu Wasser	51° 16,01' S	12° 36,93'W	4113,2
PS79/141-5	18.02.12	03:54	MUC	am Grund/ auf Tiefe	51° 16,04' S	12° 36,88'W	4115,5
PS79/141-5	18.02.12	03:56	MUC	Hieven	51° 16,03' S	12° 36,87'W	4117,7
PS79/141-5	18.02.12	04:52	MUC	an Deck	51° 16,01' S	12° 37,00'W	4115
PS79/141-6	18.02.12	05:06	MUC	zu Wasser	51° 15,99' S	12° 37,14'W	4113,5
PS79/141-6	18.02.12	06:04	MUC	am Grund/ auf Tiefe	51° 15,98' S	12° 37,04'W	4113
PS79/141-6	18.02.12	06:05	MUC	Hieven	51° 15,98' S	12° 37,03'W	4112,2
PS79/141-6	18.02.12	06:58	MUC	Wasserober-fläche	51° 15,96' S	12° 36,97'W	4109,4
PS79/141-6	18.02.12	07:01	MUC	an Deck	51° 15,95' S	12° 37,00'W	4112
PS79/141-7	18.02.12	08:27	AGT	zu Wasser	51° 15,95' S	12° 30,51'W	4105,2
PS79/141-7	18.02.12	09:44	AGT	am Grund/ auf Tiefe	51° 15,96' S	12° 35,67'W	4119,7
PS79/141-7	18.02.12	10:16	AGT	Profil Anfang	51° 15,98' S	12° 37,47'W	4109,5
PS79/141-7	18.02.12	10:26	AGT	Profil Ende	51° 15,95' S	12° 37,70'W	4109,7
PS79/141-7	18.02.12	10:26	AGT	Hieven	51° 15,95' S	12° 37,70'W	4109,7
PS79/141-7	18.02.12	11:32	AGT	frei vom Grund	51° 16,14' S	12° 38,19'W	4121
PS79/141-7	18.02.12	14:06	AGT	an Deck	51° 17,54' S	12° 36,09'W	4120,5
PS79/141-8	18.02.12	16:10	AGT	zu Wasser	51° 15,91' S	12° 30,12'W	4103,7
PS79/141-8	18.02.12	17:31	AGT	am Grund/ auf Tiefe	51° 15,98' S	12° 35,82'W	4092,5
PS79/141-8	18.02.12	18:00	AGT	am Grund/ auf Tiefe	51° 16,07' S	12° 37,51'W	4111
PS79/141-8	18.02.12	18:00	AGT	Profil Anfang	51° 16,07' S	12° 37,51'W	4111
PS79/141-8	18.02.12	18:10	AGT	Hieven	51° 15,95' S	12° 37,73'W	4109,2
PS79/141-8	18.02.12	18:10	AGT	Profil Ende	51° 15,95' S	12° 37,73'W	4109,2
PS79/141-8	18.02.12	19:12	AGT	frei vom Grund	51° 16,07' S	12° 37,65'W	4112,2
PS79/141-8	18.02.12	21:34	AGT	Wasserober-fläche	51° 16,54' S	12° 37,84'W	4141,3
PS79/141-8	18.02.12	21:36	AGT	an Deck	51° 16,53' S	12° 37,82'W	4158,7
PS79/141-9	18.02.12	22:04	MUC	zu Wasser	51° 15,98' S	12° 37,01'W	4112,7
PS79/141-9	18.02.12	22:58	MUC	am Grund/ auf Tiefe	51° 16,03' S	12° 37,06'W	0
PS79/141-9	18.02.12	23:00	MUC	Hieven	51° 16,03' S	12° 37,04'W	4114,2
PS79/141-9	18.02.12	23:54	MUC	an Deck	51° 15,96' S	12° 36,95'W	4112,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/141-10	19.02.12	00:13	MUC	zu Wasser	51° 15,96' S	12° 36,93'W	4112,5
PS79/141-10	19.02.12	01:08	MUC	am Grund/ auf Tiefe	51° 15,97' S	12° 36,94'W	0
PS79/141-10	19.02.12	01:09	MUC	Hieven	51° 15,97' S	12° 36,94'W	4113
PS79/141-10	19.02.12	02:05	MUC	an Deck	51° 16,01' S	12° 37,04'W	4116,5
PS79/141-11	19.02.12	02:18	MUC	zu Wasser	51° 16,00' S	12° 37,07'W	4109,4
PS79/141-11	19.02.12	03:15	MUC	am Grund/ auf Tiefe	51° 16,02' S	12° 37,12'W	4113,2
PS79/141-11	19.02.12	03:16	MUC	Hieven	51° 16,03' S	12° 37,12'W	4113
PS79/141-11	19.02.12	04:05	MUC	Aktion	51° 16,06' S	12° 37,14'W	0
PS79/141-11	19.02.12	05:26	MUC	Hieven	51° 16,04' S	12° 36,52'W	4118,2
PS79/141-11	19.02.12	06:18	MUC	Wasserober-fläche	51° 15,92' S	12° 36,27'W	4113,5
PS79/141-11	19.02.12	06:20	MUC	an Deck	51° 15,92' S	12° 36,27'W	3814,1
PS79/142-1	19.02.12	07:27	CTD/RO	zu Wasser	51° 11,94' S	12° 40,11'W	3971,5
PS79/142-1	19.02.12	07:45	CTD/RO	am Grund/ auf Tiefe	51° 11,87' S	12° 40,00'W	3943,5
PS79/142-1	19.02.12	07:46	CTD/RO	Hieven	51° 11,87' S	12° 39,99'W	3970
PS79/142-1	19.02.12	08:06	CTD/RO	an Deck	51° 11,75' S	12° 39,78'W	3873,5
PS79/143-1	24.02.12	00:50	CTD/RO	zu Wasser	53° 30,01' S	36° 24,08'W	1272,1
PS79/143-1	24.02.12	01:27	CTD/RO	am Grund/ auf Tiefe	53° 30,00' S	36° 24,01'W	1268,2
PS79/143-1	24.02.12	01:27	CTD/RO	Hieven	53° 30,00' S	36° 24,01'W	1268,2
PS79/143-1	24.02.12	01:59	CTD/RO	an Deck	53° 30,05' S	36° 23,99'W	1264,4
PS79/143-2	24.02.12	02:05	GO-FLO	zu Wasser	53° 30,06' S	36° 24,01'W	1266,3
PS79/143-2	24.02.12	02:27	GO-FLO	am Grund/ auf Tiefe	53° 30,12' S	36° 24,15'W	1273,5
PS79/143-2	24.02.12	02:32	GO-FLO	Hieven	53° 30,12' S	36° 24,15'W	1273,1
PS79/143-2	24.02.12	02:48	GO-FLO	an Deck	53° 30,16' S	36° 24,17'W	1272
PS79/144-1	24.02.12	18:58	CTD/RO	zu Wasser	50° 47,87' S	36° 59,88'W	4978,4
PS79/144-1	24.02.12	19:11	CTD/RO	Hieven	50° 47,84' S	36° 59,62'W	4977,1
PS79/144-1	24.02.12	19:11	CTD/RO	am Grund/ auf Tiefe	50° 47,84' S	36° 59,62'W	4977,1
PS79/144-1	24.02.12	19:18	CTD/RO	Wasserober-fläche	50° 47,82' S	36° 59,44'W	4977,6
PS79/144-1	24.02.12	19:19	CTD/RO	an Deck	50° 47,81' S	36° 59,42'W	4977,3
PS79/144-2	24.02.12	19:56	CTD/RO	zu Wasser	50° 47,93' S	36° 59,85'W	4978
PS79/144-2	24.02.12	20:31	CTD/RO	am Grund/ auf Tiefe	50° 47,69' S	36° 59,38'W	4978,6
PS79/144-2	24.02.12	20:32	CTD/RO	Hieven	50° 47,69' S	36° 59,36'W	4978,8
PS79/144-3	24.02.12	20:35	HN	zu Wasser	50° 47,67' S	36° 59,34'W	4979,2
PS79/144-3	24.02.12	20:36	HN	am Grund/ auf Tiefe	50° 47,67' S	36° 59,32'W	4980
PS79/144-3	24.02.12	20:38	HN	an Deck	50° 47,67' S	36° 59,29'W	4978,1
PS79/144-2	24.02.12	21:04	CTD/RO	Wasserober-fläche	50° 47,65' S	36° 58,68'W	4979,6

