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The Expedition of the Research Vessel "Polarstern" to the Antarctic in 2011 (ANT-XXVII/3) (CAMBIO)

Edited by
Rainer Knust, Dieter Gerdes and Katja Mintenbeck
with contributions of the participants

HELMHOLTZ
GEMEINSCHAFT

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ANT-XXVII/3

CAMBIO

8 February - 18 April 2011

Punta Arenas - Cape Town

Chief scientist
Rainer Knust

Coordinator
Eberhard Fahrbach

Contents

1. ZUSAMMENFASSUNG UND FAHRTVERLAUF

Rainer Knust , Katja Mintenbeck Alfred-Wegener-Institut

Laut Bericht des IPCC (Intergovernmental Panel on Climate Change) aus dem Jahr 2007 sind die Anzeichen für Klimaveränderungen in der Gesamt-Antarktis zwar weniger offensichtlich als in der Arktis, in einigen Teilen der Antarktis gibt es aber bereits erhebliche Veränderungen im Temperaturregime. Die mittleren Lufttemperaturen an der Antarktischen Halbinsel und in der Bellingshausen-See sind seit 1950 um ca. 1,5 °C gestiegen; in den letzten 100 Jahren sogar um ca. 3 °C. Die Wassertemperatur bei Südgeorgien ist im Winter um 3,3 °C und im Sommer um 0,9 °C wärmer als zu Beginn des 20. Jahrhunderts. Als Folge der Erwärmung lässt sich insbesondere im Bereich der Antarktischen Halbinsel ein deutlicher Rückgang diverser Eisschelfe beobachten. So sind zum Beispiel innerhalb der vergangenen 10 Jahre an der Ostküste der Antarktischen Halbinsel die beiden Larsen-Schelfeise A und B mit einer Gesamtfläche von ca. 80 x 80 km komplett weggebrochen. Die Veränderungen im Temperaturregime sowie die Veränderungen in der Eisschelfdynamik werden signifikante Einflüsse auf die Lebensgemeinschaften der betroffenen Schelfgebiete haben. Mögliche langfristige Folgen einer fortschreitenden Erwärmung auf die marinen Lebensgemeinschaften reichen von Veränderungen in Populationsdynamik und Verbreitungsgrenzen einzelner Arten bis hin zu einer kompletten Verschiebung in der Artenzusammensetzung durch Auslöschung (Extinktion) ansässiger (endemischer) Arten und Invasion von Arten aus nördlicheren Meeresgebieten. Eine solche Veränderung im Artenspektrum wird mit erheblichen Veränderungen des Nahrungsnetzes einhergehen. Ob eine Art unter veränderten abiotischen Bedingungen in ihrem Lebensraum erfolgreich bestehen kann, ist abhängig von der individuellen genetischen und physiologischen Ausstattung und Plastizität der Art, sowie vom Neubesiedlungspotential invasiver Arten.

Untersuchungen während früherer Expeditionen zur Biogeographie und Biodiversität entlang des Scotia Bogens und an der Insel Bouvet haben gezeigt, dass diese Inseln im Südatlantik wichtige Trittsteine für eine Besiedlung der Antarktis durch Arten aus den nördlicheren Bereichen sein können. Erste Hinweise für solche Neubesiedlung durch reptante dekapode Krebse wurden während der *Polarstern* Expedition ANT-XIX/5 im Jahr 2002 gefunden.

Die Veränderungen in der Schelfeisdynamik führen einerseits zu Veränderungen in den Stoffflüssen zwischen Pelagial und Benthal in den jetzt unbedeckten Schelfgebieten, andererseits aber auch zu einem erhöhtem Aufkommen von Eisbergstrandungen auf dem Schelf mit entsprechenden Konsequenzen für die benthischen Lebensgemeinschaften und die demersale Fischfauna. Derartige Veränderungen sind in den Jahren 1996-2006 bereits auf verschiedenen Antarktisexpeditionen (EASIZ I-III, BENDEX, LARSEN A/B) untersucht worden. Dabei wurden deutliche Fortschritte beim Verständnis der Bedeutung pelago-benthischer Kopplungsprozesse und der Störungsintensität durch Eisbergstrandungen für Besiedlungsmuster und Biodiversität des antarktischen Schelfs erzielt. Das Zeitfenster der Wiederbesiedlungsprozesse nach Störungen ist allerdings immer noch vollkommen unklar. Um die zeitlichen Abläufe näher untersuchen zu können, wurde in der Saison 2003/2004 ein Störungsexperiment begonnen (ANT-XXI/2, BENDEX). Um eine Zeitmarke zu setzen, wurde in einem definierten Gebiet eine künstliche mechanische Störung des Meeresbodens herbeigeführt. Das gestörte Gebiet wurde auf dieser Expedition erneut aufgesucht, um den Fortschritt der Wiederbesiedlung zu dokumentieren. Welche Auswirkungen die großflächigen Schelfeisabbrüche in der Westantarktis auf die Biodiversität und Arten-zusammensetzung haben, ist ebenfalls wenig bekannt. 2006/2007 wurden während der Expedition ANT-XXIII/8 erste Untersuchungen zur Besiedlung der ehemals von Schelfeis bedeckten LARSEN A/B Gebiete an der östlichen Halbinsel durchgeführt. Die damals begonnenen Arbeiten wurden auf dieser Expedition fortgesetzt.

Auf der Expedition ANT-XXVII/3 wurden mögliche Auswirkungen von Klimaveränderungen auf die Biodiversität von Lebensgemeinschaften und auf Ökosystemfunktionen in sub- und hochantarktischen Gebieten untersucht. Die Expedition war Bestandteil des internationalen SCAR-Programms „Biodiversity and Evolution in the Antarctic: The response of life to change" (EBA). Aufbauend auf Daten und Ergebnissen von früheren Expeditionen (ANT-XV/3, ANT-XVII/3, ANT-XIX/5, ANT-XXI/2, ANT-XXIII/8) im Rahmen der Programme EASIZ und EVOLANTA hat sich diese Expedition auf drei Hauptthemen konzentriert:

1. Die geographische Verbreitung von Arten in der Sub- und Hochantarktis sowie die genetischen und physiologischen Steuerungsprozesse, die diese Verbreitung bestimmen.
2. Pelago-benthische Kopplungsprozesse und Auswirkungen von klimabedingten Veränderungen auf das Nahrungsnetz.
3. Auswirkungen von veränderten Schelfeissituationen auf die Biodiversität des Benthos und der demersalen Fischfauna des westlichen und östlichen Weddellmeeres.

Die Arbeiten während der Expedition konzentrierten sich auf die Lebensgemeinschaften des Schelfs (ca. 200 - 600 m Wassertiefe) und des Schelfrandes. Die Untersuchungen umfassten sowohl Probennahmen in subantarktischen Gebieten der Scotia See und um Bouvet Island als auch in hochantarktischen Schelfgebieten des westlichen und östlichen Weddellmeeres. Arbeiten zur Biogeographie, Genetik, Ökologie und Physiologie wurden an ausgewählten Arten des Zooplanktons und Makrozoobenthos und an Cephalopoden, Dekapoden und Fischen durchgeführt.

Der 3. Fahrtabschnitt der *Polarstern* Expedition ANT-XXVII begann am 8. Februar 2011 um 20:00 in Punta Arenas, Chile (Abb. 1.1). Bei sehr guten Wetterbedingungen dampfte das Schiff zur ersten Station auf der Burdwood Bank, wo das wissenschaftliche Arbeitsprogramm am 11. Februar begann. Weitere Stationen bei Südgeorgien und den Süd-Orkneys folgten. Die Probennahmen in der Scotia-See konnten wie geplant durchgeführt werden und *Polarstern* erreichte das Dallmann-Labor an der Jubany-Station (King George Island) planmäßig am 22. Februar. Tagsüber wurde die Versorgung des Labors durchgeführt, wobei zwei Geophysikerinnen von Bord gingen und ein Biologe zustieg. Abends wurde das wissenschaftliche Programm wieder aufgenommen; nach zwei Tagen Arbeit bei King George Island verholte die *Polarstern* via Antarctic Sound zum westlichen Weddellmeer und erreichte am 26. Februar das ehemalige Schelfeisgebiet Larsen A/B. Hier wurde ein intensives Probennahme-Programm durchgeführt, wobei fast alle Stationen, die in einer früheren Expedition in 2006/07 bereits bearbeitet wurden, erneut beprobt werden konnten. Zusätzliche Proben wurden an zwei neuen Stationen am Schelfrand des Larsen-C-Gebietes genommen. Während der Arbeiten im Larsen-Gebiet konnte als außergewöhnliches Wetterphänomen eine Fönsituation mit Lufttemperaturen von +9 °C beobachtet werden. Auf mehreren Hubschrauberflügen konnten wir beobachten, dass die verbliebenen Reste des Schelfeises weiter abtauen (Abb. 1.2). Ausgedehnte Wasserflächen (Schmelzwasserlinsen) auf dem Eis und z.T. immense, sich ins Meer ergießende Wasserfälle waren deutliche Anzeichen dafür. Die Benthosgemeinschaft in Larsen C war überraschenderweise sehr arm und in Larsen B hat noch so gut wie keine Besiedlung durch typische Arten des Schelfs stattgefunden. Im schon seit längerem freigelegten Gebiet Larsen A konnten einige frühe Sukzessionsstadien identifiziert werden. Am 13. März beendeten wir unsere Arbeiten in diesem Seegebiet und versegelten in den östlichen Teil des Weddellmeeres. Am 20. März erreichten wir unser Experimentierfeld BENDEX bei Austasen. Hier begannen wir ein weiteres intensives Probennahmeprogramm. Videoaufnahmen mittels ROV und Multigreifer ergaben, dass nach unserem Störungsexperiment im Jahr 2003 die Wiederbesiedlung der gestörten Fläche sehr langsam beginnt, obwohl in unmittelbarer Nähe adulte Organismen als Rekruten bereit standen. Dies belegt, wie bereits im Larsen-Gebiet beobachtet, dass in der Hochantarktis die Besiedlung benthischer Lebensräume ein sehr langsamer Prozess ist. Am 26. März wurden die Arbeiten für einen Tag unterbrochen, um Neumayer III zu versorgen.

Wie bereits auf früheren Expeditionen wurde auch auf dieser Expedition die Schelfeiskante mit Hilfe des GPS an Bord der Hubschrauber vermessen. Der Vergleich der Daten mit Messungen aus den Jahren 1996, 2000 und 2003 ergaben ein sehr dynamisches aber ausgewogenes Bild der Schelfeisausdehnung. Während zwischen 1996 und 2000 in einigen Gebieten ein Rückgang zu verzeichnen war, wuchs das Schelfeis an den gleichen Stellen von 2000 bis heute. Während unserer Arbeiten im östlichen Weddellmeer fielen die Temperaturen bis auf -27 °C (Windchill -53 °C), was die Arbeiten an Deck für Mannschaft und Wissenschaft deutlich erschwerte. Die rasant zunehmende Neueisbildung behinderte die Arbeiten ebenfalls und erforderte das ganze nautische Geschick der Schiffsführung. Am 5. April wurden die Arbeiten im östlichen Weddellmeer erfolgreich abgeschlossen. Nach einer weiteren tiefen Plankton-Station bei 2000 m am 6. April dampfte *Polarstern* Richtung Bouvet. Hier musste das wissenschaftliche Programm auf eine CTD und zwei Grundschleppnetzfänge reduziert werden, da uns ein herannahendes Sturmtief mit Orkanstärke zum raschen Ablaufen aus diesem Seegebiet zwang. Am 18. April in den frühen Morgenstunden erreichte *Polarstern* Kapstadt, Südafrika, womit der 3. Fahrtabschnitt beendet war.