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/144-2	24.02.12	21:05	CTD/RO	an Deck	50° 47,65' S	36° 58,66'W	4980
PS79/145-1	24.02.12	23:44	CTD/RO	zu Wasser	50° 23,89' S	36° 59,93'W	0
PS79/145-1	25.02.12	00:22	CTD/RO	am Grund/ auf Tiefe	50° 23,79' S	36° 59,73'W	5069,4
PS79/145-1	25.02.12	00:58	CTD/RO	an Deck	50° 23,61' S	36° 59,84'W	5070,6
PS79/145-2	25.02.12	01:05	FLOAT	zu Wasser	50° 23,60' S	36° 59,89'W	5070,9
PS79/145-2	25.02.12	01:06	FLOAT	am Grund/ auf Tiefe	50° 23,61' S	36° 59,92'W	5070,8
PS79/146-1	25.02.12	03:52	CTD/RO	zu Wasser	50° 0,07' S	37° 0,07'W	5141,5
PS79/146-2	25.02.12	04:14	HN	zu Wasser	50° 0,10' S	37° 0,06'W	5140,7
PS79/146-2	25.02.12	04:16	HN	am Grund/ auf Tiefe	50° 0,10' S	37° 0,07'W	5140,5
PS79/146-2	25.02.12	04:19	HN	an Deck	50° 0,10' S	37° 0,07'W	5142
PS79/146-1	25.02.12	04:28	CTD/RO	am Grund/ auf Tiefe	50° 0,07' S	37° 0,09'W	5140,2
PS79/146-1	25.02.12	04:29	CTD/RO	Hieven	50° 0,07' S	37° 0,10'W	5141
PS79/146-1	25.02.12	05:02	CTD/RO	an Deck	50° 0,11' S	37° 0,06'W	5141,2
PS79/146-3	25.02.12	05:14	RMT	zu Wasser	50° 0,57' S	36° 59,78'W	5139
PS79/146-3	25.02.12	05:29	RMT	Profil Anfang	50° 1,19' S	36° 59,29'W	5136,7
PS79/146-3	25.02.12	05:30	RMT	Hieven	50° 1,23' S	36° 59,26'W	5136,5
PS79/146-3	25.02.12	05:44	RMT	Profil Ende	50° 1,90' S	36° 58,98'W	5129,7
PS79/146-3	25.02.12	05:47	RMT	Wasserober-fläche	50° 2,05' S	36° 58,94'W	5128
PS79/146-3	25.02.12	05:50	RMT	an Deck	50° 2,19' S	36° 58,91'W	5127
PS79/147-1	25.02.12	08:55	CTD	zu Wasser	49° 35,93' S	36° 59,78'W	0
PS79/147-1	25.02.12	09:30	CTD	am Grund/ auf Tiefe	49° 36,08' S	37° 0,34'W	0
PS79/147-1	25.02.12	09:31	CTD	Hieven	49° 36,08' S	37° 0,36'W	0
PS79/147-1	25.02.12	10:08	CTD	an Deck	49° 36,35' S	37° 0,84'W	5172,3
PS79/148-1	25.02.12	12:38	CTD/RO	zu Wasser	49° 11,98' S	36° 59,84'W	3717,6
PS79/148-1	25.02.12	13:14	CTD/RO	am Grund/ auf Tiefe	49° 11,87' S	36° 59,00'W	3696,5
PS79/148-1	25.02.12	13:16	CTD/RO	Hieven	49° 11,87' S	36° 58,93'W	3703,9
PS79/148-1	25.02.12	13:50	CTD/RO	an Deck	49° 11,79' S	36° 58,01'W	3709,2
PS79/149-1	25.02.12	16:33	CTD/RO	zu Wasser	48° 47,93' S	36° 59,87'W	5096
PS79/149-1	25.02.12	17:08	CTD/RO	am Grund/ auf Tiefe	48° 48,07' S	36° 59,42'W	5077,7
PS79/149-1	25.02.12	17:41	CTD/RO	an Deck	48° 48,13' S	36° 58,98'W	5027,2
PS79/150-1	25.02.12	20:30	CTD/RO	zu Wasser	48° 48,00' S	37° 35,91'W	5280,9
PS79/150-1	25.02.12	21:04	CTD/RO	am Grund/ auf Tiefe	48° 48,12' S	37° 35,44'W	5266
PS79/150-1	25.02.12	21:05	CTD/RO	Hieven	48° 48,12' S	37° 35,43'W	5265,5
PS79/150-1	25.02.12	21:36	CTD/RO	Wasserober-fläche	48° 48,29' S	37° 35,16'W	5253,2
PS79/150-1	25.02.12	21:37	CTD/RO	an Deck	48° 48,30' S	37° 35,15'W	5252

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/151-1	26.02.12	00:06	CTD/RO	zu Wasser	49° 11,91' S	37° 36,08'W	5670
PS79/151-2	26.02.12	00:40	HN	zu Wasser	49° 11,78' S	37° 35,91'W	5612,2
PS79/151-1	26.02.12	00:42	CTD/RO	am Grund/ auf Tiefe	49° 11,77' S	37° 35,89'W	5611,2
PS79/151-1	26.02.12	00:44	CTD/RO	Hieven	49° 11,77' S	37° 35,87'W	5644,5
PS79/151-2	26.02.12	00:49	HN	am Grund/ auf Tiefe	49° 11,77' S	37° 35,84'W	5638
PS79/151-2	26.02.12	00:49	HN	an Deck	49° 11,77' S	37° 35,84'W	5638
PS79/151-1	26.02.12	01:21	CTD/RO	an Deck	49° 11,94' S	37° 35,64'W	5502
PS79/152-1	26.02.12	03:51	CTD/RO	zu Wasser	49° 36,06' S	37° 35,91'W	5131,2
PS79/152-1	26.02.12	04:26	CTD/RO	am Grund/ auf Tiefe	49° 36,30' S	37° 35,89'W	5131,7
PS79/152-1	26.02.12	04:26	CTD/RO	Hieven	49° 36,30' S	37° 35,89'W	5131,7
PS79/152-2	26.02.12	04:59	HN	zu Wasser	49° 36,36' S	37° 35,72'W	5132,2
PS79/152-2	26.02.12	05:00	HN	am Grund/ auf Tiefe	49° 36,37' S	37° 35,72'W	5131,5
PS79/152-1	26.02.12	05:02	CTD/RO	an Deck	49° 36,38' S	37° 35,72'W	5131,7
PS79/152-2	26.02.12	05:02	HN	an Deck	49° 36,38' S	37° 35,72'W	5131,7
PS79/152-3	26.02.12	05:12	RMT	zu Wasser	49° 36,67' S	37° 36,22'W	5130,7
PS79/152-3	26.02.12	05:27	RMT	Profil Anfang	49° 37,15' S	37° 37,01'W	5131,2
PS79/152-3	26.02.12	05:28	RMT	Hieven	49° 37,19' S	37° 37,07'W	5129,2
PS79/152-3	26.02.12	05:41	RMT	Profil Ende	49° 37,61' S	37° 37,74'W	5131,5
PS79/152-3	26.02.12	05:43	RMT	Wasserober-fläche	49° 37,65' S	37° 37,84'W	5131,2
PS79/152-3	26.02.12	05:45	RMT	an Deck	49° 37,72' S	37° 37,96'W	5131
PS79/153-1	26.02.12	08:05	CTD/RO	zu Wasser	49° 59,96' S	37° 36,01'W	5175
PS79/153-2	26.02.12	08:32	HN	zu Wasser	50° 0,06' S	37° 36,22'W	5175,2
PS79/153-2	26.02.12	08:35	HN	am Grund/ auf Tiefe	50° 0,06' S	37° 36,26'W	5174
PS79/153-1	26.02.12	08:39	CTD/RO	am Grund/ auf Tiefe	50° 0,07' S	37° 36,30'W	5173,4
PS79/153-1	26.02.12	08:40	CTD/RO	Hieven	50° 0,08' S	37° 36,31'W	5174,3
PS79/153-2	26.02.12	08:40	HN	an Deck	50° 0,08' S	37° 36,31'W	5174,3
PS79/153-1	26.02.12	09:12	CTD/RO	Wasserober-fläche	50° 0,15' S	37° 36,55'W	5174,1
PS79/153-1	26.02.12	09:13	CTD/RO	an Deck	50° 0,15' S	37° 36,55'W	5173,2
PS79/154-1	26.02.12	11:41	CTD/RO	zu Wasser	50° 23,98' S	37° 36,02'W	0