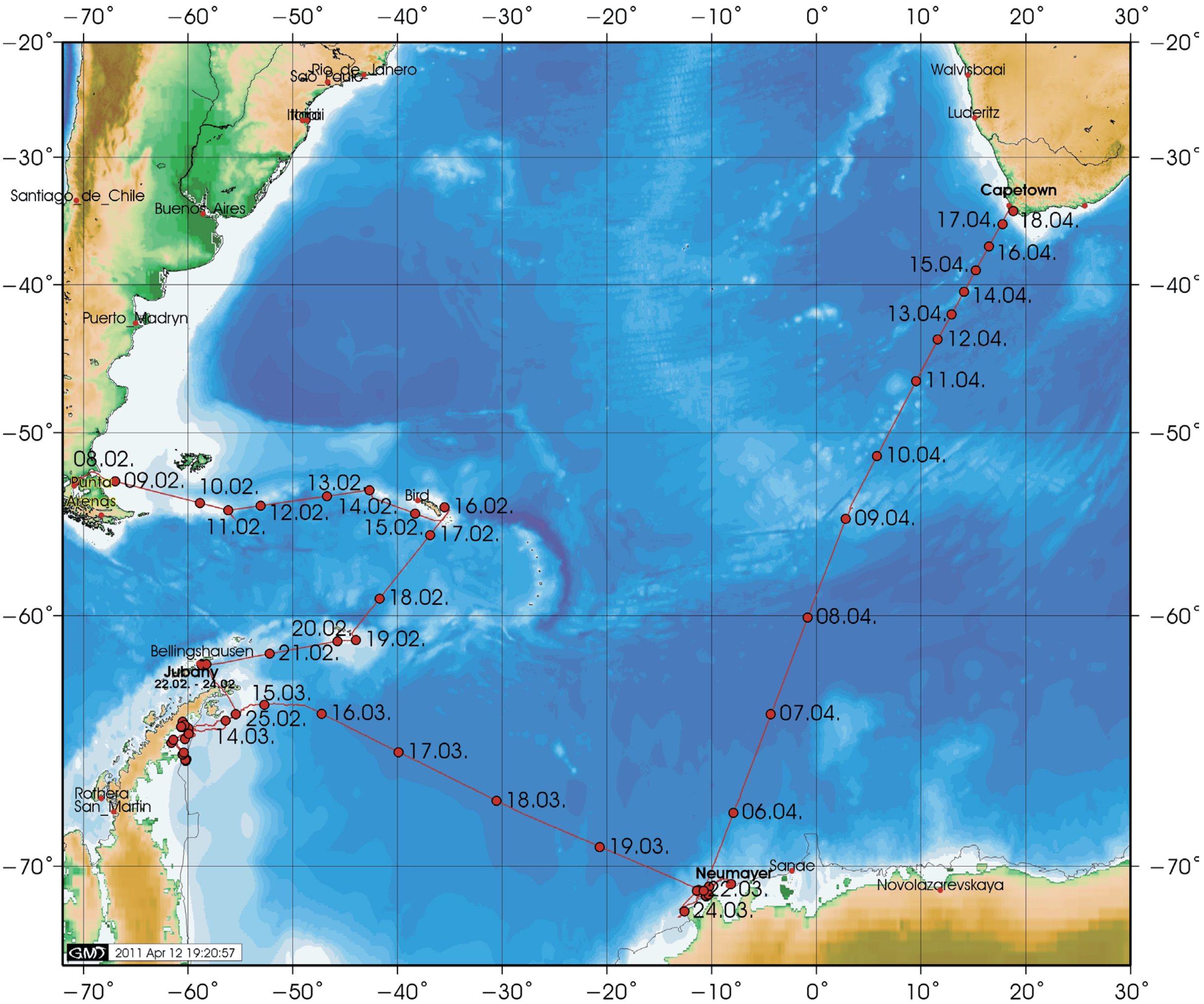

Abb. 1.1 : Kurskarte der Polarstern Reise ANT-XXVII/3

Fig. 1.1 : Cruise track of Polarstern during the expedition ANT-XXVII/3

ITINERARY AND SUMMARY

According to the IPCC (Intergovernmental Panel on Climate Change) 2007 signs of climate change in the Antarctic are less pronounced as compared to the Arctic but in some parts of the Antarctic clear and significant temperature changes are detectable. Mean air temperatures at the Antarctic Peninsula and in the Bellingshausen Sea increased approximately by 1.5 °C since the 1950s, and by almost 3 °C within the last 100 years. Around South Georgia Island water temperatures increased by 3.3 °C in winter and by 0.9 °C in summer as compared to the early 20th century. The temperature rise entailed a drastic disintegration and reduction of various ice shelves along the Antarctic Peninsula; on the eastern side of the Antarctic Peninsula the Larsen A and B ice shelves, covering an area of approximately 80 x 80 km, broke away completely within the last 10 years. Both, changes in the temperature regime and changes of the shelf ice dynamics affect the marine living communities in these regions. In the long run, ongoing climate warming will most likely affect population dynamics and distributional ranges of species and finally might result in significant shifts in community composition due to extinction of endemic species and invasion of new species from adjacent northern regions. Such alterations in species composition will involve significant changes in the food web structure. Survival of particular endemic species and persistence of populations under altered abiotic conditions strongly depend on adaptability and physiological fitness and plasticity of individuals, as well as on the capacity of invasive species to build up competitive populations.

Former expeditions focusing on biogeography and biodiversity along the Scotia Arc and around Bouvet Island have shown that these islands in the South Atlantic might be important stepping stones for the colonization of Antarctic waters by northern alien species. During the expedition ANT-XIX/5 the discovery of reptant decapods around Bouvet Island provided first evidence that invasion via these islands might be already under way. However, whether these island shelves are also used by other taxonomic groups for invasion into Antarctic waters still needs to be verified.

Changes in shelf ice dynamics involve alterations in pelago-benthic flow patterns in the formerly ice-covered regions, and at the same time give rise to an increase in iceberg scouring events, which impacts the benthos and demersal fish communities on the shelf. The investigation of these effects was in the focus of several previous Antarctic expeditions between 1996 and 2006 (EASIZ I–III, BENDEX, LARSEN-A/B). These studies considerably improved our knowledge on the importance of pelago-benthic coupling processes and the significance of iceberg scouring events for benthic community structure and biodiversity. However, the timescales of recolonisation phases after disturbance are still completely unknown. To set a time stamp for the investigation of the recolonisation timescale, the artificial disturbance experiment BENDEX was initiated in 2003/04 on the north-eastern Weddell Sea shelf. During BENDEX the sea floor in a defined area was artificially disturbed to simulate an iceberg scour mark. This area was revisited during this expedition to document the recolonisation progress after 6 years. The consequences of the tremendous ice shelf disintegrations along the Antarctic Peninsula on biodiversity and community composition are so far unknown, as well. Some first studies focusing on benthic communities in the formerly ice-covered LARSEN A/B embayments were carried out during ANT-XXIII/8 in 2006/07; these studies were continued during this expedition.

The expedition ANT-XXVII/3 aimed at investigating the potential effects of climate change on biodiversity and ecosystem functioning in sub and high Antarctic regions. The expedition is part of the international SCAR programme "Biodiversity and Evolution in the Antarctic: The response of life to change" (EBA). Based on data and results obtained during former expeditions (ANT-XV/3, ANT-XVII/3, ANT-XIX/5, ANT-XXI/2, ANT-XXIII/8) in the framework of EASIZ and EVOLANTA, this expedition was focusing on three main topics:

1. Zoogeography und biodiversity in the sub and high Antarctic and the genetic and physiological processes and characteristics determining species distribution.
2. Pelago-benthic coupling processes and the impact of climate change induced environmental alterations on food web structure.
3. Impact of changing shelf ice dynamics on the biodiversity of benthic and demersal fish communities on the shelf.

The studies concentrated on shelf and upper slope communities down to about 600 m water depth. Study areas included the sub Antarctic islands in the Scotia Sea and Bouvet Island, as well as high Antarctic shelf areas in the western and eastern Weddell Sea. In all areas studies on biogeography, genetics, ecology and physiology of zooplankton, benthos and fishes were carried out.

The 3rd leg of the *Polarstern* expedition ANT-XXVII started on the 8th of February 2011 at 20:00 in Punta Arenas, Chile (see Fig. 1.1). Under good weather conditions the ship sailed towards the first sampling location on Burdwood Bank, where scientific work started at the 11th of February. Further stations were located around South Georgia and the South Orkneys. The sampling schedule in the Scotia Sea could be completed successfully and *Polarstern* reached the Dallmann Laboratory at Jubany Station (King George Island) on the 22nd of February. During the day some logistic operations were carried out including personnel exchange (two geophysicists from board / one biologist on board). After two days of field work off King George Island, *Polarstern* steamed through the Antarctic Sound and reached the former Larsen A/B ice shelf areas on February the 26th. Here, on the east Antarctic Peninsula shelf, an extensive sampling programme was processed. Almost all stations that were sampled during a previous expedition in 2006/07 could be resampled. Additionally two new sites at the edge of the Larsen C ice shelf were sampled. During our work in the Larsen embayments we experienced exceptional weather phenomena, namely foen situations with air temperatures of up to +9 °C. During helicopter monitoring flights progressive melting of the residual shelf ice, indicated by large lakes on the ice shelf and water run offs from the ice edge, were observed (Fig. 1.2).

The Larsen C area was characterized by a very poor benthic community. In Larsen B benthic community structure did not differ from what was found during the last visit in 2006. In the area of Larsen A, where the benthic realm is free from shelf ice for longer time, few early successional stages could be identified. On the 13th of March we finished our work at Larsen and *Polarstern* moved towards the eastern part of the Weddell Sea. On the 20th of March we arrived at the BENDEX site in the vicinity of Austasen and another extensive working programme was immediately started. Video observations by ROV and the video-equipped multicorer revealed some signs of first slow recolonisation of the sea floor after the artificial disturbance in 2003, although a rich benthic community is present directly adjacent to the experimental site. As also observed in the Larsen embayments recolonisation of the sea floor seems to be a very long lasting process in high Antarctic waters. On the 26th of March the working programme at the BENDEX site was interrupted for one day in order to supply the Neumayer III station in Atka Bay. Continuing the work from previous expeditions, the edge of the ice shelf between Atka Bay and Kapp Norvegia was surveyed by helicopter GPS. A comparison with data from

1996, 2000 and 2003 showed a highly dynamic ice shelf situation. In some areas the ice shelf decreased between 1996 and 2000, but increased again between 2000 and 2011.

During our work in the eastern Weddell Sea the air temperature declined drastically down to -27 °C (wind chill -53 °C), making the working conditions on deck quite difficult and unpleasant for crew and scientists. The rapid development of fast ice demanded the nautical skills of the ship's guidance. On the 5th of April the work in the eastern Weddell Sea was successfully completed. After one more plankton station at 2,000 m on the 6th of April *Polarstern* headed towards Bouvet Island, where the scientific programme had be reduced to one CTD and two bottom trawls due to stormy weather conditions. A storm with hurricane wind force, approaching the area of Bouvet, forced us to leave the area immediately. On the 18th of April 2011 in the early morning hours the 3rd leg of ANT-XXVII finished with the arrival of *Polarstern* in Cape Town, South Africa.

Abb. 1.2 : Schmelzwasserfall in der Schelfeiskante bei Larsen A

Fig. 1.2 : Shelf ice melt water run-off at Larsen A

(Photo R.Knust)

2. WEATHER CONDITIONS

Michael Knobelsdorf Deutscher Wetterdienst

Polarstern left Punta Arenas on the 8th of February. Until Thursday we moved eastwards through the Straits of Magellan towards the Burdwood Bank under mainly sunny weather conditions within a moderate north-westerly airstream. The wave height was roughly one meter. On Friday the 11th a high moved with us further east with wind blowing at times with 7 Beaufort (Bft.) and a sea getting more and more rough. After calming down temporarily on Sunday we came under the influence of a strong northerly airflow due to a low located to the west of the Falkland Islands and a subtropical high.

From Sunday to Wednesday we operated in the vicinity of South Georgia under a grey sky and poor visibility. On Wednesday, the north-westerly winds freshened up to about 8 Bft. ahead of a cold front approaching; in the night the wind turned to southwest with at times 10 Bft. Until Friday the 18th we went to the South Orkneys with an initial swell of 6 m coming from southwest. During the weekend a powerful storm developed in the Larsen region. The wind increased to 9 Bft. changing the direction from northwest to southwest causing wave heights of 6 m. Later the wind subsided slightly but increased thereafter again and the station work was cancelled.

At the beginning of the 3rd week the weather was often murky with occasional rain showers. Until the middle of the week *Polarstern* operated in the Bransfield Strait under westerly winds up to 9Bft. and a sea state up to 4 m. Under miserable visibility with at times strong wind and snow but low waves we started at the weekend our way to the south into the lee of the Antarctic Peninsula. The sea ice was packed and a helicopter was required to find the best route through the ice. Later we moved between icebergs southwards in bright sunshine. This sunny weather persisted in our lagoon in the Larsen embayments from Sunday to Tuesday. Over the Peninsula mountains ´Foehnwolken´ were building up. Within predominantly northerly winds around 5 Bft. occasionally the wind suddenly increased up to 10 Bft. These katabatic winds fall down from the up to 2,000 m high Peninsula mountain chain, being visible as white cascades in front of the coastline. In the bright sun temperatures at times increased above +10 °C (Fig. 2.1). At midweek a strong low passed through with a strong wind shift to the south resulting in an air temperature drop of 8 °C and a water temperature drop of almost 2 °C. Nevertheless, the sunshine in the region continued until on Saturday the 5th of March the conditions changed to occasional snow with poor visibility and wind at times of 6 Bft. from the south.

On Sunday the 6th of March a storm low (975 hPa) moved across with heavy snow fall. At first easterly winds shifted to the south and increased to 6 to 7 Bft. After a stormy night with occasional 10 Bft. wind strength the wind dropped down again. Around the middle of the week winds appeared weak and visibility was poor due to fog and low clouds and heavy snow fall. On Thursday the 10th of March we returned to Larsen A due to a storm low (968 hPa) building up in Larsen B. This decision prevented *Polarstern* from sticking in the accumulated heavy ice. The storm did not hit us because we were detected by the islands close to the coastal fringe and almost in the eye of the storm; the snowfall subsided. During the weekend we got in touch with the tail of the storm experiencing winds with strength Bft. 7 and temperatures of -30 °C with wind chill. The wind directions during the Larsen studies are shown in Fig. 2.3.

From Sunday 13th to Tuesday 15th of March a weak high pressure system brought us sunny weather with light winds and the expedition continued under the influence of a high pressure ridge across the Weddell Sea to Neumayer Station in the Atka Bay. Until the weekend it was foggy and calm. From Sunday onwards the wind increased again from south-westerly directions up to Bft. 8, however, the sea ice protected us from too high waves. During the day we experienced bright sunshine with south-westerly winds and temperatures around -10 °C, corresponding to -35 °C with wind chill.

During the 7th week we worked in the BENDEX area off Austasen. At the beginning we stayed under a weak high pressure influence with south-westerly winds, later in a north-easterly flow with wind strengths around 4 Bft. From Thursday (24th) onwards a combination of strong north-easterly winds and cold temperatures made work outside on deck rather unpleasant – new sea ice developed rapidly at this time. Due to favourable weather conditions we interrupted our work and sailed on Saturday to Neumayer Station in the Atka Bay. Air temperatures were around -20 °C and on Sunday *Polarstern* returned to the BENDEX area within a moderate south-easterly wind of about Bft. 4. At temperatures around -17 °C with plenty of sunshine new sea ice was forming rapidly around the ship. The 8th week started with some snow, however, afterwards it turned again to sunny conditions. At times we experienced strong southerly winds and on Saturday morning we measured the lowest temperature with -27 °C, corresponding to –53 °C with wind chill. Temperature and wind conditions in the BENDEX area are shown in Figs. 2.2 and 2.4.

After a final station in the BENDEX area we had on our way to Bouvet Island mostly sunny weather but also some snow. The wind blew from the north with strength 6 to 8 Bft. On Friday the wind turned to southwest and the swell increased to almost 5 m coming from the west. On Saturday afternoon (9th of April) *Polarstern* reached Bouvet Island where the wind came from northwest with strength 7 Bft. Some station work started immediately, but the weather forecast predicted strong stormy conditions to follow the next day; hurricane force winds of about 12 Bft with waves up to 15 m were likely. Based on this forecast and increasing winds *Polarstern* left Bouvet already on Saturday evening to go as fast as possible to Cape Town to avoid these stormy conditions. Within a westerly swell of about 5 m we steamed towards Cape Town.