PS79/154-1	26.02.12	12:23	CTD/RO	am Grund/ auf Tiefe	50° 24,13' S	37° 36,10'W	5076,5
PS79/154-1	26.02.12	13:00	CTD/RO	an Deck	50° 24,25' S	37° 36,27'W	5077,2
PS79/155-1	26.02.12	15:26	CTD/RO	zu Wasser	50° 48,03' S	37° 35,75'W	4951,5
PS79/155-1	26.02.12	16:02	CTD/RO	am Grund/ auf Tiefe	50° 48,41' S	37° 35,23'W	4953,7
PS79/155-1	26.02.12	16:02	CTD/RO	Hieven	50° 48,41' S	37° 35,23'W	4953,7
PS79/155-2	26.02.12	16:06	HN	zu Wasser	50° 48,43' S	37° 35,16'W	4954,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/155-2	26.02.12	16:08	HN	am Grund/ auf Tiefe	50° 48,44' S	37° 35,13'W	4955,7
PS79/155-2	26.02.12	16:10	HN	an Deck	50° 48,45' S	37° 35,10'W	4954,5
PS79/155-1	26.02.12	16:36	CTD/RO	an Deck	50° 48,60' S	37° 34,64'W	4954,7
PS79/156-1	26.02.12	19:07	CTD/RO	zu Wasser	50° 48,08' S	38° 12,07'W	4899,6
PS79/156-1	26.02.12	19:41	CTD/RO	am Grund/ auf Tiefe	50° 48,43' S	38° 11,96'W	4897,7
PS79/156-1	26.02.12	19:41	CTD/RO	Hieven	50° 48,43' S	38° 11,96'W	4897,7
PS79/156-1	26.02.12	20:14	CTD/RO	Wasserober-fläche	50° 48,84' S	38° 11,70'W	4895,5
PS79/156-1	26.02.12	20:15	CTD/RO	an Deck	50° 48,85' S	38° 11,69'W	4901,7
PS79/157-1	26.02.12	22:48	CTD/RO	zu Wasser	50° 23,98' S	38° 12,19'W	5040,1
PS79/157-1	26.02.12	23:27	CTD/RO	am Grund/ auf Tiefe	50° 24,21' S	38° 11,96'W	5039,2
PS79/157-1	26.02.12	23:30	CTD/RO	Hieven	50° 24,22' S	38° 11,91'W	5039,3
PS79/157-1	27.02.12	00:07	CTD/RO	an Deck	50° 24,41' S	38° 11,35'W	5040
PS79/158-1	27.02.12	02:46	CTD/RO	zu Wasser	50° 0,05' S	38° 12,12'W	5108,5
PS79/158-2	27.02.12	02:54	HN	zu Wasser	50° 0,02' S	38° 12,22'W	5107,7
PS79/158-2	27.02.12	02:59	HN	am Grund/ auf Tiefe	50° 0,02' S	38° 12,29'W	5108
PS79/158-2	27.02.12	03:01	HN	an Deck	50° 0,02' S	38° 12,32'W	5107,5
PS79/158-1	27.02.12	03:22	CTD/RO	am Grund/ auf Tiefe	50° 0,05' S	38° 12,63'W	5105,7
PS79/158-1	27.02.12	03:24	CTD/RO	Hieven	50° 0,05' S	38° 12,66'W	5107
PS79/158-3	27.02.12	03:33	HN	zu Wasser	50° 0,04' S	38° 12,80'W	5105,7
PS79/158-3	27.02.12	03:37	HN	am Grund/ auf Tiefe	50° 0,03' S	38° 12,85'W	5106
PS79/158-3	27.02.12	03:39	HN	an Deck	50° 0,03' S	38° 12,88'W	5105,7
PS79/158-1	27.02.12	03:57	CTD/RO	an Deck	50° 0,00' S	38° 13,09'W	5105,2
PS79/158-4	27.02.12	03:59	FLOAT	zu Wasser	49° 59,98' S	38° 13,10'W	5104,5
PS79/158-4	27.02.12	03:59	FLOAT	am Grund/ auf Tiefe	49° 59,98' S	38° 13,10'W	5104,5
PS79/158-5	27.02.12	04:02	BUOY	zu Wasser	49° 59,93' S	38° 13,10'W	5104
PS79/158-5	27.02.12	04:03	BUOY	am Grund/ auf Tiefe	49° 59,91' S	38° 13,09'W	5104,2
PS79/158-6	27.02.12	04:11	RMT	zu Wasser	49° 59,65' S	38° 13,00'W	5104
PS79/158-6	27.02.12	04:26	RMT	Profil Anfang	49° 59,14' S	38° 12,80'W	5103,7
PS79/158-6	27.02.12	04:27	RMT	Hieven	49° 59,11' S	38° 12,79'W	5103,5
PS79/158-6	27.02.12	04:42	RMT	Profil Ende	49° 58,62' S	38° 12,60'W	5103,7
PS79/158-6	27.02.12	04:43	RMT	Wasserober-fläche	49° 58,59' S	38° 12,59'W	5103,2
PS79/158-6	27.02.12	04:46	RMT	an Deck	49° 58,50' S	38° 12,55'W	5103,7
PS79/159-1	27.02.12	07:06	CTD/RO	zu Wasser	49° 59,98' S	38° 48,21'W	4824,2
PS79/159-1	27.02.12	07:43	CTD/RO	am Grund/ auf Tiefe	49° 59,79' S	38° 48,35'W	4821
PS79/159-1	27.02.12	07:44	CTD/RO	Hieven	49° 59,79' S	38° 48,36'W	4824,8

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/159-2	27.02.12	07:59	HN	zu Wasser	49° 59,76' S	38° 48,49'W	4819,5
PS79/159-2	27.02.12	08:01	HN	am Grund/ auf Tiefe	49° 59,76' S	38° 48,51'W	4819,5
PS79/159-2	27.02.12	08:05	HN	an Deck	49° 59,76' S	38° 48,55'W	4819,2
PS79/159-1	27.02.12	08:15	CTD/RO	Wasserober-fläche	49° 59,75' S	38° 48,65'W	0
PS79/159-1	27.02.12	08:16	CTD/RO	an Deck	49° 59,75' S	38° 48,66'W	0
PS79/160-1	27.02.12	10:40	CTD/RO	zu Wasser	50° 24,00' S	38° 48,07'W	4798,5
PS79/160-1	27.02.12	11:17	CTD/RO	am Grund/ auf Tiefe	50° 23,89' S	38° 48,00'W	4799,9
PS79/160-1	27.02.12	11:19	CTD/RO	Hieven	50° 23,88' S	38° 48,00'W	4800,2
PS79/160-1	27.02.12	11:50	CTD/RO	an Deck	50° 23,82' S	38° 48,05'W	4800
PS79/161-1	27.02.12	14:26	CTD/RO	zu Wasser	50° 48,02' S	38° 48,06'W	4588,7
PS79/161-1	27.02.12	15:01	CTD/RO	am Grund/ auf Tiefe	50° 48,00' S	38° 47,81'W	4591,7
PS79/161-1	27.02.12	15:01	CTD/RO	Hieven	50° 48,00' S	38° 47,81'W	4591,7
PS79/161-1	27.02.12	15:35	CTD/RO	an Deck	50° 48,06' S	38° 47,71'W	4591,7
PS79/162-1	27.02.12	18:48	RMT	zu Wasser	50° 48,04' S	39° 27,34'W	0
PS79/162-1	27.02.12	19:03	RMT	am Grund/ auf Tiefe	50° 48,04' S	39° 26,51'W	4127,6
PS79/162-1	27.02.12	19:03	RMT	Profil Anfang	50° 48,04' S	39° 26,51'W	4127,6
PS79/162-1	27.02.12	19:03	RMT	Hieven	50° 48,04' S	39° 26,51'W	4127,6
PS79/162-1	27.02.12	19:19	RMT	Profil Ende	50° 48,04' S	39° 25,70'W	0
PS79/162-1	27.02.12	19:19	RMT	Wasserober-fläche	50° 48,04' S	39° 25,70'W	4136,3
PS79/162-1	27.02.12	19:21	RMT	an Deck	50° 48,04' S	39° 25,57'W	4137,9
PS79/162-2	27.02.12	19:36	CTD/RO	zu Wasser	50° 48,01' S	39° 24,46'W	4151,6
PS79/162-3	27.02.12	20:04	HN	zu Wasser	50° 48,01' S	39° 24,67'W	4149
PS79/162-3	27.02.12	20:05	HN	am Grund/ auf Tiefe	50° 48,01' S	39° 24,67'W	4149,4
PS79/162-3	27.02.12	20:07	HN	an Deck	50° 48,00' S	39° 24,67'W	4149,8
PS79/162-2	27.02.12	20:09	CTD/RO	am Grund/ auf Tiefe	50° 47,99' S	39° 24,69'W	4148,2
PS79/162-2	27.02.12	20:10	CTD/RO	Hieven	50° 48,00' S	39° 24,70'W	4150,1
PS79/162-2	27.02.12	20:44	CTD/RO	Wasserober-fläche	50° 47,80' S	39° 24,95'W	4148,2
PS79/162-2	27.02.12	20:44	CTD/RO	an Deck	50° 47,80' S	39° 24,95'W	4148,2
PS79/163-1	28.02.12	00:00	CTD/RO	zu Wasser	50° 24,10' S	39° 24,18'W	4327,5
PS79/163-1	28.02.12	00:49	CTD/RO	am Grund/ auf Tiefe	50° 24,13' S	39° 23,97'W	4330,6
PS79/163-1	28.02.12	00:50	CTD/RO	Hieven	50° 24,13' S	39° 23,98'W	4331,2
PS79/163-1	28.02.12	01:25	CTD/RO	an Deck	50° 24,08' S	39° 23,96'W	0
PS79/163-2	28.02.12	01:31	GO-FLO	zu Wasser	50° 24,10' S	39° 23,80'W	4332
PS79/163-2	28.02.12	01:52	GO-FLO	am Grund/ auf Tiefe	50° 24,09' S	39° 23,56'W	4335
PS79/163-3	28.02.12	01:53	HN	zu Wasser	50° 24,09' S	39° 23,56'W	4335,6

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/163-3	28.02.12	01:56	HN	am Grund/ auf Tiefe	50° 24,09' S	39° 23,55'W	4334,5
PS79/163-2	28.02.12	01:57	GO-FLO	Hieven	50° 24,09' S	39° 23,56'W	4335
PS79/163-3	28.02.12	01:59	HN	an Deck	50° 24,10' S	39° 23,52'W	4335,8
PS79/163-2	28.02.12	02:15	GO-FLO	an Deck	50° 24,10' S	39° 23,36'W	4339,1
PS79/163-4	28.02.12	02:28	RMT	zu Wasser	50° 24,24' S	39° 22,53'W	4346,7
PS79/163-4	28.02.12	02:43	RMT	Profil Anfang	50° 24,59' S	39° 21,57'W	4358,8
PS79/163-4	28.02.12	02:43	RMT	Hieven	50° 24,59' S	39° 21,57'W	4358,8
PS79/163-4	28.02.12	03:00	RMT	Profil Ende	50° 25,07' S	39° 20,45'W	4371,3
PS79/163-4	28.02.12	03:02	RMT	Wasserober-fläche	50° 25,13' S	39° 20,31'W	4373,3
PS79/163-4	28.02.12	03:05	RMT	an Deck	50° 25,21' S	39° 20,10'W	4376,2
PS79/164-1	28.02.12	06:23	CTD/RO	zu Wasser	50° 0,07' S	39° 24,22'W	0
PS79/164-1	28.02.12	06:58	CTD/RO	am Grund/ auf Tiefe	50° 0,02' S	39° 24,30'W	4188,9
PS79/164-1	28.02.12	06:59	CTD/RO	Hieven	50° 0,02' S	39° 24,31'W	4189,6
PS79/164-1	28.02.12	07:30	CTD/RO	Wasserober-fläche	49° 59,91' S	39° 24,17'W	4191,2
PS79/164-1	28.02.12	07:31	CTD/RO	an Deck	49° 59,91' S	39° 24,16'W	4191,2
PS79/164-2	28.02.12	07:34	FLOAT	zu Wasser	49° 59,92' S	39° 24,10'W	4192,4
PS79/164-2	28.02.12	07:35	FLOAT	am Grund/ auf Tiefe	49° 59,92' S	39° 24,07'W	4117,5
PS79/164-2	28.02.12	07:35	FLOAT	an Deck	49° 59,92' S	39° 24,07'W	4117,5
PS79/165-1	28.02.12	11:30	BUOY	zu Wasser	49° 35,89' S	39° 23,70'W	4160,5
PS79/165-1	28.02.12	11:30	BUOY	am Grund/ auf Tiefe	49° 35,89' S	39° 23,70'W	4160,5
PS79/165-2	28.02.12	15:00	MSS	zu Wasser	49° 32,76' S	39° 22,29'W	4208,7
PS79/165-2	28.02.12	15:15	MSS	am Grund/ auf Tiefe	49° 32,80' S	39° 22,35'W	4207,2
PS79/165-2	28.02.12	16:10	MSS	an Deck	49° 33,20' S	39° 22,44'W	4200
PS79/165-3	28.02.12	16:25	RAMSES	zu Wasser	49° 33,12' S	39° 22,45'W	4199,7
PS79/165-3	28.02.12	16:39	RAMSES	am Grund/ auf Tiefe	49° 33,09' S	39° 22,35'W	4202,2
PS79/165-3	28.02.12	17:13	RAMSES	an Deck	49° 32,98' S	39° 22,13'W	4208,5
PS79/165-4	28.02.12	17:37	BUOY	am Grund/ auf Tiefe	49° 30,93' S	39° 23,56'W	4200,2
PS79/165-4	28.02.12	17:50	BUOY	an Deck	49° 30,24' S	39° 23,84'W	4223,1
PS79/165-5	28.02.12	21:04	CTD/RO	zu Wasser	49° 35,93' S	39° 24,00'W	4156,7
PS79/165-5	28.02.12	21:42	CTD/RO	am Grund/ auf Tiefe	49° 36,02' S	39° 23,98'W	4157,5
PS79/165-5	28.02.12	21:43	CTD/RO	Hieven	49° 36,02' S	39° 23,98'W	4157,7
PS79/165-5	28.02.12	22:19	CTD/RO	an Deck	49° 36,06' S	39° 24,08'W	4152
PS79/166-1	29.02.12	00:47	CTD/RO	zu Wasser	49° 12,02' S	39° 24,05'W	5493
PS79/166-2	29.02.12	00:57	HN	zu Wasser	49° 11,98' S	39° 24,12'W	5495,3
PS79/166-3	29.02.12	01:04	HN	zu Wasser	49° 12,03' S	39° 24,21'W	5492,9

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/166-2	29.02.12	01:06	HN	am Grund/ auf Tiefe	49° 12,04' S	39° 24,21'W	5494
PS79/166-2	29.02.12	01:06	HN	an Deck	49° 12,04' S	39° 24,21'W	5494
PS79/166-3	29.02.12	01:12	HN	am Grund/ auf Tiefe	49° 12,06' S	39° 24,20'W	5491,5
PS79/166-3	29.02.12	01:12	HN	an Deck	49° 12,06' S	39° 24,20'W	5491,5
PS79/166-1	29.02.12	01:25	CTD/RO	am Grund/ auf Tiefe	49° 12,06' S	39° 24,14'W	5492,2
PS79/166-1	29.02.12	01:26	CTD/RO	Hieven	49° 12,06' S	39° 24,13'W	5493,4
PS79/166-1	29.02.12	02:01	CTD/RO	an Deck	49° 12,00' S	39° 23,89'W	5491,8
PS79/166-4	29.02.12	02:15	RMT	zu Wasser	49° 12,38' S	39° 24,52'W	5477,6
PS79/166-4	29.02.12	02:29	RMT	Profil Anfang	49° 12,83' S	39° 25,17'W	5436,1
PS79/166-4	29.02.12	02:30	RMT	Hieven	49° 12,86' S	39° 25,21'W	5431,2
PS79/166-4	29.02.12	02:45	RMT	Profil Ende	49° 13,36' S	39° 25,85'W	5350,6
PS79/166-4	29.02.12	02:46	RMT	Wasserober- fläche	49° 13,39' S	39° 25,89'W	5346,7
PS79/166-4	29.02.12	02:49	RMT	an Deck	49° 13,49' S	39° 26,04'W	5337,7
PS79/167-1	29.02.12	05:36	CTD/RO	zu Wasser	48° 47,95' S	39° 23,63'W	5325,8