During the last week we were heading through the South Atlantic to Cape Town. Apart from south-westerly winds with strength 7 to 8 Bft. on Tuesday we experienced mainly north-westerly winds of Bft. 8 to 9. These winds were caused by two strong cold fronts associated with rapidly moving gale force lows near the Bouvet region. On Thursday the winds shifted to the west and eased a little. The swell was at times 6 to 7 m coming from the west. On Friday a large subtropical high close to the South African coast set in and accompanied us towards Cape Town. *Polarstern* experienced quite stormy southeast winds on Sunday but reached Cape Town on the 18th of April without having experienced a taste of the feared ´Cape Doctor´.

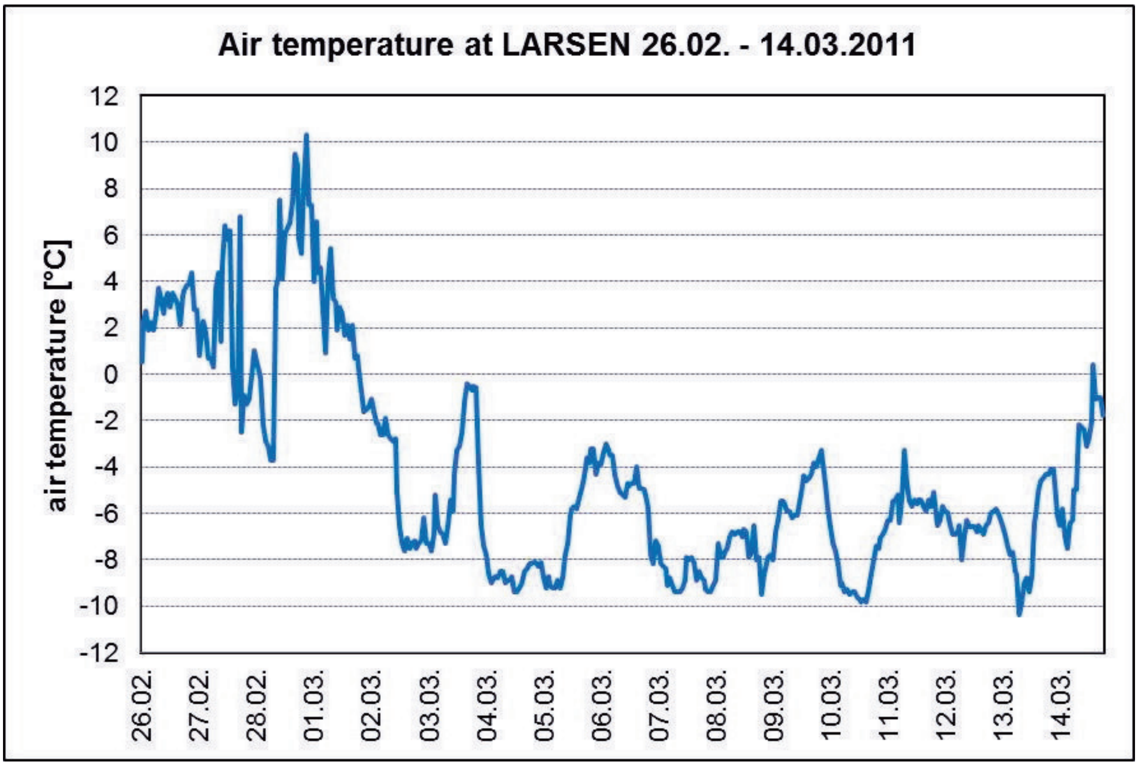

Fig. 2.1: Air temperature in the Larsen A/B/C area 26.02. - 14.03.2011

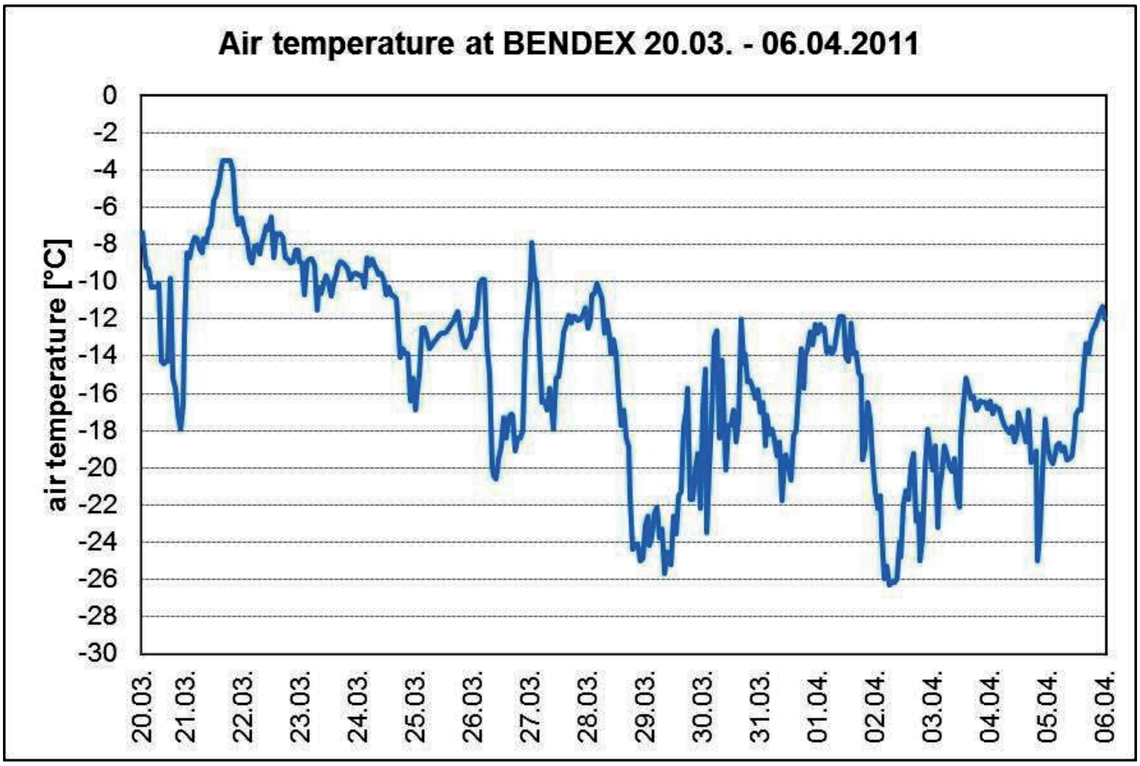

Fig. 2.2: Air temperature in the Bendex area 20.03. - 06.04.2011

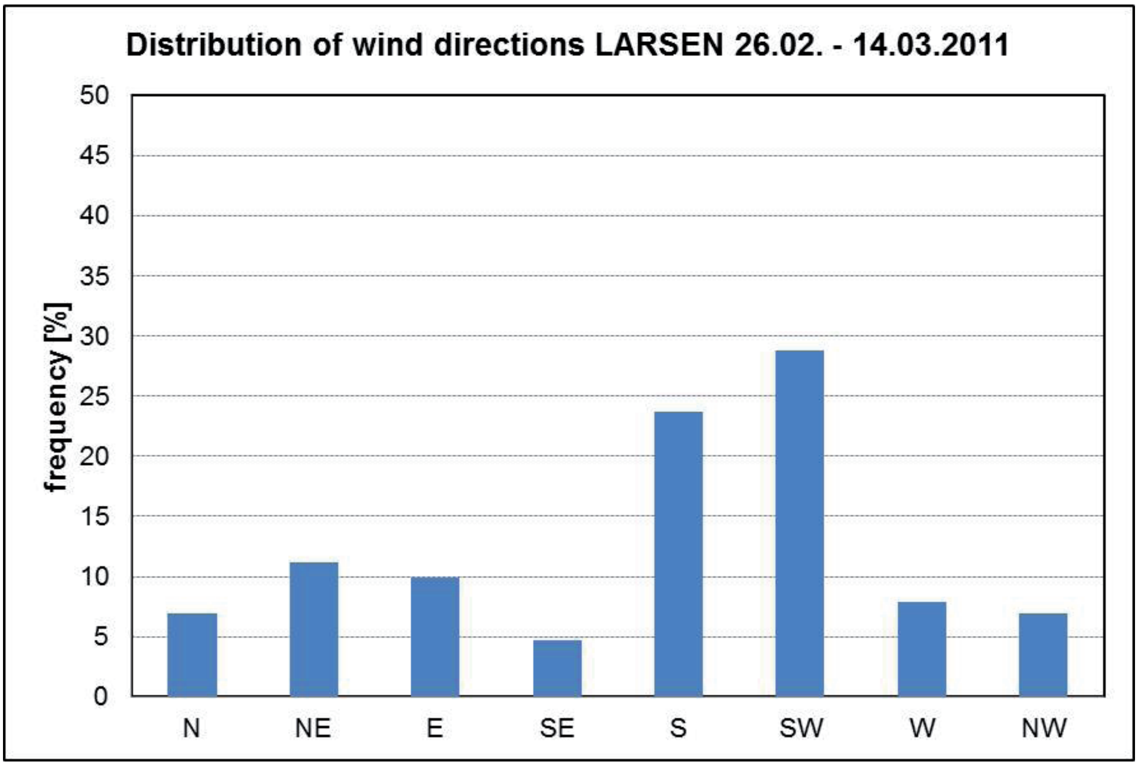

Fig. 2.3: Distribution of wind directions in Larsen A/B/C area 26.02. - 14.03.2011

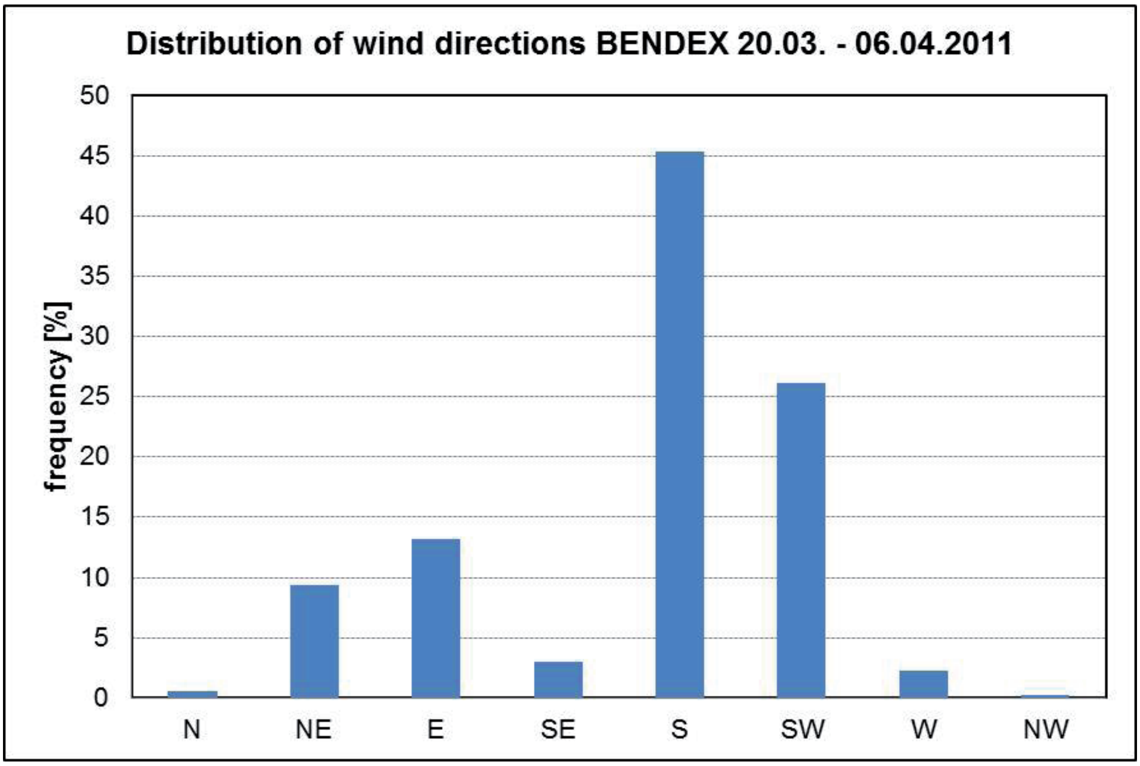

Fig. 2.4: Distribution of wind directions in the Bendex area 20.03. - 06.04.2011

3. SCIENTIFIC PROGRAMMES

3.1 Biodiversity, biogeography, phylogeography and phylogenetics in a latitudinal cline

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The benthos of the Southern Ocean is remarkably rich (Clarke & Johnston 2003). It is characterised by high levels of endemism and radiations of groups that have adapted over time to the various niches available in the cold conditions. The processes underlying the evolution of this diversity and endemism are primarily large-scale tectonic, oceanographic and climatic changes, including the break-up of Gondwana, the establishment of an ocean gate between Tasmania and Antarctica and the opening of the Drake Passage. Coriolis force promoted the Antarctic Circumpolar Current (ACC), which contributed to the thermal isolation of the Antarctic continent (Barker et al. 2007, DeConto & Pollard 2003). The ACC continues to be a significant feature, which may act as a barrier to species with low temperature change tolerance, or due to turbulence and eddies, promote dispersal of other more temperature tolerant species (Thatje & Fuentes 2003, Aronson et al. 2007). The glacial (Milankovich) cycles of the Quaternary are also likely to have had a profound effect on the distribution and evolution of the benthic fauna (Clarke 1996). The Antarctic benthos is thought to have originated from three main sources: a relic Gondwanan fauna that has evolved over millions of years, migrants from the deep sea, and migrants from the Magellanic region of South America via the Scotia Arc (Clarke & Crame 1989).

Biogeographic studies have identified provinces corresponding, a.o., to the east and west Antarctic, the Subantarctic and the Magellanic (Hedgpeth 1969 who suggested, however, that more data would probably rule out the existence of two separate Antarctic provinces). Dell (1972) united them into a single province. German biogeographic research in the southeastern Weddell Sea started in the beginning of the 1980s, when *Polarstern* enabled access to and work in the packice zone. On several international cruises starting with EPOS (Hempel 1992) and lateron, under the umbrella of the EASIZ and IBMANT projects (Arntz & Clarke 2002, Clarke et al. 2006, Arntz & Ríos 1999, Arntz et al. 2005), hundreds of German and foreign specialists sampled large amounts of benthic material, which created the basis for a better knowledge of the high Antarctic fauna of the Weddell Sea as well as the Antarctic Peninsula, the Scotia Arc, the Magellan region, Bouvet Island and, finally, the area formerly covered by the Larsen ice shelf (Gutt et al. 2011). An extension to the polar deep sea, which was virtually unknown, were the ANDEEP cruises, which were also carried out in international cooperation (Brandt et al. 2007). More recently, Griffiths et al. (2009) examined data of several groups from the SCAR MarBIN database to reappraise the state of Antarctic biogeography. With this large dataset they found a Magellanic, Kerguelenian and Antarctic province, but also a South Georgian element that may be a mix of Magellanic and Antarctic elements. They stated a strong, long-term influence of the ACC demonstrated by a gradual reduction in the prevalence of the Magellanic elements with increasing distance east from South America. This was also a major result of the LAMPOS and BENDEX cruises, the latter including research at Bouvet Island (Arntz et al. 2006).