PS79/167-1	29.02.12	06:14	CTD/RO	am Grund/ auf Tiefe	48° 47,75' S	39° 21,38'W	5296,8
PS79/167-1	29.02.12	06:15	CTD/RO	Hieven	48° 47,74' S	39° 21,32'W	5292,4
PS79/167-1	29.02.12	06:47	CTD/RO	Wasserober- fläche	48° 47,39' S	39° 19,39'W	5218,8
PS79/167-1	29.02.12	06:48	CTD/RO	an Deck	48° 47,37' S	39° 19,33'W	5223,8
PS79/168-1	29.02.12	08:41	CTD/RO	zu Wasser	48° 48,08' S	38° 47,71'W	5313,7
PS79/168-1	29.02.12	09:17	CTD/RO	am Grund/ auf Tiefe	48° 47,84' S	38° 45,79'W	5296
PS79/168-1	29.02.12	09:18	CTD/RO	Hieven	48° 47,84' S	38° 45,74'W	5295,5
PS79/168-1	29.02.12	09:49	CTD/RO	Wasserober- fläche	48° 47,76' S	38° 44,13'W	5328,2
PS79/168-1	29.02.12	09:50	CTD/RO	an Deck	48° 47,76' S	38° 44,08'W	5328,5
PS79/169-1	29.02.12	12:24	CTD/RO	zu Wasser	49° 11,98' S	38° 47,93'W	396,9
PS79/169-1	29.02.12	13:04	CTD/RO	am Grund/ auf Tiefe	49° 11,93' S	38° 47,97'W	5504,5
PS79/169-1	29.02.12	13:06	CTD/RO	Hieven	49° 11,92' S	38° 47,96'W	5504,2
PS79/169-2	29.02.12	13:12	HN	zu Wasser	49° 11,91' S	38° 47,95'W	5504,5
PS79/169-2	29.02.12	13:23	HN	am Grund/ auf Tiefe	49° 11,94' S	38° 47,98'W	5504,2
PS79/169-2	29.02.12	13:23	HN	an Deck	49° 11,94' S	38° 47,98'W	5504,2
PS79/169-1	29.02.12	13:40	CTD/RO	an Deck	49° 11,99' S	38° 48,03'W	5503,7
PS79/170-1	29.02.12	16:12	CTD/RO	zu Wasser	49° 35,93' S	38° 47,99'W	0
PS79/170-1	29.02.12	16:47	CTD/RO	am Grund/ auf Tiefe	49° 36,06' S	38° 47,93'W	4687
PS79/170-1	29.02.12	16:47	CTD/RO	Hieven	49° 36,06' S	38° 47,93'W	4687
PS79/170-1	29.02.12	17:20	CTD/RO	an Deck	49° 36,15' S	38° 47,87'W	4688,8
PS79/171-1	29.02.12	22:21	CTD/RO	zu Wasser	48° 47,92' S	38° 11,58'W	5398,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/171-1	29.02.12	23:01	CTD/RO	am Grund/ auf Tiefe	48° 47,75' S	38° 10,26'W	5409,7
PS79/171-1	29.02.12	23:03	CTD/RO	Hieven	48° 47,75' S	38° 10,19'W	5411,3
PS79/171-1	29.02.12	23:39	CTD/RO	an Deck	48° 47,77' S	38° 8,89'W	5429,2
PS79/171-2	29.02.12	23:44	FLOAT	am Grund/ auf Tiefe	48° 47,76' S	38° 8,77'W	5426,5
PS79/171-2	29.02.12	23:45	FLOAT	zu Wasser	48° 47,78' S	38° 8,76'W	5426,5
PS79/172-1	01.03.12	02:08	CTD/RO	zu Wasser	49° 12,00' S	38° 12,12'W	5389,7
PS79/172-2	01.03.12	02:18	HN	zu Wasser	49° 12,01' S	38° 12,14'W	5390,8
PS79/172-2	01.03.12	02:20	HN	am Grund/ auf Tiefe	49° 12,00' S	38° 12,13'W	5390,7
PS79/172-2	01.03.12	02:23	HN	an Deck	49° 12,00' S	38° 12,13'W	5390,2
PS79/172-1	01.03.12	02:41	CTD/RO	am Grund/ auf Tiefe	49° 12,06' S	38° 12,12'W	5390,9
PS79/172-1	01.03.12	02:42	CTD/RO	Hieven	49° 12,07' S	38° 12,12'W	5390,7
PS79/172-1	01.03.12	03:17	CTD/RO	an Deck	49° 12,29' S	38° 12,19'W	5397,1
PS79/172-3	01.03.12	03:23	RMT	zu Wasser	49° 12,38' S	38° 12,30'W	0
PS79/172-3	01.03.12	03:38	RMT	Profil Anfang	49° 12,85' S	38° 12,97'W	0
PS79/172-3	01.03.12	03:38	RMT	Hieven	49° 12,85' S	38° 12,97'W	0
PS79/172-3	01.03.12	03:53	RMT	Profil Ende	49° 13,32' S	38° 13,67'W	0
PS79/172-3	01.03.12	03:55	RMT	Wasserober-fläche	49° 13,38' S	38° 13,76'W	0
PS79/172-3	01.03.12	03:57	RMT	an Deck	49° 13,44' S	38° 13,85'W	0
PS79/173-1	01.03.12	06:24	CTD/RO	zu Wasser	49° 35,97' S	38° 12,01'W	4988,4
PS79/173-1	01.03.12	07:00	CTD/RO	am Grund/ auf Tiefe	49° 35,89' S	38° 12,21'W	4989,3
PS79/173-1	01.03.12	07:01	CTD/RO	Hieven	49° 35,89' S	38° 12,22'W	4986,6
PS79/173-1	01.03.12	07:34	CTD/RO	Wasserober-fläche	49° 35,87' S	38° 12,36'W	4986,8
PS79/173-1	01.03.12	07:35	CTD/RO	an Deck	49° 35,87' S	38° 12,36'W	4988,5
PS79/174-1	01.03.12	09:08	TRAPS	zu Wasser	49° 40,05' S	38° 16,25'W	4989,1
PS79/174-1	01.03.12	09:20	TRAPS	zu Wasser	49° 40,03' S	38° 16,27'W	4989
PS79/174-1	01.03.12	09:27	TRAPS	am Grund/ auf Tiefe	49° 40,01' S	38° 16,30'W	4991,3
PS79/174-1	01.03.12	09:31	TRAPS	an Deck	49° 40,02' S	38° 16,31'W	4988,7
PS79/174-2	01.03.12	09:49	MN	zu Wasser	49° 40,01' S	38° 15,78'W	4992,1
PS79/174-2	01.03.12	10:44	MN	am Grund/ auf Tiefe	49° 39,98' S	38° 15,83'W	4995
PS79/174-2	01.03.12	10:44	MN	Hieven	49° 39,98' S	38° 15,83'W	4995
PS79/174-2	01.03.12	11:09	MN	an Deck	49° 39,90' S	38° 15,78'W	4994,7
PS79/174-3	01.03.12	11:26	CTD/RO	zu Wasser	49° 39,86' S	38° 15,79'W	4994,5
PS79/174-3	01.03.12	11:36	CTD/RO	am Grund/ auf Tiefe	49° 39,83' S	38° 15,83'W	4993,7
PS79/174-3	01.03.12	11:37	CTD/RO	Hieven	49° 39,83' S	38° 15,83'W	4993,7
PS79/174-3	01.03.12	11:41	CTD/RO	an Deck	49° 39,81' S	38° 15,85'W	4994

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/174-3	01.03.12	12:01	CTD/RO	zu Wasser	49° 39,78' S	38° 15,96'W	4992,7
PS79/174-3	01.03.12	12:15	CTD/RO	Hieven	49° 39,76' S	38° 16,02'W	4992,2
PS79/174-3	01.03.12	12:15	CTD/RO	am Grund/ auf Tiefe	49° 39,76' S	38° 16,02'W	4992,2
PS79/174-3	01.03.12	12:23	CTD/RO	an Deck	49° 39,74' S	38° 16,06'W	4992,2
PS79/174-4	01.03.12	12:35	MSS	zu Wasser	49° 39,73' S	38° 16,15'W	4991,5
PS79/174-4	01.03.12	13:40	MSS	am Grund/ auf Tiefe	49° 39,68' S	38° 17,80'W	4980,2
PS79/174-4	01.03.12	13:40	MSS	an Deck	49° 39,68' S	38° 17,80'W	4980,2
PS79/174-5	01.03.12	14:10	BUOY	zu Wasser	49° 39,32' S	38° 17,21'W	4981,5
PS79/174-5	01.03.12	14:10	BUOY	am Grund/ auf Tiefe	49° 39,32' S	38° 17,21'W	4981,5
PS79/174-6	01.03.12	14:14	CTD/RO	zu Wasser	49° 39,30' S	38° 17,27'W	4980,7
PS79/174-6	01.03.12	15:55	CTD/RO	am Grund/ auf Tiefe	49° 38,98' S	38° 17,81'W	4974,5
PS79/174-6	01.03.12	15:55	CTD/RO	Hieven	49° 38,98' S	38° 17,81'W	4974,5
PS79/174-7	01.03.12	17:18	HN	zu Wasser	49° 38,77' S	38° 18,22'W	4969,7
PS79/174-7	01.03.12	17:20	HN	am Grund/ auf Tiefe	49° 38,77' S	38° 18,24'W	4970
PS79/174-7	01.03.12	17:21	HN	an Deck	49° 38,77' S	38° 18,25'W	4969,7
PS79/174-6	01.03.12	17:32	CTD/RO	an Deck	49° 38,74' S	38° 18,29'W	4969
PS79/174-8	01.03.12	17:40	RAMSES	zu Wasser	49° 38,71' S	38° 18,31'W	4968,5
PS79/174-8	01.03.12	18:04	RAMSES	am Grund/ auf Tiefe	49° 38,63' S	38° 18,36'W	4968
PS79/174-8	01.03.12	18:04	RAMSES	Hieven	49° 38,63' S	38° 18,36'W	4968
PS79/174-8	01.03.12	18:23	RAMSES	Wasserober-fläche	49° 38,58' S	38° 18,37'W	4967,2
PS79/174-8	01.03.12	18:24	RAMSES	an Deck	49° 38,58' S	38° 18,37'W	4967
PS79/174-9	01.03.12	18:37	CTD/RO	zu Wasser	49° 38,56' S	38° 18,41'W	4966,5
PS79/174-9	01.03.12	18:54	CTD/RO	am Grund/ auf Tiefe	49° 38,54' S	38° 18,51'W	4966,2
PS79/174-9	01.03.12	18:54	CTD/RO	Hieven	49° 38,54' S	38° 18,51'W	4966,2
PS79/174-9	01.03.12	19:09	CTD/RO	Wasserober-fläche	49° 38,53' S	38° 18,59'W	4965,5
PS79/174-9	01.03.12	19:10	CTD/RO	an Deck	49° 38,53' S	38° 18,60'W	4965,5
PS79/174-10	01.03.12	19:17	GO-FLO	zu Wasser	49° 38,53' S	38° 18,64'W	4965,5
PS79/174-10	01.03.12	19:35	GO-FLO	am Grund/ auf Tiefe	49° 38,54' S	38° 18,73'W	4964,5
PS79/174-10	01.03.12	19:40	GO-FLO	Hieven	49° 38,54' S	38° 18,75'W	4964,5
PS79/174-10	01.03.12	19:55	GO-FLO	Wasserober-fläche	49° 38,56' S	38° 18,81'W	4964,2
PS79/174-10	01.03.12	19:55	GO-FLO	an Deck	49° 38,56' S	38° 18,81'W	4964,2
PS79/174-11	01.03.12	20:10	RMT	zu Wasser	49° 38,61' S	38° 18,91'W	4964,2
PS79/174-11	01.03.12	21:29	RMT	am Grund/ auf Tiefe	49° 39,88' S	38° 22,70'W	4948
PS79/174-11	01.03.12	21:30	RMT	Profil Anfang	49° 39,90' S	38° 22,75'W	4947,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/174-11	01.03.12	21:30	RMT	Hieven	49° 39,90' S	38° 22,75'W	4947,7
PS79/174-11	01.03.12	23:48	RMT	Profil Ende	49° 41,73' S	38° 29,54'W	4909
PS79/174-11	01.03.12	23:50	RMT	an Deck	49° 41,74' S	38° 29,58'W	4909
PS79/174-12	02.03.12	01:07	MSS	zu Wasser	49° 37,28' S	38° 19,54'W	4948,2
PS79/174-12	02.03.12	02:00	MSS	am Grund/ auf Tiefe	49° 37,52' S	38° 20,47'W	4943,2
PS79/174-12	02.03.12	02:11	MSS	an Deck	49° 37,54' S	38° 20,68'W	4942,2
PS79/174-13	02.03.12	02:13	RAMSES	zu Wasser	49° 37,54' S	38° 20,71'W	4942
PS79/174-13	02.03.12	02:27	RAMSES	am Grund/ auf Tiefe	49° 37,44' S	38° 20,64'W	4941,7
PS79/174-13	02.03.12	02:27	RAMSES	Hieven	49° 37,44' S	38° 20,64'W	4941,7
PS79/174-13	02.03.12	02:41	RAMSES	an Deck	49° 37,39' S	38° 20,67'W	4941,2
PS79/174-14	02.03.12	02:47	RMT	zu Wasser	49° 37,40' S	38° 20,81'W	4940,2
PS79/174-14	02.03.12	03:06	RMT	Profil Anfang	49° 37,54' S	38° 22,08'W	4932,2
PS79/174-14	02.03.12	03:06	RMT	Hieven	49° 37,54' S	38° 22,08'W	4932,2
PS79/174-14	02.03.12	03:24	RMT	Profil Ende	49° 37,71' S	38° 23,27'W	4925,2
PS79/174-14	02.03.12	03:26	RMT	Wasserober-fläche	49° 37,73' S	38° 23,40'W	4924,5
PS79/174-14	02.03.12	03:29	RMT	an Deck	49° 37,76' S	38° 23,60'W	4923
PS79/174-15	02.03.12	04:00	MN	zu Wasser	49° 37,07' S	38° 20,60'W	4939,5
PS79/174-15	02.03.12	04:54	MN	am Grund/ auf Tiefe	49° 36,93' S	38° 21,04'W	4935,2
PS79/174-15	02.03.12	04:54	MN	Hieven	49° 36,93' S	38° 21,04'W	4935,2
PS79/174-15	02.03.12	05:19	MN	an Deck	49° 36,86' S	38° 21,30'W	4934,5
PS79/174-16	02.03.12	05:24	MSS	zu Wasser	49° 36,86' S	38° 21,39'W	4932
PS79/174-16	02.03.12	05:43	MSS	am Grund/ auf Tiefe	49° 36,93' S	38° 21,99'W	4928
PS79/174-16	02.03.12	06:29	MSS	an Deck	49° 36,98' S	38° 23,17'W	4929,2
PS79/174-17	02.03.12	06:43	ISP	zu Wasser	49° 36,81' S	38° 22,62'W	4921
PS79/174-18	02.03.12	06:52	HN	zu Wasser	49° 36,72' S	38° 22,78'W	4920
PS79/174-18	02.03.12	07:00	HN	am Grund/ auf Tiefe	49° 36,66' S	38° 22,85'W	4919
PS79/174-17	02.03.12	07:11	ISP	am Grund/ auf Tiefe	49° 36,59' S	38° 22,94'W	4917,5
PS79/174-18	02.03.12	07:21	HN	an Deck	49° 36,51' S	38° 23,05'W	4915
PS79/174-17	02.03.12	09:16	ISP	Hieven	49° 36,28' S	38° 23,69'W	4909
PS79/174-17	02.03.12	09:41	ISP	an Deck	49° 36,31' S	38° 23,76'W	4909,2
PS79/174-19	02.03.12	10:18	TRAPS	an Deck	49° 36,38' S	38° 23,37'W	4912,2
PS79/174-19	02.03.12	10:22	TRAPS	an Deck	49° 36,37' S	38° 23,38'W	4913
PS79/174-19	02.03.12	10:29	TRAPS	an Deck	49° 36,32' S	38° 23,40'W	4911
PS79/174-19	02.03.12	10:43	TRAPS	am Grund/ auf Tiefe	49° 36,33' S	38° 23,50'W	4910,2
PS79/174-19	02.03.12	10:43	TRAPS	an Deck	49° 36,33' S	38° 23,50'W	4910,2
PS79/174-20	02.03.12	10:56	CTD/RO	zu Wasser	49° 36,32' S	38° 23,41'W	4910,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/174-20	02.03.12	12:31	CTD/RO	am Grund/ auf Tiefe	49° 35,97' S	38° 23,14'W	4909,5