The international *Polarstern* cruises mentioned here included biogeographic work on Antarctic fish. The different provinces are also reflected in the composition of demersal fish communities (Kock 1985, Schröder et al. 1999, 2001, Knust et al. 2001). Among the Subantarctic Islands, in particular between South Georgia, the South Sandwich and South Orkney Islands and Bouvet, a close faunal connection seems to exist (Hureau 1994, Mintenbeck et al. 2003, 2005).

There are several factors that compromise biogeographic studies. Despite increased efforts, spatial sampling is far from thorough, with much of the material taken from the Scotia Sea, Weddell Sea, Ross Sea, and Bellingshausen Sea but with large gaps in the east Antarctic region and only a single expedition to the Amundsen Sea. Even within the frequently visited seas, sampling is patchy. Sampling depths are also biased to the shelf and upper slope as they yield larger catches in a shorter time compared with the time-consuming deeper trawls. Taxonomic issues also confound biogeographic studies. Many groups still have complex systematics where molecular phylogenies conflict with current taxonomy, resulting in familial or generic groups that are unequally weighted (Havermans et al. 2010). Misidentifications, synonyms and in many cases lack of taxonomic expertise also inhibit biogeographic studies.

The introduction of molecular techniques has, to a certain extent, begun to address the taxonomic and systematic issues. Furthermore the information content in DNA sequence data, and fast evolving markers such as microsatellites, is greater than simply identifying conspecifics and evolutionary relationships. Molecular dating of divergences, ancestral state reconstruction and demographic parameters such as population size over time and migration rates both contemporary and historical can be estimated given enough molecular characters and computational power.

Over the past 15 years molecular work in the Antarctic has begun to address some of the issues related to origins and maintenance of the fauna. Molecular dating of gastropod diversification around 40 – 73 Ma lends support for the scenario of vicariance after Gondwanan fragmentation (Williams et al. 2003). The radiation of notothenioid fish in Antarctic waters has been dated at 17 – 32 Ma, corresponding to the cooling of the waters around the continent. Other radiations suggested to be the result of Southern Ocean isolation include crustaceans, octopods (Strugnell et al.

2008) and pycnogonids (Arango & Wheeler 2007). Support for recent connectivity between the Magellanic region and the Antarctic Peninsula comes from studies of the brittle star *Astrotoma agassizi* which has a date estimate of divergence across Drake Passage of around 2.4 Ma (Hunter & Halanych 2008), and the genus *Nacella* which appears to have had connectivity between these regions between 6 and 15 Ma (González-Wevar et al. 2010).

Phylogeographic studies are beginning to illuminate the spatial genetic structure of benthic organisms in much greater detail than biogeographic studies of the past. For example, a study into the bivalve *Lissarca notorcadensis* found that each location sampled throughout the Scotia Sea had its own unique genetic lineages, and these were so different from the samples from the Ross and Weddell Sea as to suggest cryptic speciation (Linse et al. 2007). Indeed, unrecognised species appear to be a common feature in most groups studied (Brandão et al. 2010; Havermans et al. 2011; Janosik & Halanych 2010; Held 2003; Held & Wägele 2005; Krabbe et al. 2010).

The objectives of this part of the cruise were to sample a range of benthic taxa using Agassiz trawl (AGT), bottom trawl (BT), Rauschert dredge (RD), multibox corer (MG) and multi corer (MUC) from regions of the Scotia Sea, Bransfield Strait, Larsen A, B and C, the BENDEX area of the eastern Weddell Sea and from around Bouvet Island. One approach that includes the entire benthic catch on a high taxonomic level is the visual check on deck, which was initiated on the EPOS cruise in 1989. Another approach is the collection of all specimens of certain higher taxa for taxonomic and genetic studies. Individuals from each higher taxon will be identified by the relevant expert taxonomist and data submitted to SCAR MarBIN database. Where funding is available molecular studies will be conducted on various groups. The data collected will improve our knowledge of taxonomy and systematics, spatial distributions and the processes that influence the origins and maintenance of the Southern Ocean fauna.

3.1.1 Macrobenthos: Visual check of bottom trawl and AGT catches on deck

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Objectives

The biogeographic comparison of macrobenthic communities based on rough visual estimates of the relative significance of major taxa in the catches of trawled gear (AGT, BT) was continued during the cruise. The idea is to find out which groups dominate in different areas on a latitudinal gradient from the Magellan region via the sub Antarctic to the high Antarctic Weddell Sea shelf and slope. These data, which are an easily accessible by-product of trawling, which in the first instance serves the needs of specialists working on individual taxa or those that require large amounts of material, have been taken from the eastern Weddell Sea since the EPOS I/3 cruise in 1989 (Arntz et al. 1990) and from other Antarctic, sub Antarctic and Magellan areas since the mid-1990s.

The data resulting from this comparison also serve as background information for studies on biodiversity and as a further approach within our attempt to explore Antarctic and sub Antarctic benthic communities with a variety of gears, ranging from imaging methods via quantitative corers to trawls and dredges.

Work at sea

To determine relative abundance of major taxonomic groups, the AGT and BT catches were subjected to a visual check by several experienced marine biologists who then agreed on a classification within a simple four-point scheme:

o	absent
-	scarce
+	regular appearance to fairly common
++	very common, dominant

The bottom trawl (BT) used was a 130 ft trawl with a herring codend (10 mm mesh). In most Agassiz trawl catches we used an AGT of 3 m width and 10 mm meshes in the codend, only in AGT 10 - 12, 17, 18 a smaller AGT (1.5 m width) was used, however with the same mesh. All nets keep back much smaller organisms than would correspond to their meshes when large amounts of sponges, bryozoans or spicule mats are caught. The data from the Scotia Arc (Burdwood Bank to South Georgia) were derived from 6 AGT (266 - 403 m depth) and 10 BT (273 - 473 m depth), which were checked on deck and appear in the list (Annex A4). AGT No. 6 (net torn) from the South Orkneys contained no catch. In the Larsen area 10 AGT (172 - 573 m depth) and 5 BT (298 - 448 m depth) were used for the check (Annex A4). AGT 10 - 15 and 17, and BT 13 - 15 yielded minimal benthic catches of <10 kg fauna, with a record in AGT 11 (Larsen B West) where 7 individuals were found in 500 kg mud. In AGT 16 the net was badly torn and the catch not considered. Near Austasen the BENDEX experimental field was not trawled. Outside 3 AGT (~250 m) and 7 BT catches (~260 m) were taken and used for the check (Annex A4). At Bouvet Island, only two hauls were taken with the bottom trawl (271, 288 m) and will be included in the comparison.

Preliminary results

Full information on the relative significance of the 38 major taxa considered is given in the Annex. Fish are not included in the analysis because they are not part of the benthic fauna (for fishes in these catches, see section 3.1.11). The remaining 37 taxa differ strongly in their frequency of appearance; e.g., stomatopods were not found at all, priapulids only twice, cumaceans three times, whereas ophiuroids were captured in all AGT catches and all except two BT catches. Some taxa exhibit a regional distribution; e.g., reptant decapods were caught only from Burdwood Bank and Shag Rocks, pterobranchs only from the Austasen area. All these data will be added to the existent data pool, subjected to cluster analysis and used for the biogeographic comparisons mentioned above. An evaluation of the frequency of taxa in the four categories and different areas of study (Table 3.1.1) shows the highest frequency of missing taxa („0") in the Larsen and the lowest figure in the

Austasen area. For the dominant (++) and common (+) categories the data show the reverse. This analysis could be refined by distinguishing different stations of the Scotia Arc and the Larsen area. Dominant taxa on the Scotia Arc were sponges, gorgonians, bryozoans and ophiuroids in the AGT, and – only on Burdwood Bank - hydrocorals and gorgonians in the BT catches. Quite a varied group of species is of common appearance in both the AGT and BT catches on the Scotia Arc, including various cnidarian taxa, all echinoderm taxa, sponges and some arthropod taxa. In Larsen A, sponges, echinoids and ophiuroids were dominant in both types of gear, and there were no dominant taxa in Larsen B and C. Common taxa in Larsen A included sponges, shrimps, ophiuroids, and several rare taxa, in Larsen B and C it was ophiuroids, holothurians, hydroids and pennatularians. In the Austasen area, sponges were dominant in almost all catches, gorgonians in most, asteroids in 3 catches, holothurians and crinoids each in one catch. Common taxa included sponges, hydrozoans, bryozoans, gorgonians, pterobranchs, ophiuroids and ascidians in the AGT, and in addition to these, sedentary polychaetes, asteroids and crinoids in the BT.

Tab. 3.1.1: Summary of dominance across the major sampling regions: Frequency of the respective category summed up for a region and divided by the number of hauls. Example: The "dominant" category was found only twice in four hauls of the Burdwood/Shag Rock region, thus the frequency is 0.5.

GSN/area	dominant	common	few	zero
Burdwood/Shag	0.5	4	13	19.5
Scotia Arc	0	0.5	9.7	26.8
together	0.2	1.9	11	23.5
Larsen	0.6	1.2	9.6	**25.6**
BENDEX	1.9	3.4	17.3	**13**

AGT/area	dominant	common	few	zero
Burdwood/Shag	2	2.7	15.7	13.3
Scotia Arc	0.3	4	16	16.7
together	1.1	3.3	15.8	15
Larsen	0.6	1.9	12.9	**21.6**
BENDEX	1.3	3	20.3	**12.3**

Tab. 3.1.2: Detailed results for bottom trawls

ANT-XXVII/3			PS77/208-2	PS77/208-3	PS77/211-7	PS77/211-8	PS77/214-1	PS77/214-2	PS77/217-6	PS77/218-2	PS77/222-6	PS77/222-7	PS77/228-3	PS77/231-3
Gear			GSN1	GSN2	GSN3	GSN4	GSN5	GSN6	GSN7	GSN8	GSN9	GSN10	GSN11	GSN12
Average depth (m)			282	288	306	306	273	273	353	334	473	464	298	334
Porifera			+	+	+	-	-	-	-	0	-	0	+	++
Cnidaria														
	Hydroidea		++	+	-	-	0	0	0	0	0	0	0	0
	Actiniaria		-	-	0	-	-	-	-	0	-	-	-	-
	Gorgonaria		++	-	-	+	-	-	-	-	0	0	0	0
	Pennatularia		0	0	0	0	0	0	-	-	0	0	0	0
	Scleractinia		+	+	0	0	0	0	-	0	0	0	0	0
Nemertini			-	-	0	0	0	0	0	0	0	0	0	0
Mollusca														
	Bivalvia		-	-	0	0	0	0	-	0	0	0	-	0
	Aplacophora		-	0	0	0	0	0	0	0	0	0	0	0
	Gastropoda													
		Prosobranchia	-	-	0	0	0	0	-	0	0	0	0	-
		Opisthobranchia	-	-	-	0	0	0	-	0	0	0	-	0
	Polyplacophora		0	0	0	0	0	0	0	0	0	0	0	0
	Cephalopoda / Octopoda		+	0	-	0	0	-	0	-	-	0	0	0
	Scaphopoda		0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta														
	Sedentaria		0	-	0	0	0	0	0	0	-	0	-	0
	Errantia		-	-	-	-	-	-	-	0	-	-	-	-
Priapulida			0	0	0	0	0	0	0	0	0	0	0	0
Sipunculida			0	0	0	0	0	0	0	0	0	0	0	0
Echiurida			0	0	0	0	-	0	0	0	0	0	0	0
Crustacea														
	Cirripedia		-	0	0	0	0	0	0	0	0	0	0	-
	Amphipoda		-	-	-	0	0	0	-	0	-	0	-	-
	Isopoda		-	-	-	-	0	0	-	-	0	0	0	0
	Cumacea		0	0	0	0	0	0	0	0	0	0	0	0
	Mysidacea		0	0	0	0	0	0	-	0	-	-	-	-
	Stomatopoda		0	0	0	0	0	0	0	0	0	0	0	0
	Decapoda													
		Natantia	0	0	0	0	-	+	-	-	0	-	+	+
		Reptantia	+	-	0	0	0	0	0	0	0	0	0	0
Pantopoda			-	-	-	0	0	0	0	0	-	0	0	0
Bryozoa			+	-	0	0	0	0	-	0	0	0	-	-
Brachiopoda			-	0	0	0	0	0	0	0	0	0	-	-
Pterobranchia			0	0	0	0	0	0	0	0	0	0	0	0
Echinodermata														
	Ophiuroidea		+	+	-	+	+	-	0	0	-	-	-	+
	Asteroidea		-	-	-	-	-	0	-	-	-	0	-	-
	Echinoidea		+	-	+	+	-	+	-	0	-	0	++	++
	Crinoidea		-	0	-	0	0	0	0	0	-	-	-	-
	Holothuroidea		-	-	0	0	0	0	-	-	0	0	-	-
Ascidiacea			-	-	-	-	0	0	-	0	-	0	0	0
Pisces			++	++	++	++	++	++	++	++	+	+	-	-