PS79/174-20	02.03.12	12:35	CTD/RO	Hieven	49° 35,96' S	38° 23,11'W	4911,7
PS79/174-20	02.03.12	14:06	CTD/RO	an Deck	49° 35,91' S	38° 22,80'W	4912,7
PS79/174-21	02.03.12	14:15	MSS	zu Wasser	49° 35,83' S	38° 22,86'W	4911,5
PS79/174-21	02.03.12	14:36	MSS	am Grund/ auf Tiefe	49° 35,48' S	38° 23,14'W	4905,7
PS79/174-21	02.03.12	15:22	MSS	an Deck	49° 34,71' S	38° 23,52'W	4896,2
PS79/174-22	02.03.12	15:43	CTD/RO	zu Wasser	49° 34,72' S	38° 23,30'W	4897,5
PS79/174-22	02.03.12	17:04	CTD/RO	am Grund/ auf Tiefe	49° 34,26' S	38° 23,85'W	4889
PS79/174-22	02.03.12	17:04	CTD/RO	Hieven	49° 34,26' S	38° 23,85'W	4889
PS79/174-22	02.03.12	18:30	CTD/RO	Wasserober-fläche	49° 34,02' S	38° 24,07'W	4885,2
PS79/174-22	02.03.12	18:31	CTD/RO	an Deck	49° 34,01' S	38° 24,08'W	4885
PS79/174-23	02.03.12	18:47	MUC	zu Wasser	49° 34,02' S	38° 24,02'W	4886,2
PS79/174-23	02.03.12	19:09	MUC	Hieven	49° 33,89' S	38° 24,21'W	4882,2
PS79/174-23	02.03.12	19:58	MUC	am Grund/ auf Tiefe	49° 33,80' S	38° 24,27'W	4881
PS79/174-23	02.03.12	21:03	MUC	Wasserober-fläche	49° 33,57' S	38° 24,47'W	4877,2
PS79/174-23	02.03.12	21:05	MUC	an Deck	49° 33,56' S	38° 24,47'W	4877
PS79/174-24	02.03.12	21:24	MSS	zu Wasser	49° 33,26' S	38° 25,02'W	4869
PS79/174-24	02.03.12	22:37	MSS	am Grund/ auf Tiefe	49° 32,49' S	38° 26,39'W	4849,5
PS79/174-24	02.03.12	22:37	MSS	an Deck	49° 32,49' S	38° 26,39'W	4849,5
PS79/175-1	03.03.12	07:03	CTD/RO	zu Wasser	50° 47,99' S	39° 23,91'W	4158,1
PS79/175-1	03.03.12	08:27	CTD/RO	am Grund/ auf Tiefe	50° 48,21' S	39° 23,61'W	4162,2
PS79/175-1	03.03.12	08:28	CTD/RO	Hieven	50° 48,22' S	39° 23,61'W	4161,7
PS79/175-2	03.03.12	09:00	HN	zu Wasser	50° 48,23' S	39° 23,65'W	4161,2
PS79/175-2	03.03.12	09:04	HN	am Grund/ auf Tiefe	50° 48,20' S	39° 23,65'W	4161,7
PS79/175-2	03.03.12	09:09	HN	an Deck	50° 48,16' S	39° 23,65'W	4162
PS79/175-1	03.03.12	09:44	CTD/RO	Wasserober-fläche	50° 48,03' S	39° 23,61'W	4163,5
PS79/175-1	03.03.12	09:45	CTD/RO	an Deck	50° 48,03' S	39° 23,61'W	4163,7
PS79/175-3	03.03.12	11:11	AGT	zu Wasser	50° 51,82' S	39° 22,85'W	4137,2
PS79/175-3	03.03.12	12:30	AGT	am Grund/ auf Tiefe	50° 48,02' S	39° 23,96'W	4159,7
PS79/175-3	03.03.12	13:00	AGT	Profil Anfang	50° 46,98' S	39° 24,39'W	4163,2
PS79/175-3	03.03.12	13:10	AGT	Profil Ende	50° 46,85' S	39° 24,44'W	4163,5
PS79/175-3	03.03.12	13:10	AGT	Hieven	50° 46,85' S	39° 24,44'W	4163,5
PS79/175-3	03.03.12	14:15	AGT	frei vom Grund	50° 46,78' S	39° 24,49'W	4163,5
PS79/175-3	03.03.12	16:48	AGT	an Deck	50° 46,10' S	39° 24,17'W	4173,5

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/175-4	03.03.12	17:58	AGT	zu Wasser	50° 51,92' S	39° 22,84'W	4135,7
PS79/175-4	03.03.12	19:16	AGT	am Grund/ auf Tiefe	50° 48,68' S	39° 23,71'W	4156,2
PS79/175-4	03.03.12	19:47	AGT	Profil Anfang	50° 47,60' S	39° 24,20'W	4161,2
PS79/175-4	03.03.12	19:57	AGT	Hieven	50° 47,38' S	39° 24,21'W	4162,2
PS79/175-4	03.03.12	19:57	AGT	Profil Ende	50° 47,38' S	39° 24,21'W	4162,2
PS79/175-4	03.03.12	21:03	AGT	frei vom Grund	50° 47,13' S	39° 24,01'W	4166,7
PS79/175-4	03.03.12	23:39	AGT	an Deck	50° 46,36' S	39° 23,19'W	4183,5
PS79/175-5	04.03.12	00:19	MUC	zu Wasser	50° 46,72' S	39° 25,74'W	4149,2
PS79/175-5	04.03.12	01:15	MUC	am Grund/ auf Tiefe	50° 46,69' S	39° 25,35'W	4154,2
PS79/175-5	04.03.12	01:16	MUC	Hieven	50° 46,69' S	39° 25,35'W	4154
PS79/175-5	04.03.12	02:14	MUC	an Deck	50° 46,63' S	39° 25,16'W	4156,7
PS79/175-6	04.03.12	02:27	MUC	zu Wasser	50° 46,64' S	39° 25,16'W	4157,2
PS79/175-6	04.03.12	03:25	MUC	am Grund/ auf Tiefe	50° 46,59' S	39° 25,33'W	4155,2
PS79/175-6	04.03.12	03:26	MUC	Hieven	50° 46,59' S	39° 25,33'W	4155,2
PS79/175-6	04.03.12	03:27	MUC	frei vom Grund	50° 46,59' S	39° 25,34'W	4155,5
PS79/175-6	04.03.12	04:22	MUC	an Deck	50° 46,63' S	39° 25,36'W	4154,7
PS79/175-7	04.03.12	04:40	MUC	zu Wasser	50° 46,63' S	39° 25,41'W	4153,7
PS79/175-7	04.03.12	05:36	MUC	am Grund/ auf Tiefe	50° 46,60' S	39° 25,38'W	4154,2
PS79/175-7	04.03.12	05:36	MUC	Hieven	50° 46,60' S	39° 25,38'W	4154,2
PS79/175-7	04.03.12	05:37	MUC	frei vom Grund	50° 46,60' S	39° 25,39'W	4154,2
PS79/175-7	04.03.12	06:31	MUC	Wasserober-fläche	50° 46,62' S	39° 25,42'W	4154
PS79/175-7	04.03.12	06:33	MUC	an Deck	50° 46,62' S	39° 25,42'W	4154,2
PS79/175-8	04.03.12	06:47	MUC	zu Wasser	50° 46,58' S	39° 25,38'W	4154,5
PS79/175-8	04.03.12	07:43	MUC	am Grund/ auf Tiefe	50° 46,60' S	39° 25,39'W	0
PS79/175-8	04.03.12	07:44	MUC	Hieven	50° 46,60' S	39° 25,38'W	0
PS79/175-8	04.03.12	08:37	MUC	Wasserober-fläche	50° 46,63' S	39° 25,37'W	4155
PS79/175-8	04.03.12	08:40	MUC	an Deck	50° 46,63' S	39° 25,37'W	4154,2
PS79/175-9	04.03.12	08:53	MUC	zu Wasser	50° 46,60' S	39° 25,37'W	4154,7
PS79/175-9	04.03.12	09:49	MUC	am Grund/ auf Tiefe	50° 46,57' S	39° 25,33'W	4152,1
PS79/175-9	04.03.12	09:50	MUC	Hieven	50° 46,57' S	39° 25,33'W	4155
PS79/175-9	04.03.12	10:46	MUC	an Deck	50° 46,55' S	39° 25,15'W	4157,5
PS79/175-10	04.03.12	11:10	RMT	zu Wasser	50° 46,44' S	39° 25,16'W	4157,5
PS79/175-10	04.03.12	13:17	RMT	am Grund/ auf Tiefe	50° 42,85' S	39° 31,17'W	4117,7
PS79/175-10	04.03.12	13:17	RMT	Profil Anfang	50° 42,85' S	39° 31,17'W	4117,7

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/175-10	04.03.12	13:23	RMT	Profil Ende	50° 42,72' S	39° 31,39'W	4116,5
PS79/175-10	04.03.12	13:23	RMT	Hieven	50° 42,72' S	39° 31,39'W	4116,5
PS79/175-10	04.03.12	18:42	RMT	Wasserober-fläche	50° 35,23' S	39° 41,09'W	4079,8
PS79/175-10	04.03.12	18:44	RMT	an Deck	50° 35,21' S	39° 41,10'W	4079,1
PS79/176-1	05.03.12	06:54	RMT	zu Wasser	52° 15,89' S	40° 29,14'W	3798,4
PS79/176-1	05.03.12	07:09	RMT	am Grund/ auf Tiefe	52° 15,60' S	40° 29,47'W	3798
PS79/176-1	05.03.12	07:10	RMT	Profil Anfang	52° 15,58' S	40° 29,50'W	3797,5
PS79/176-1	05.03.12	07:10	RMT	Hieven	52° 15,58' S	40° 29,50'W	3797,5
PS79/176-1	05.03.12	07:25	RMT	Profil Ende	52° 15,25' S	40° 29,87'W	3797,1
PS79/176-1	05.03.12	07:26	RMT	Wasserober-fläche	52° 15,23' S	40° 29,89'W	3797,1
PS79/176-1	05.03.12	07:30	RMT	an Deck	52° 15,15' S	40° 29,99'W	3796,8
PS79/176-2	05.03.12	09:34	MOR	zu Wasser	52° 16,45' S	40° 28,61'W	3799,2
PS79/176-2	05.03.12	09:44	MOR	zu Wasser	52° 16,30' S	40° 28,78'W	3798,8
PS79/176-2	05.03.12	09:49	MOR	zu Wasser	52° 16,23' S	40° 28,86'W	3798,8
PS79/176-2	05.03.12	09:50	MOR	Fieren	52° 16,21' S	40° 28,88'W	3798,7
PS79/176-2	05.03.12	10:18	MOR	zu Wasser	52° 15,62' S	40° 29,45'W	3797,7
PS79/176-2	05.03.12	10:27	MOR	zu Wasser	52° 15,42' S	40° 29,60'W	3796,9
PS79/176-2	05.03.12	10:28	MOR	Fieren	52° 15,39' S	40° 29,63'W	3796,5
PS79/176-2	05.03.12	10:41	MOR	zu Wasser	52° 15,12' S	40° 29,91'W	3796,1
PS79/176-2	05.03.12	11:00	MOR	am Grund/ auf Tiefe	52° 15,01' S	40° 29,97'W	3796,1
PS79/176-2	05.03.12	11:02	MOR	zu Wasser	52° 15,01' S	40° 29,98'W	3795,9
PS79/177-1	07.03.12	09:13	GO-FLO	zu Wasser	53° 40,01' S	51° 59,99'W	765,5
PS79/177-1	07.03.12	09:29	GO-FLO	am Grund/ auf Tiefe	53° 40,05' S	51° 59,88'W	762,7
PS79/177-1	07.03.12	09:39	GO-FLO	an Deck	53° 40,05' S	51° 59,89'W	763,7
PS79/177-2	07.03.12	12:36	GO-FLO	zu Wasser	53° 48,48' S	52° 21,45'W	331,7
PS79/177-2	07.03.12	12:50	GO-FLO	am Grund/ auf Tiefe	53° 48,54' S	52° 21,45'W	336,5
PS79/177-2	07.03.12	12:55	GO-FLO	Hieven	53° 48,55' S	52° 21,41'W	339,2
PS79/177-2	07.03.12	13:08	GO-FLO	an Deck	53° 48,60' S	52° 21,33'W	339,7
PS79/177-3	07.03.12	13:14	MUC	zu Wasser	53° 48,56' S	52° 21,32'W	340,7
PS79/177-3	07.03.12	13:22	MUC	am Grund/ auf Tiefe	53° 48,53' S	52° 21,31'W	338,7
PS79/177-3	07.03.12	13:24	MUC	Hieven	53° 48,53' S	52° 21,30'W	339,5
PS79/177-3	07.03.12	13:31	MUC	an Deck	53° 48,54' S	52° 21,31'W	339,2
PS79/177-4	07.03.12	13:41	MUC	zu Wasser	53° 48,54' S	52° 21,30'W	341
PS79/177-4	07.03.12	13:50	MUC	am Grund/ auf Tiefe	53° 48,54' S	52° 21,30'W	340,2
PS79/177-4	07.03.12	13:51	MUC	Hieven	53° 48,54' S	52° 21,30'W	340,5
PS79/177-4	07.03.12	13:59	MUC	an Deck	53° 48,54' S	52° 21,30'W	340,2
PS79/177-5	07.03.12	14:09	MUC	zu Wasser	53° 48,55' S	52° 21,33'W	339,2

Station	Date	Time	Gear	Action	Position Lat	Position Lon	Depth [m]
PS79/177-5	07.03.12	14:21	MUC	am Grund/ auf Tiefe	53° 48,55' S	52° 21,30'W	340,5
PS79/177-5	07.03.12	14:22	MUC	Hieven	53° 48,55' S	52° 21,31'W	339,7
PS79/177-5	07.03.12	14:29	MUC	an Deck	53° 48,56' S	52° 21,29'W	339,5
PS79/177-6	07.03.12	14:39	MUC	zu Wasser	53° 48,57' S	52° 21,29'W	348
PS79/177-6	07.03.12	14:47	MUC	am Grund/ auf Tiefe	53° 48,56' S	52° 21,27'W	343
PS79/177-6	07.03.12	14:58	MUC	an Deck	53° 48,63' S	52° 21,35'W	337,2
PS79/177-7	07.03.12	15:24	AGT	zu Wasser	53° 48,61' S	52° 20,04'W	339
PS79/177-7	07.03.12	15:36	AGT	am Grund/ auf Tiefe	53° 48,53' S	52° 21,04'W	331,2
PS79/177-7	07.03.12	15:43	AGT	Profil Anfang	53° 48,52' S	52° 21,47'W	336,5
PS79/177-7	07.03.12	15:53	AGT	Profil Ende	53° 48,56' S	52° 21,73'W	331
PS79/177-7	07.03.12	16:10	AGT	frei vom Grund	53° 48,64' S	52° 21,73'W	333
PS79/177-7	07.03.12	16:23	AGT	an Deck	53° 48,67' S	52° 21,76'W	332,7
PS79/177-8	07.03.12	16:51	MUC	zu Wasser	53° 48,56' S	52° 21,31'W	340,7
PS79/177-8	07.03.12	17:00	MUC	am Grund/ auf Tiefe	53° 48,57' S	52° 21,29'W	340,7
PS79/177-8	07.03.12	17:01	MUC	Hieven	53° 48,56' S	52° 21,29'W	340,2
PS79/177-8	07.03.12	17:02	MUC	frei vom Grund	53° 48,56' S	52° 21,29'W	340
PS79/177-8	07.03.12	17:13	MUC	an Deck	53° 48,53' S	52° 21,32'W	337,2
PS79/177-9	07.03.12	17:22	MUC	zu Wasser	53° 48,52' S	52° 21,37'W	331,7
PS79/177-9	07.03.12	17:29	MUC	am Grund/ auf Tiefe	53° 48,53' S	52° 21,35'W	335,2
PS79/177-9	07.03.12	17:31	MUC	Hieven	53° 48,53' S	52° 21,33'W	338,7
PS79/177-9	07.03.12	17:32	MUC	frei vom Grund	53° 48,53' S	52° 21,32'W	338,2
PS79/177-9	07.03.12	17:39	MUC	an Deck	53° 48,56' S	52° 21,24'W	338,2

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