ANT-XXVII/3			PS77/235-8	PS77/237-2	PS77/237-3	PS77/281-1	PS77/286-1	PS77/291-1	PS77/292-2	PS77/300-1	PS77/301-1	PS77/308-1	PS77/312-2	PS77/312-4
Gear			GSN13	GSN14	GSN15	GSN16	GSN17	GSN18	GSN19	GSN20	GSN21	GSN22	GSN23	GSN24
Average depth (m)			448	371	388	284	248	291	262	276	249	245	271	288
Porifera			-	-	-	++	++	++	+	++	++	++	+	-
Cnidaria														
	Hydroidea		0	0	0	0	-	-	-	-	-	0	0	-
	Actiniaria		0	-	0	-	-	-	-	-	-	-	-	0
	Gorgonaria		0	0	0	-	++	+	+	++	++	+	-	-
	Pennatularia		0	+	-	-	-	-	0	-	-	-	0	-
	Scleractinia		0	0	0	0	0	0	0	0	0	0	0	0
Nemertini			0	0	0	-	-	-	0	0	-	-	0	0
Mollusca														
	Bivalvia		0	0	0	-	-	0	0	0	-	0	0	-
	Aplacophora		0	0	0	0	-	0	0	0	0	-	0	0
	Gastropoda													
		Prosobranchia	0	0	0	-	-	-	-	-	0	-	0	-
		Opisthobranchia	0	0	0	-	-	-	-	-	-	-	-	-
	Polyplacophora		0	0	0	0	-	0	0	-	-	-	0	0
	Cephalopoda / Octopoda		0	0	0	0	0	0	-	0	-	-	0	0
	Scaphopoda		0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta														
	Sedentaria		0	0	0	+	-	-	-	-	+	-	-	-
	Errantia		-	0	0	-	-	-	-	-	-	-	-	-
Priapulida			0	0	0	0	-	0	0	0	0	0	0	0
Sipunculida			0	0	0	0	-	0	0	0	0	0	0	0
Echiurida			0	0	0	0	0	0	0	0	0	0	0	0
Crustacea														
	Cirripedia		0	0	0	0	0	0	0	0	0	0	0	0
	Amphipoda		0	0	-	-	-	-	-	-	-	-	0	0
	Isopoda		0	0	0	-	-	-	-	-	-	-	0	-
	Cumacea		0	0	0	0	-	0	0	0	0	0	0	0
	Mysidacea		-	0	-	-	-	0	0	0	0	-	0	0
	Stomatopoda		0	0	0	0	0	0	0	0	0	0	0	0
	Decapoda													
		Natantia	-	-	-	-	-	-	-	-	-	-	0	0
		Reptantia	0	0	0	0	0	0	0	0	0	0	0	0
Pantopoda			0	0	0	-	-	-	-	-	-	-	-	-
Bryozoa			0	0	0	-	-	-	-	-	-	-	-	+
Brachiopoda			0	0	0	-	-	0	0	0	0	0	0	0
Pterobranchia			0	0	0	-	+	+	-	+	+	+	-	0
Echinodermata														
	Ophiuroidea		-	-	-	-	-	-	-	-	-	-	+	-
	Asteroidea		-	-	-	+	++	++	+	++	+	+	-	-
	Echinoidea		-	0	0	-	-	-	-	-	-	-	0	0
	Crinoidea		-	-	0	+	+	+	+	-	+	+	-	-
	Holothuroidea		+	-	-	-	-	-	-	+	++	+	-	-
Ascidiacea			0	-	0	-	-	-	-	-	+	-	0	-
Pisces			-	-	-	+	-	-	-	+	+	+	+	+

Tab. 3.1.3: Detailed results for AGT catches

ANT-XXVII/3			PS77/208-5	PS77/211-5	PS77/211-6	77/214-5	77/217-5	77/218-3	77/222-5	77/226-7	PS77/228-4	PS77/233-3	PS77/235-3
Gear			AGT1	AGT2	AGT3	AGT4	AGT5	AGT6	AGT7	AGT8	AGT9	AGT10	AGT11
Average depth (m)			291	323	287	266	403	325	450	228	314	314	295
Porifera			++	-	++	+	-		-	++	+	0	0
Cnidaria													
	Hydroidea		+	-	-	-	0	Net torn	0	-	0	0	0
	Actiniaria		-	0	0	+	-		+	-	-	0	0
	Gorgonaria		+	++	++	-	-	No catch	0	-	0	0	0
	Pennatularia		0	0	0	0	0		0	0	0	0	0
	Scleractinia		-	0	-	0	0		0	-	0	0	0
Nemertini			-	0	0	0	0		-	-	-	0	0
Mollusca													
	Bivalvia		-	0	-	-	-		-	0	-	0	0
	Aplacophora		0	0	0	0	0		0	0	0	0	0
	Gastropoda												
		Prosobranchia	-	0	-	-	-		-	-	-	0	0
		Opisthobranchia	-	-	0	0	0		0	-	-	0	0
	Polyplacophora		0	-	0	0	0		0	0	0	0	0
	Cephalopoda / Octopoda		-	0	-	-	-		-	0	0	0	0
	Scaphopoda		0	0	0	0	-		-	0	-	0	0
Polychaeta													
	Sedentaria		0	0	-	-	-		-	-	-	-	-
	Errantia		-	-	-	+	-		-	-	+	-	0
Priapulida			0	0	0	0	0		0	0	0	0	-
Sipunculida			-	0	0	-	0		0	0	-	-	-
Echiurida			-	0	0	0	0		-	0	0	0	0
Crustacea													
	Cirripedia		0	-	-	0	0		0	0	0	0	0
	Amphipoda		-	0	-	0	-		-	-	-	-	0
	Isopoda		-	0	-	-	-		-	-	-	-	0
	Cumacea		0	0	0	0	0		0	0	0	0	0
	Mysidacea		0	0	-	+	-		0	0	-	-	0
	Stomatopoda		0	0	0	0	0		0	0	0	0	0
	Decapoda												
		Natantia	0	0	0	+	-		0	-	+	-	0
		Reptantia	+	0	-	0	0		0	0	0	0	0
Pantopoda			-	-	-	-	-		+	-	-	-	0
Bryozoa			-	-	++	-	-		-	-	-	-	0
Brachiopoda			-	-	-	0	-		0	-	+	0	0
Pterobranchia			0	0	0	0	0		0	0	0	0	0
Echinodermata													
	Ophiuroidea		+	+	++	+	-		++	-	++	+	-
	Asteroidea		-	-	-	+	-		-	-	-	-	0
	Echinoidea		+	-	+	+	-		+	++	++	-	0
	Crinoidea		-	-	-	0	-		+	-	-	-	0
	Holothuroidea		+	0	0	-	-		-	-	-	-	0
Ascidiacea			-	0	-	0	-		-	+	0	-	0
Pisces			-	-	-	-	-		-	-	-	-	0

ANT-XXVII/3			PS77/235-3	PS77/239-3	PS77/248-2	PS77/248-3	PS77/250-6	PS77/252-3	PS77/252-7	PS77/257-2	PS77/260-6	PS77/265-2	PS77/275-3
Gear			AGT11	AGT12	AGT13	AGT14	AGT15	AGT16	AGT17	AGT18	AGT19	AGT20	AGT 21
Average depth (m)			295	361	205	429	573	313	333	172	255	ca.500	225
Porifera			0	-	-	-	-	0	0	++	+	++	++
Cnidaria													
	Hydroidea		0	0	+	-		0	0	-	+	-	-
	Actiniaria		0	-	-	0		0	0	-	-	-	-
	Gorgonaria		0	-	-	-	Net torn,	0	0	+	+	++	-
	Pennatularia		0	0	0	-		0	0	0	0	-	0
	Scleractinia		0	0	-	0	almost	0	0	-	-	-	0
Nemertini			0	-	-	0		0	-	-	0	0	-
Mollusca							no catch						
	Bivalvia		0	-	0	0		0	+	-	-	-	-
	Aplacophora		0	0	0	0		0	0	0	0	0	0
	Gastropoda												
		Prosobranchia	0	-	-	0		0	0	-	-	-	-
		Opisthobranchia	0	0	0	0		0	0	0	0	0	0
	Polyplacophora		0	0	0	0		0	0	0	-	0	-
	Cephalopoda / Octopoda		0	-	0	0		0	0	0	-	-	-
	Scaphopoda		0	0	0	+		0	-	0	0	0	0
Polychaeta													
	Sedentaria		-	-	-	0		0	-	-	-	-	-
	Errantia		0	-	-	0	-	-	-	-	-	-	-
Priapulida			-	0	0	0		0	0	0	0	0	0
Sipunculida			-	0	0	0		0	0	-	-	0	0
Echiurida			0	-	0	0	-	-	+	-	0	-	0
Crustacea													
	Cirripedia		0	0	0	0		0	0	0	0	-	0
	Amphipoda		0	-	-	-		0	0	-	-	-	-
	Isopoda		0	-	-	-		0	0	-	-	-	-
	Cumacea		0	0	0	0		0	0	0	0	-	-
	Mysidacea		0	0	0	-		0	0	0	0	0	0
	Stomatopoda		0	0	0	0		0	0	0	0	0	0
	Decapoda												
		Natantia	0	-	0	+	-	0	-	0	-	0	0
		Reptantia	0	0	0	0		0	0	0	0	0	0
Pantopoda			0	-	-	-		0	0	-	+	-	-
Bryozoa			0	0	-	0	-	-	0	-	-	+	-
Brachiopoda			0	0	-	-	-	0	0	-	-	-	-
Pterobranchia			0	0	0	0		0	0	0	0	+	-
Echinodermata													
	Ophiuroidea		-	+	+	-	-	-	-	+	-	+	-
	Asteroidea		0	-	-	-	-	0	0	-	-	-	-
	Echinoidea		0	0	0	0	-	-	0	++	-	-	-
	Crinoidea		0	-	-	-		0	0	-	-	++	-
	Holothuroidea		0	+	-	-	-	-	-	-	+	-	-
Ascidiacea			0	0	0	0		-	-	+	-	-	+
Pisces			0	-	-	-	-	0	-	++	-	-	-

3.1.2 Relative importance of environmental and dispersal-related processes in structuring meiofauna communities in the Southern Ocean

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Objectives

It is believed that both local environmental factors and dispersion ability play key roles in structuring communities and defining geographic/spatial ranges of organisms (referred to as the 'metacommunity concept', Wilson 1992; Leibold et al. 2004). The main aim of this research is to identify and understand the factors (environmental or dispersal-related) that explain the distribution patterns and biodiversity of Southern Ocean meiofauna. Furthermore, we are interested in the relative importance of both sets of explanatory variables in determining community structure. The prevailing hypotheses are that for large distances the legacy of historical separation may transcend any effect of environmental factors on community structure and biodiversity, whereas at intermediate spatial scales the effect of both historical contingencies and contemporary ecological factors probably shape biodiversity and distribution patterns. At small scales, distance effects would be negligible on community variations. In short, the relative importance of dispersal-related processes becomes more prevalent at larger geographical scales. The validity and generality of these hypotheses for marine benthic organisms remains largely unknown and will be investigated here on free-living marine nematodes and Harpacticoid copepods from the Southern Ocean.

Work at sea

During the ANT-XXVII/3 expedition, samples had been collected with the multicorer (MUC6) at different spatial scales (cm – 1,000 km) in the Southern Ocean for community analysis, including meiofauna (nematodes/copepods) species distribution and biodiversity patterns. Additionally, samples were collected to quantify relevant habitat characteristics (environmental factors) that play a role in either local or regional control of community dynamics. Finally, a number of samples were collected for population genetic analysis on some dominant nematode species present at different spatial scales to identify the distribution and connectivity between populations. Next to the MUC samples, a colonisation experiment was set up during the expedition to test selectivity of meiofauna/nematodes for certain habitats when settling down from the water column, thereby characterising habitat preference.

In total, 12 hauls of the MUC6 were used for this project at 8 different locations (see Table 3.1.4). Each time the same depth range (between 240 and 450 m) was sampled to rule out depth as a factor. From each haul, two or three cores were used (at the first Larsen A South station we could only recover one core) and samples were collected at scales of cm (subsamples within a core), m (cores from the same MUC deployment), 10 to 100 m (samples from different MUC deployments at the same station) and between 10 to 1,000 km (different stations), because spatial scale has been proven to be an important determinant in structuring meiofauna communities. For every core we divided the upper 5 cm of sediment in two slices (0 - 3 and 3 - 5 cm) and each slice was subsequently divided into 6 parts with a pie-shaped metal piece for the smallest scale sampling. Of these 6 pieces, three were stored in 4 - 7 % formalin for community analysis (meiofauna identification and abundance), one was kept in ethanol for population genetics and two were kept frozen (-20 °C) for abiotic factors, such as grain size, pigment concentration (as a measure of primary production input) and organic C/N content. At each station, bottom temperatures (CTD), geographic position (to calculate distances between habitats) and depth were recorded as well.

All organisms sampled quantitatively with the MUC6 will be sorted and counted on major taxa 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 and Harpacticoid copepods will be identified to species level at DZMB.

Preliminary results

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

Tab. 3.1.4: MUC6 stations worked up during ANT-XXVII/3 for small-scale analysis of meiofauna communities. SG NE=South Georgia North-East, SO=South Orkneys, KG MB=King George Maxwell Bay

Station No.	Position Lat	Position Long	Date	Cores	Depth (m)	Area
214-3	54°25,61'S	35°41,79'W	16.02.2011	4,9,12	264,5	SG NE
214-4	54°25,62'S	35°41,86'W	16.02.2011	4,9,12	265,2	SG NE
217-3	61°8,66'S	43°58,00'W	19.02.2011	4,9,12	401,7	SO
222-3	62°13,28'S	58°50,95'W	23.02.2011	4,9,12	244,2	KG MB
226-10	64°56,01'S	60°38,61'W	26.02.2011	4,9,12	242,0	Larsen A_South
231-5	64°56,16'S	60°38,66'W	28.02.2011	9	246,7	Larsen A_South
233-4	65°32,99'S	61°36,94'W	01.03.2011	2,9,12	294,2	Larsen B_West
235-4	65°32,96'S	61°36,88'W	02.03.2011	4,9,12	286,0	Larsen B_West
246-3	65°54,95'S	60°20,43'W	06.03.2011	4,9,12	432,2	Larsen B_South
247-3	65°55,12'S	60°19,83'W	07.03.2011	7,9,12	435,2	Larsen B_South
265-3	70°48,38'S	10°39,72'W	22.03.2011	5,10	450,7	Austasen
274-2	70°56,35'S	10°34,00'W	25.03.2011	4,9,12	331,2	Bendex Ref.

3.1.3 Systematics, phylogenomics and comparative phylogeography of Southern Ocean benthos

Chester Sands British Antarctic Survey

Objectives

Understanding the origins of the Southern Ocean benthos requires reconstruction of the evolution of the elements involved and information regarding the processes that underly the spatial distribution of the elements. Phylogenomic and phylogeographic techniques are rapidly improving and have the power to elucidate timing, order and location of significant events in the evolution of lineages and clades. Using phylogeographic techniques it is also possible to reconstruct historical demographic scenarios. Comparative phylogeography (analysis of geographic patterns of genetic lineages across multiple co-distributed species) has the ability to tease out historical processes acting on lineages, populations and species, from organism specific processes. Phylogenomic and phylogeographic analyses rely on sufficient taxon and spatial sampling – a challenge for any benthic study and doubly so for the remote Southern Ocean.

Work at sea

We conducted a total of 21 AGTs, 24 BTs and 4 RDs. Samples were sorted to class, given uniquely identifying labels and stored in 100 % ethanol (maximum ratio ethanol to animal volume 5:1) at -1 °C. After 3 – 5 days the ethanol was drained from the specimens and the specimens were further stored in barrels containing 100 % ethanol.

Preliminary results

I collected all ophiuroids, asteroids, bivalves, gastropods, scaphopods, poly-placophorans, aplacophorans and pycnogonids from each trawl (see Table 3.1.5 for details). These collections will add spatial resolution to my previous collections from the Scotia Sea (BIOPEARL 1, 2006 RRS *James Clark Ross*), Amundsen Sea (BIOPEARL 2, 2008 RRS *James Clark Ross*) and Marguarite Bay, Bellingshausen Sea (BASWAP, 2009 RRS *James Clark Ross*). Material from this cruise will be identified by the relevant taxonomic authority. Data will be submitted to SCAR MarBIN database. All ophiuroids will be identified by Rafael Martin Ledo (Sevilla, Spain). DNA barcoding is being provided by CAML/BoLD (Guelph, Canada). Replicate DNA samples will be enriched for genes following the procedure developed in my laboratory at BAS. Sequencing of enriched libraries from each individual will be conducted on a Roche 454 GFLX titanimum and data will be used for phylogenomic / systematic studies as well as phylogeographic and population studies of conspecifics.

Tab 3.1.5: Collections from trawls for further biogeographic, systematic and genomic studies.

Region	Station	Gear	Echinodermata			Mollusca					Pycnogonida
			Asteroidea	Crinoidea	Ophiuroidea	Aplacophora	Bivalvia	Gastropoda	Polyplacophora	Scaphopoda	
Burdwood Bank	208-2	BT	8	4	>100		5	5			3
	208-3	BT	3		38		9	4			1
	208-5	AGT	12	15	>200			8			16
Shag Rocks	211-5	AGT	7	5	110		13	7			16
	211-6	AGT	15	20	>500		20	3			11
	211-7	BT	5		25		10				
	211-8	BT	6	2	25						
South Georgia	214-1	BT									
	214-2	BT			10						
	214-5	AGT	10		>100		17	7			12
South Orkney	217-5	AGT	2	1	26		7	15		50	2
	217-6	BT	8		8			1			1
	218-2	BT	1								
	218-3	AGT	2		10		8			5	
King George Island	222-5	AGT	2	11	>100		11	2		10	>200
	222-6	BT	1	2	5						25
	222-7	BT			5		4				2
Larson A south	226-7	AGT	10	20	>100			2			20
	228-3	BT	3		20						1
	228-4	AGT	13	4	>100						
	231-3	BT	3		10						
Larson B west	233-3	AGT									
	235-3	AGT			3						
	235-8	BT	2	1	4						
Larson C	237-2	BT	5	1	4						
	237-3	BT	2	1	4						
	239-3	AGT	7		30		12			3	
Larson B south	248-2	AGT	5	15	30						4
	248-3	AGT	6	2	10					5	4
Larson B seep	250-6	AGT	2		10						
Larson A north	252-3	AGT			2						
	252-7	AGT			6		20			20	
Larson A south	257-2	AGT	15	31	55		4	17			20
BENDEX area	260-6	AGT	6	10	28		4	9	2		22
	265-2	AGT	34	20	>500		10	20		2	5
	275-3	AGT	4	2	50		2	20	1		1
	280-2	RD	1	2	20		9	3			5
	281-1	BT	12	10	30		1	30			9
	284-1	RD			16						1
	286-1	BT	10	30	50	1	2	4	4		20
	291-1	BT	15	30	20			4			20
	292-2	BT	5		11						6
	300-1	BT	6		4			3	1		7
	301-1	BT	10	30	31			1	3		15
	308-1	BT	26	30	33	1		3	1		14
Bouvet	312-2	BT	9	1	33			2			1
	312-3	RD	1		60						
	312-4	BT	10	1	17		1	2			1

3.1.4 Diversity of Weddell Sea Porifera and their role in the benthic communities

Dorte Janussen — Forschungsinstitut und Naturmuseum Senckenberg

Objectives

Porifera (sponges) are ecologically important by structuring the sea floor and creating habitats for other animals (e.g. Barthel & Tendal 1994). This is true particularly on the Antarctic shelf, where Rossellidae spp. (Hexactinellida) grow to large sizes and host rich communities of associated organisms. Results from the recent ANDEEP/SYSTCO expeditions have shown that the diversity, especially of the glass sponges, is high also in deep water (e. g. Brandt et al. 2007, Janussen & Rapp in press, Janussen & Tendal 2007). Scientific objectives of this sponge project are the following:

- Better understanding of the zoogeography and phylogenetic relationships of Antarctic sponges with special focus on common and widely distributed key taxa.
- Research on the role of Porifera in the Antarctic food web and bentho-pelagic coupling by means of stable isotope and lipid analyses of representative key species.

Work at sea

I. Collection of representative material of all sponge species especially from towed benthic gear, Agassiz trawl (AGT), bottom trawl (BT), and Rauschert dredge (RD).

II. Initial sorting of all collected sponges according to morpho-species and subsampling for genetics, isotopes, fatty acids, histology and further taxonomic investigations (45 skeletal preparations were made on board).

III. Observation of ROV videos with focus on the distribution and possible ecological role of the sponges (in close cooperation with I. Uriz and the WGs of C. Richter and J. Gutt).

IV. Common sponge species were documented according to size classes and preserved as dried specimens for later calibration of biomass-size relationships to improve the semi-quantitative evaluation of ROV photos (together with L. Fillinger, WG Richter).

V. Specimens of the common sponge species (if possible, min. 20 - 30 specimens from one catch) were subsampled for population genetics (I. Uriz).

Preliminary results

Sponges were collected mainly by AGT and BT (AGT and sponge data given in Table 3.1.6). So far, around 55 morpho-species of Porifera from all types of gear were distinguished, of which ~42 belong to the Demospongiae, ~10 are Hexactinellida and 3 Calcarea. These estimates are based mostly on outer morphology without skeletal preparations, and accordingly the species numbers are very conservative. According to personal experience from earlier Antarctic expeditions, the current number of distinguished morpho-species will increase by approximately 35 % after histology, SEM, etc. investigations have been done to obtain the proper identifications. In the following, some important faunistic data on Porifera of the main investigation areas are given.

Subantarctic to Antarctic regions

(Fig. 3.1.1 - stations: BB #208, SR #211, SG #214, SO #217, KG #222, BO #312). Of all stations the Burdwood Bank (BB) had the second most diverse sponge faunas with 17 spp., 15 Demospongiae and 2 Hexactinellida spp. It is a rather typical Magellan fauna with *Phakellia* sp. as dominant and *Geodia, Polymastia* spp. a. o. as common taxa. Shag Rock (SR) was diverse with 12 demosponge spp.,? a. g. common Polymastiidae. Only 1 hexactinellid sp. was found at this station*, Rossella cf. racovitzae* which was numerous. The fauna here resembled more the Antarctic type than that of BB, although this station is further to the north. The catches at South Georgia (SG), South Orkney Island (SO) and King George Island (KG) were rather poor with only few sponge species; the richest one was SG with common *Tetilla* spp.; 28 specimens of *T. leptoderma* were subsampled for genetics. At Bouvet Island (BO) 2 BTs brought not much material in terms of invertebrate fauna. However, these small catches included 13 species of sponges, e. g. 1 large Calcarean (asconoid) sp. Most species were represented by just 1 specimen, an indication of high species diversity around Bouvet Island.

Larsen shelf A, B, C

(Fig. 3.1.1. - stations: LA-S, #226, #228, #257, LB-W #233, #235, LC #237, #239, LB-S #248, LB Seep #250, LA-N #252). In Larsen A and B we tried to do repetitions as exactly as possible of the stations from the earlier expedition ANT-XXIII/8 in 2007, but due to the ice conditions this was not always possible with the towed gears. With the AGT, it was possible at 2 stations (LA South and LB West) and approximately for another one 3 miles WNW of the old LB Seep track. By far the richest station in terms of AGT-catches was LA South, where we collected 14 sponge spp. from 3 stations. At #226 (repetition station) we found 4 *Rossella* spp., 10 - 20 cm large, commonly sitting on dead shells (as initial substrate) of Calyptogena. This bivalve is known to be typical for cold seeps, and it was found in 2007 at Larsen B Seep (Gutt et al. 2011). At LA South (#228-4) we further recorded 8 Demospongiae spp. (e. g. *Guitarra cf. fimbriata*, found in 2007 at LB North) and 2 Hexactinellida (1 was *Chonelasma cf. lamella*, a deep-sea taxon). From 3 AGTs and 1 BT at Larsen A South 20 specimens of *Esperiopsis sp*., 25 of *Rossella cf. villosa*, and 20 of *Rossella* sp. were subsampled for population genetics (I. Uriz). LA North and LB West were extremely poor in benthic animals, despite of 2 AGT deployments in each area no sponges were found. Two AGTs at LB South were rather poor (6 sponge spp., including 1 Calcarea) compared with the catches from 2007 (where one AGT contained 8 sponge spp., including 1 Calcarea). The AGT catches were poor also compared with the ROV observations, which mostly showed a diverse sponge fauna associated with hydrocorals at LB South. 1 green *Latrunculia cf. bocagei* and 2 young *Homaxinella* sp. were collected by ROV from this station. At LB Seep the small AGT net was torn and the catch therefore was very small, it contained only 1 hexactinosan sponge fragment (deep-sea taxon). At the reference station Larsen C, we had only one small AGT deployment which collected hardly any material. However, this catch together with two BTs at Larsen C provided 6 sponge spp., 5 of which were deep-sea taxa belonging to the genera

Asbestopluma, *Pararete*, *Bathydorus*, and Euplectellidae sp. Furthermore, the ROV collected 3 live specimens of *Caulophacus cf. brandtae* (or sp. nov.?), another abyssal genus. Altogether, the Larsen A and B catches were poorer than in 2007. The reference station Larsen C was also poor in species and specimens, but provided an interesting deep-sea sponge fauna. This area as well as further reference stations should be investigated in more detail during upcoming expeditions.

Austasen and the BENDEX area

(Fig. 3.1.1 - stations: #256, #260, #275, #281, #286, #293, #301, #308). In this area we had 3 AGTs, all in BENDEX reference localities. The deep shelf station (#265-2, ca. 600 m) with 18 Porifera spp was the most diverse sponge locality sampled during this expedition. Generally, the AGTs and BTs in all near-BENDEX locations were rich to very rich in sponge numbers and some individuals reached large sizes, in accordance to the ROV observations. 6 BTs in more or less the same area resulted in medium diverse sponge catches (11 - 13 spp. each), but with distinctly different sponge assemblages reflecting the general patchiness of the Antarctic Porifera fauna (Janussen & Tendal 2007). These sponge accumulations were mostly found associated with more or less dense spicule mats: 1) Hexactinellida, dominated by Rossella, were represented mainly by 6 spp. (*R. nuda, R. vanhoeffeni, R. villosa, R. racovitzae, R. fibulata and R. antarctica*), sometimes also *Anoxycalyx (Scolymastra) joubini* occurred and less abundant 7-10 demosponge spp. 2) Demospongiae, dominated by *Cinachyra* spp. and *Tetilla* spp. 3) Demospongiae, dominated by Tetilla, Homaxinella, Stylocordyla. The latter two assemblages were combined with 6-9 other Demospongiae and 3-4 Hexactinellida spp. 1 Calcarea sp. was also found.

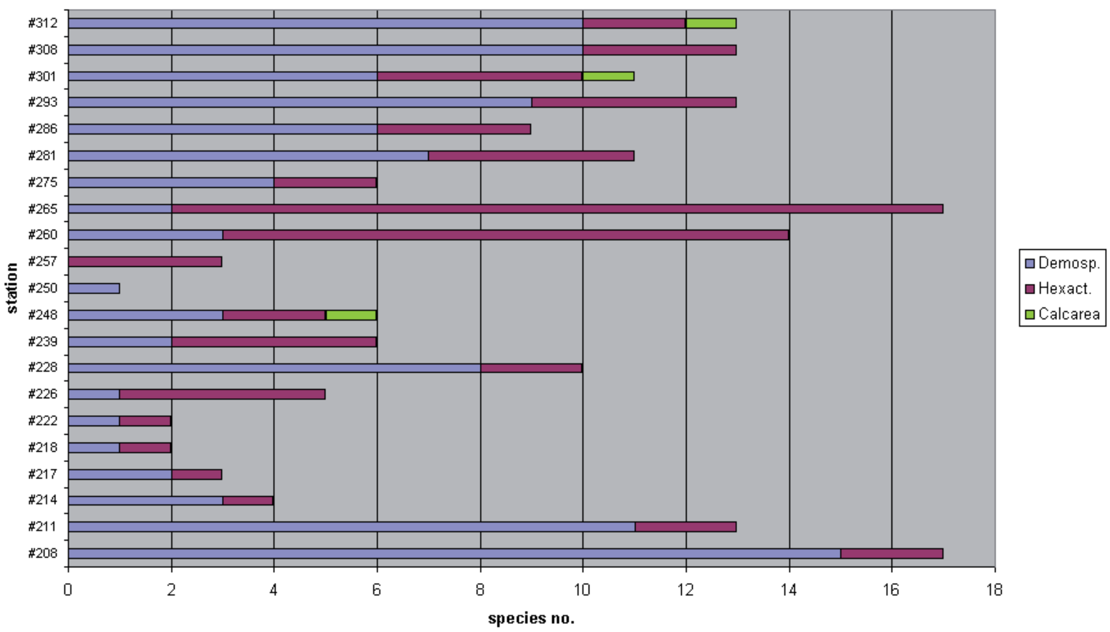

Fig. 3.1.1: Preliminary sponge species number at each station

Tab 3.1.6: All AGTs and some crucial BT stations (locations where only BT, but no AGT was employed) with main station data and numbers of morphospecies of Porifera: Demospongiae and Hexactinellida per catch. 1) The calculated trawling distance gives a rough estimate of the meters trawled during the bottom time of the AGT.

Station PS77/ Area	Coordinates	Depth, m	Gear: AGT/ BT	Trawl. dist.,m calc.[1]	Mor-spp., no.[2]	Dem. spp., no.	Hex. spp., no	Remarks, important sponges
208-5 Burdwood Bank	54°33.5S 56°20W	190-295	AGT1 Big +RD	509	17	15	2	*Phakellia* sp. dom., *Geodia*,. *Polymastia* Microcionidae, present Diverse Magellan fauna!
211-5 Shag Rock Bank	53°24S 42°38W	315-336	AGT2 Big +RD	449	2	1	1	Only 1 Huge stone with a few sessile animals, e.g. *Polymastia*
211-6 Shag Rocks Bank	53°25S 42°40W	301-285	AGT3 Big +RD	504	11	10	1	*Rossella cf. racovitzae*v26 domin., large *Mycale* sp. v25. Microcionide v28. Mostly an (impovered) Antarctic fauna!
214-5 South Georgia	54°25S 35°41W	265-267	AGT4 Big+RD	524	4	3	1	Catch very muddy. *Tetilla* spp. common, stalked astrophoride sp. present
217-5 South Orkney Isl.	61°09S 43°58W	410-384	AGT5 big +RD	421	3	2	1	Poor catch, 4 astrophoride, hex. Fragm., 1 *Tetilla*
218-3 South Orkney Isl.	61°11.95S 45°44.4W	319-324	AGT6 big +RD	558	2	1	1	Very poor catch, 2 *Tedania* cf. *tantula*
222-5 King George Isl.	62°17.65S 58°42.4W	452-427	AGT7 big +RD	859	2	1	1	Muddy catch, many Echinoderms, 3 sponges
226-7 Larsen A South. Repeat!	64°54.80S 60°37.46W	210-226	AGT8 Big +RD	663	4-5	1	3-4	3-4 *Rossella* spp., commonly on *Calyptogena* shells!
228-4 Larsen A South	64°58.1S 60°34.7W	329-312	AGT9 Big +RD	689	10	8	2	Muddy, with diverse demosponge fauna
233-3 Larsen B West. Repeat!	65°33.45S 61°37.30W	320-278	AGT10 small	609				Muddy, no sponges, few echinoderms
235-3 Larsen B West	65°32.73S 61°37.61W	298-271	AGT11 small	707				Mud&stones, hardly animals
239-3 + 237-2, 3 Larsen C. Reference	66°11.56S 60°8.44W	362-358	AGT12 Small + RD and BT	744	5-6	1-2	4	Deep-sea spp.: *Asbestopluma*, *Pararete*, *Bathydorus*
248-2 Larsen B South	65°57,85S 60°28,42W	205-197	AGT13 Big + RD	569	4	2	1	Rather poor compared to ROV. In RD: 2 Calcarea!
248-3 Larsen B South	65°55,40S 60°19,95W	433-424	AGT14 Big + RD	769	2	1	1	Muddy, poor. Demosp. with embryos/larvae
250-6 Larsen B Seep 3 miles NW`repeat!	65°25.94S 61°26.73W	555-581	AGT15 Big + RD	849	1	1		RD lost! Net torn. Poor catch, Hexactinosan

252-3 Larsen A North	64°41.69S 60°30.87W	303-332	AGT16 big	534				AGT stuck, after several attempts free. Poor catch
252-7 Larsen A North	64°41.50S 60°30.40W	338-343	AGT17, Small,	719				Large muddy catch, but few animals.
257-2 Larsen A South	64°54.9S 60°38.5W	152-192	AGT18, small	457	2-3		2-3	Hexactinellida catch, common *Rossella* spp.
260-6 BENDEX out (nearby)	70°50.17S 10°35.61W	260-250	AGT19 big	653	13	2-3	10-11	Muddy, many juveniles and pioneer sp., *Tetilla leptoderma*
265-2 BENDEX out (N´of)	70°47.91S 010°40.02W	538-615	AGT 20 big	654	18	3	15	Deep shelf fauna, diverse Demospongiae
275-3 BENDEX out (nearby)	70°56.40S 10°31.40W	236-212	AGT21 big	559	6	3-4?	2	*Rossella* catch, mostly *R. nuda*
281-1 BENDEX out		278-280m	BT		11	7	3-4?	*Rossella* catch, 1 specimen spics: *R.* cf. *vanhoeffeni*
286-1 BENDEX out		247-249	BT		9	6	3	*Chinachyra-Tetilla* catch
293-1 BENDEX out		247-249	BT		13	9	4	*Tetilla*,.*Homaxinella Stylocordyla.* catch
301-1 BENDEX out		225-265	BT		11	6	4	*Tetilla* dominant, 2 syconoid Calcarea fragm.
308-1 BENDEX out		223-250	BT		13	10	3	Large Bowl-shaped Hexacts: Probably *Anoxycalyx* (*Scolymastra*)
Bouvet Isl.								

3.1.5 Clonality and bacterial symbioses of sub Antarctic and high Antarctic sponges

Iosune Uriz Centre d'Estudis Avancats de Blanes-CSIC

Clonality in Antarctic Sponges

Objectives

The well-known patchy distribution of the Antarctic benthos has been considered to be the result of both, iceberg scouring (see also 3.4) and patchy distribution of the pelagic food resources arriving to the benthos. However, other causes related with propagules dispersal are likely involved in generating patchiness in the Antarctic benthic assemblages. The aim of the study is to analyse the contribution of the asexual reproduction to the patchy sponge distribution using one or few preponderant and densely distributed species.

Work at sea and preliminary results

We have quantified asexual budding of the dominant sponge species on the Antarctic shelf, following the approach of Teixidó et al. (2006) on the hexactinellid sponges but going further by also considering demosponges and not only external large buds, easy to record in video-transects, but also "micro-buds" and internal asexual propagules in 11 dominant sponge species: *Stylocordyla chupachups*, *Esperiopsis* sp., *Tetilla grandis*, *Tetilla* sp., *Cinachyra* sp., *Mycale acerata*, *Rossella antarctica*, *Rossella racovitzae*, *Rossella fibulata, Rossella laevis,* and *Anoxycalyx ijimai.* A total of 215 individuals of these species have been collected. All these species roughly contributed to ca. 80 % of the sponge biomass between 100 and

400 m. Localities of the sampled populations were Shag Rocks, South Georgia, South Orkneys, Larsen A, and Austasen (BENDEX).

It is planned to compare the potential asexual reproduction in Antarctic sponges, derived from the number of asexual propagules, with the clonal structure of the populations. With this aim, we have also collected populations (30 to 40 individuals each) from the above-mentioned 11 species at the several stations sampled with AGT and BT. We plan to design species-specific microsatellites from pyro-sequencing a small part of the sponge genome (Agell & Uriz, 2010), and look for the percentage of similar genotypes (MLGs) with sufficiently low probability of having resulted by chance from sexual reproduction events (Blanquer & Uriz 2010, 2011).

Bacterial associations with Antarctic sponges

Objectives

Bacterial communities often account up to 60 % of the sponge volume. Although nothing is known about the sponge-bacteria associations in the Antarctic, it seems reasonable to expect these associations to also be relevant there because of the co-evolution component of the symbiosis. Symbiotic bacteria can contribute significantly to the sponge nutrition by being phagocited by the sponge cells (and thus transforming DOC - captured by the bacteria - into POC), transferring metabolites directly to the sponge, and removing waste materials from the sponge. In this study we aim to assess the relevance of symbiotic bacteria in transferring organic matter from the water to the sponges.

Work at sea and preliminary results

The work on board consisted in the collection of five individuals each of the most abundant sponge species in the Antarctic (*Stylocordyla chupachups*, *Esperiopsis* sp., *Tetilla grandis*, *Tetilla* sp., *Cinachyra* sp., *Mycale acerata*, *Rossella antarctica*, *Rossella racovitzae*, *Rossella fibulata, Rossella laevis,* and *Anoxycalyx ijimai*); they were fixed in 96 % ethanol and stored for pyrosequencing (454 Roche) and quantifying: 1) bacterial diversity (OTUs richness and abundance); 2) bacterial metabolism. The bacterial diversity will give us an idea about the relevance of these types of symbioses in the Antarctic. The bacterial metabolism will provide information about the type of trophic benefit that sponges receive from their symbiotic bacterial community.

3.1.6 Dispersal and connectivity of sub Antarctic and high Antarctic cnidarians

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Objectives

Population recovery after a disturbance event (e.g. ice scouring, bottom trawling) depends on the supply of new recruits (Hughes et al. 2000). Estimating connectivity is a useful tool to understand population resilience following disturbance (Palumbi

2003; Bellwood et al. 2004). Connectivity among populations is the result of complex processes, which depend on dispersal of propagules between patchily distributed populations and the survival of recruits until sexual maturity (Pineda et al. 2007). Connectivity is also strongly related to the life history and ecological characteristics of the species (reproductive strategies, presence or absence of planktonic larvae, larval movement capabilities, migration habits, etc.). A surprisingly strong pattern of genetic structuring has been found also at spatial scales of 10s of meters in gorgonians (Costantini et al. 2007), supporting the hypothesis of limited dispersal ability of the planulae in many cnidarian species (Weinberg 1979). Connectivity and the potential larval dispersal is completely unknown in Subantarctic and Antarctic cnidarians. The aim of this work is, using molecular markers with different level of polymorphism (ITS-1 and mtMSH sequences; Constantini et al. 2010, Constantini et al. in press), to find out the relationship between gorgonian and alcyonarian populations (connectivity) at horizontal and vertical micro, meso and macro scales. Part of the material collected will be used also for taxonomic purposes, especially for a long term study of Dr. Pablo López González who is studying the distribution and taxonomical classification of cnidarians from the Scotia Arc, Antarctic Peninsula, eastern Weddell Sea and Bouvet Island.

Work at sea

Four different areas will be compared using the gorgonian and alcyonarian collection made during the cruise: Scotia Arc (Burdwood Bank and Shag Rocks), Antarctic Peninsula (King George Island), eastern Weddell Sea (Austasen) and Bouvet Island (see Table 3.1.7). Samples have been collected with Agassiz trawl or bottom trawl, depending on the region. At each station several colonies were sorted (minimum 7, maximum 35 per species and station), fixing with absolute ethanol a small piece (total colonies sampled = 430).

Tab. 3.1.7: Samples obtained during the ANT-XXVII/3 cruise for genetic connectivity of gorgonians and one alcyonarian species

Area	Zone	Stations	Species	Depths (m)
Scotia Arc	Burdwood Bank	208-2, 208-3, 208-6	*Armadillogorgia sp.*, *Ophidiogorgia sp.*	280, 304, 299
	Shag Rocks (South Georgia)	211-5, 211-6, 211-7, 211-8	*Thouarella viridis*, *Thouarella sp.*	320, 290, 305, 310
Antarctic Peninsula	King George IIsland	222-5, 222-6, 222-7	*Anthomastus bathyproctus*	440, 470
East Weddell Sea	Austasen	260-6, 265-2, 286-1, 291-1, 300-1, 301-1, 308-1	*Anigmaptilon antarctica*, *Thouarella sp.*	250, 570, 290, 270, 275, 245
Bouvet	Bouvet	312-2	*Anigmaptilon antarctica*	270

Expected results

The analyses will be made in the Centro Interdipartimentale di Ricerca per le Scienze Ambientali and Dipartimento di Biologia Evoluzionistica Sperimentale, University of Bologna in coordination with the ICM-ICTA group. Total genomic DNA will be extracted from two to four polyps per fragment using the CTAB extraction procedure described by Costantini et al. (2007, 2010, in press). Nine microsatellite loci (COR9, COR15, COR46, COR48, MIC20, MIC22, MIC23, MIC24, MIC26) will be used specifically for the different species.

3.1.7 Biodiversity and distribution patterns of polychaetes in the Scotia Arc, the Antarctic Peninsula and the eastern Weddell Sea shelf.

Americo Montiel Universidad de Magallanes

Objectives

The objectives of this study were to determine species composition, species richness and distribution of the polychaete fauna along a latitudinal gradient from the Scotia Arc to the southeastern Weddell Sea.

Work at sea

Polychaetes were collected from 31 qualitative samples, 19 samples were collected from AGT, 10 samples from BT and 2 from the RD. The samples were obtained from three different areas, the Scotia Arc, the Larsen embayments A, B and C (Antarctic Peninsula) and the eastern continental shelf of the Weddell Sea. We sampled a depth range between 153 and 567 m water depth. All the collected specimens were sorted on deck. After counting and determining the specimens to family level onboard they were fixed in a 4 % buffered formalin-seawater solution until further determination to species level in the home laboratory at the Universidad de Magallanes, Punta Arenas, Chile.

Preliminary results

In total 1480 individuals were collected from all samples belonging to 27 families. In terms of individual numbers, the carnivorous Polynoidae (652) were the dominant family, followed by the detritus feeding Terebellidae (241), the carnivorous Eunicidae (151), and the deposit feeding Sternaspidae (97) and Ampharetidae (80). Seven families were represented just by single specimens, whereas the remaining families were presented by 2 to 54 individuals (Table 3.1.8).

The most frequent family was Polynoidae (in 90 % of the samples) followed by Terebellidae (65 %) and the filter feeding Sabellidae (32 %) and Syllidae (32 %). 23 families were presented by a frequency < 30 % (Fig 3.1.2).

The number of families per haul varied between 1 and 12 (mean 4.7). The highest value was obtained at station 217-5 at the South Orkney Islands, followed by station 252-7 in the Larsen A embayment. The mean number of families per haul was highest in the Scotia Arc region (5.8±2.9), followed by the southeastern Weddell Sea shelf (5.0±2.5), and was lowest in the Larsen embayments (4.0±2.4). The number of families per haul did not show any relationship to latitudes (Fig. 3.1.3).

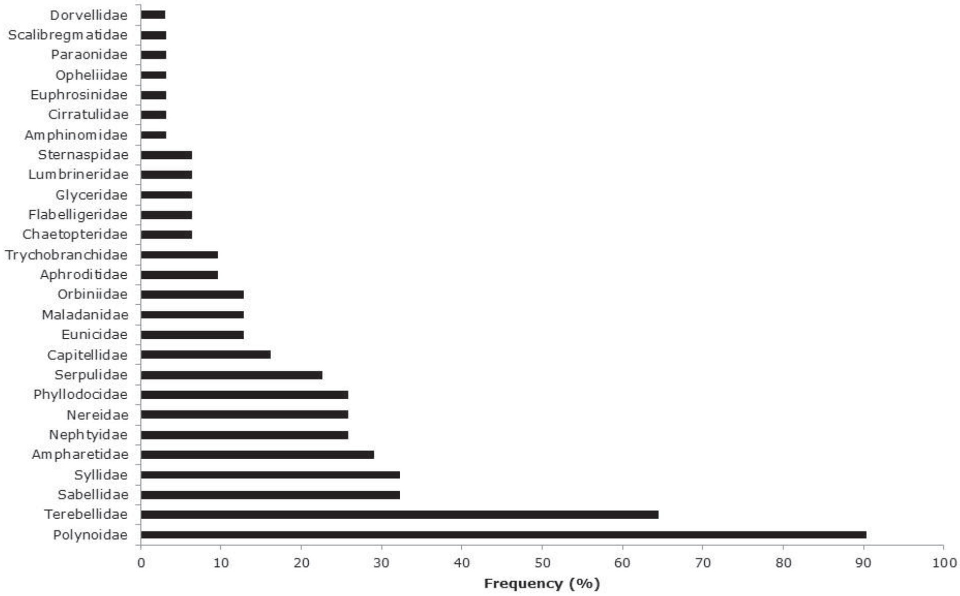

Fig 3.1.2: Overall frequency of polychaete families at the sampling stations

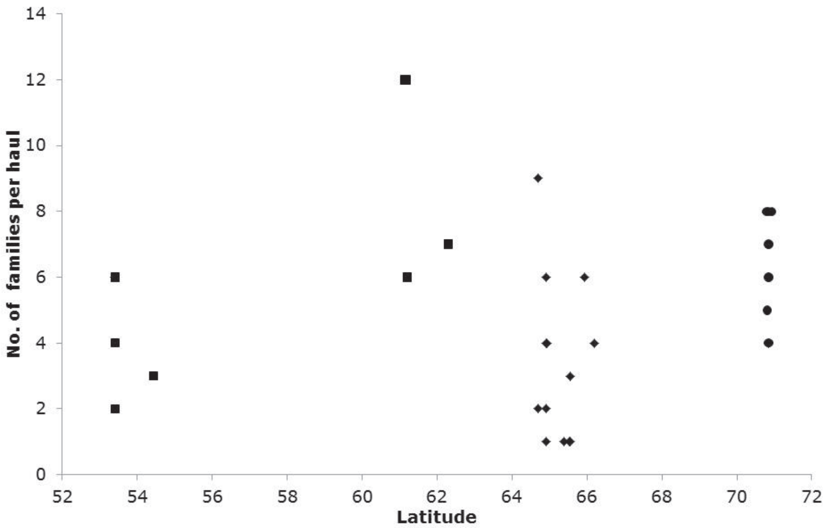

Fig. 3.1.3: Latitudinal distribution of the numbers of families per haul. Scotia Arc (square), Larsen embayments A, B and C (rhombs) and eastern Weddell Sea shelf (circle).

Tab. 3.1.8: Number of polychaete families per haul / stations and gear

Gear	RD	RD	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	AGT	BT	BT	BT	BT	BT	BT	BT	BT	BT
Station	211-6	211-5	211-5	211-6	214-6	217-5	218-3	222-5	226-7	228-4	233-3	235-5	239-3	248-3	250-6	252-3	252-7	257-2	260-6	265-2	275-3	228-3	231-3	235-8	281-1	286-1	291-1	292-2	301-1	308-1
Family																														
Ampharetidae	0	0	0	0	0	64	0	0	0	2	3	0	3	0	0	0	3	0	2	1	0	0	0	0	0	0	0	0	1	1
Amphinomidae	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aphroditidae	0	0	0	0	11	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Capitellidae	0	0	0	0	0	5	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetopteridae	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dorvellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	59	19	1	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphrosinidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flabelligeridae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0
Glyceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0
Lumbrineridae	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maladanidae	0	0	0	0	0	7	5	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Nephtyidae	0	1	0	0	1	5	0	0	0	0	0	0	1	0	0	1	1	0	2	0	1	0	0	0	0	0	0	0	0	0
Nereidae	1	0	0	1	0	0	0	0	22	0	0	0	0	1	0	0	0	26	0	0	1	0	0	0	0	1	1	0	0	0
Opheliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Orbiniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	1	0	0	0	0	0
Paraonidae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	0	1	0	0	1	0
Polynoidae	25	5	1	65	0	1	0	10	54	55	2	0	4	10	5	3	1	113	17	16	19	18	26	4	45	45	19	19	39	15
Sabellidae	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0	0	0	3	0	2	0	0	0	0	0	1	2	2	6	2
Scalibregmatidae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sepulidae	0	0	0	0	0	0	0	0	3	0	7	0	3	1	0	0	0	10	3	0	0	0	0	0	0	0	1	0	0	0
Sternaspidae	0	0	0	0	0	27	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	0	0	0	20	3	3	1	2	0
Terebellidae	1	0	0	0	1	30	1	0	3	4	0	0	0	1	0	0	28	6	23	20	6	5	0	0	18	6	21	4	58	4
Trychobranchidae	1	0	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ind. No	88	26	2	141	13	150	12	94	82	62	12	1	11	17	5	4	38	173	50	49	33	23	26	4	85	61	47	26	107	22
Total families	6	4	2	6	3	12	6	7	4	4	3	1	4	6	1	2	9	6	8	8	8	2	1	1	5	7	6	4	6	4

3.1.8 Biodiversity and phylogeographic patterns of amphipod crustaceans in Antarctic seas

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Objectives

Amphipods are the most speciose animal group in the Southern Ocean, with more than 850 described species (De Broyer et al. 2007). They are present at all depths, in all environments and occupy a large range of trophic niches. However, many species are inadequately described, the number of undescribed morphospecies is very high and recently molecular studies revealed the presence of morphospecies composed of genetically heterogeneous species complexes with allo- and sympatric distributions. Therefore, there is an urgent need for more in-depth studies on the morphological and molecular systematics and phylogeography of the Antarctic and Subantarctic amphipods. Specific topics which will be addressed are:

1. To document and compare the faunistical, zoogeographical and ecological traits of amphipod taxocoenoses from different areas of the Southern Ocean.
2. To contribute to the description of the Antarctic amphipod biodiversity, with a special focus on the Lysianassoidea, Eusiridae and Liljeborgidae.
3. To use genetic markers for revealing cryptic biodiversity, to measure the intra- and interpopulation genetic variability and to compare the phylogeography of target taxa with high and low dispersal capacities (benthopelagic vs. crawling amphipods)
4. To document the level of genetic isolation and cryptic endemism in amphipod crustaceans from different areas of the continental and insular shelf of the Antarctic, with the hypothesis of genetic isolation in refuges during the Cenozoic glaciations as background.
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

Samples have been collected with RD, AGT, BT, and baited amphipod and fish traps at the stations at Burdwood Banks, Shag Rocks, South Georgia, South Orkney Islands, King George Island, Larsen A, B and C, and in the eastern Weddell Sea (BENDEX area). Some specimens were collected from the bentho-pelagic and bongo nets. Specimens were sorted out after each catch; most of them have been identified to family or genus level and photographed with a Canon digital camera, before being fixed in pre-chilled absolute ethanol. The proportion of different scavenger species in the amphipod traps has been assessed. Supplementary samples have been obtained from the bentho-pelagic nets. DNA extractions have been carried out onboard for more than 170 specimens of taxa of interest for our studies.

Preliminary results

Morphological and molecular studies

More than 150 taxa (see Table 3.1.9) have been sorted out and identified until family, genus or species level and 99 taxa have been photographed. DNA extraction has been carried out for 174 specimens, of which 89 belong to the Lysianassoidea, 33 to the genus *Eusirus* and 15 to the genus *Liljeborgia*. Futhermore, DNA has been extracted for other commonly occurring species in our samples, belonging to the Oedicerotidae, Corophioidea, Ampeliscidae, Amathillopsidae, Hyperiidae, Epimeriidae and Iphimediidae. Several individuals of the same species have been extracted in the case of *Eurythenes gryllus*, *Abyssorchomene plebs*, *Abyssorchomene rossi*, *Uristes* spp., *Abyssorchomene* "L-shaped eye" and *Orchomenella* spp. for complementing our ongoing phylogeographic and population genetic studies on Lysianassoidea. These molecular studies already showed a high genetic diversity between sample localities for *E. gryllus* and *Orchomenella* spp., while there was a very low diversity between remote localities (e.g. Bouvet Island, shallow and deep Scotia Sea, Weddell Sea and Antarctic Peninsula) for *A. plebs* and *A*. "L-shaped eye" (Havermans et al. 2011). With the newly obtained samples, the geographical coverage of the samples can be expanded and more in-depth genetic studies can be conducted. Moreover, DNA has been extracted from all specimens of the family Liljeborgidae and all specimens of *Eusirus giganteus*, *Eusirus antarcticus* and *Eusirus properdentatus* for the current studies by C. d´Udekem d´Acoz. For some species, a preliminary morphological examination already pointed out two or more morphotypes, based on colour patterns or shape of the spines: (1) *Rhachotropis antarctica* (bright red vs. purplish), (2) *Gnathiphimedia mandibularis* (shorter vs. longer dorsal spines), (3) *Gnathiphimedia sexdentata* (shorter vs. longer dorsal spines), (4) *Eusirus antarcticus* (colour patterns, e.g. forma ocelot), (5) *Acanthonotozomoides oatesi* (e.g. red vs. yellow eyes), (6) *Parepimeria crenulata* (orange vs. dark red) and (7) *Echiniphimedia hodgsoni* (large and smaller vs. slender and longer spines). By a complementary DNA analysis and a more accurate morphological examination we will find out, whether these morphotypes are separate species or not. Some species of the genera *Epimeria*, *Gnathiphimedia* and *Liouvillea* are likely to be new for science. The lysianassoid species *Abyssorchomene* "L-shaped eye" has been sampled during former expeditions but is still undescribed. This species normally only occurs at abyssal depths (> 3,000 m) except for the Larsen area, where it has been found at shallow depths during ANT-XXIII/8 and during this cruise at Larsen A and Larsen B south.

Symbioses

The following species have been found in sponges: *Orchomenyx* sp., *Gnathiphimedia* spp., *Andaniotes* sp., *Aristias antarcticus*, *Echiniphimedia echinata*, *Eusirus* sp., *Gnathiphimedia mandibularis*.

Traps

Thousands of amphipods have been collected with the baited traps, all of them were lysianassoids. The species composition varied for each region, but the species diversity was low for each catch. The traps deployed at a greater depth around King George Island recovered many specimens of the abyssal *Eurythenes gryllus*, which have not been found at shallower stations. The species have been separated for each catch and the number per species has been counted, or roughly estimated in case of a too important catch. No new species have been recorded from the traps.

1 South Georgia St. 214-6 AT (266 m): +/- 40 *Abyssorchomene plebs* and 1 *Abyssorchomene rossi*

2 South Georgia St. 215-1 FT (347 m): +/- 200 *Abyssorchomene plebs*

3 King George Island St. 223-1 FT (1020 m): +/- 80 *Eurythenes gryllus* and 5 *Abyssorchomene rossi*

4 Larsen C St. 243-6 AT (349 m): 20 800 *Abyssorchomene plebs* and 6 *Abyssorchomene rossi*

5 Bendex St. 273-1 FT: Lost

Tab. 3.1.9: Bendex St 290-1 AT (on mooring) (214 m): 4 *Abyssorchomene rossi*
Tab. 3.1.7: List of species with preliminary identifications per area (BB: Burdwood Bank, SR: Shag Rocks, SG: South Georgia, KGI: King George Island, LA: Larsen A, LC: Larsen C, LBS: Larsen B South, LAS: Larsen A South, WDL: Eastern Weddell Sea – Bendex, BI: Bouvet Island). Records followed by "T" between brackets consist of material collected by baited traps (amphipod and fish traps).

Area	BB	SR	SG	SO	KGI	LA	LC	LBS	LAS	WDL	BI
Acanthonotozomelidae											
Acanthonotozomoides oatesi		X								X	
Acanthonotozomoides cf. *oatesi* (yellow eyes)		X									
Acanthonotozomopsis pushkini		X									
Amathillopsidae											
Parepimeria spp	X	X				X					X
Parepimeria crenulata											X
Parepimeria cf. *crenulata* (dark red)											X
Ampeliscidae											
Ampelisca spp (mostly *A. richardsoni*)	X	X		X	X		X			X	X
Calliopidae											
Calliopus sp		X								X	X
Caprellidea											
Caprellid spp	X							X		X	
Corophioidea (except Caprellidea)											
Corophioidea spp	X	X				X	X	X		X	X
Isaeidae? small, transversally yellow-striped sp 1						X		X			
Isaeidae? dark red, small, transversally yellow-striped sp 2											X
Dikwidae											
Dikwa sp	X										
Epimeriidae											
Epimeria n.det.								X		X	
Epimeria georgiana				X							
Epimeria robusta										X	
Epimeria rubrieques										X	
Epimeria inermis										X	
Epimeria similis										X	
Epimeria walkeri								X		X	
Epimeria macrodonta						X		X	X		
Epimeria cf. macrodonta										X	
Epimeriella sp (without rostrum-orange eyes)					X						
Epimeriella n.sp										X	
Eusiroidea											
Eusirus antarcticus		X				X	X		X	X	
Eusirus antarcticus forma ocelot										X	
Eusirus giganteus					X	X		X		X	
Eusirus giganteus (spotted form)					X						
Eusirus giganteus (form violet)					X						
Eusirus microps		X				X				X	
Eusirus properdentatus						X					
Eusirus n.det.	X	X								X	
Eusiroid n.det.	X	X				X	X	X		X	X
Liouvillea n.sp.										X	

Area	BB	SR	SG	SO	KGI	LA	LC	LBS	LAS	WDL	BI
Oradarea spp.		X								X	
Rhachotropis antarctica		X				X	X				
Rhachotropis aff. *antarctica* (n.sp.)						X					
Hyperiidae											
Themisto sp.										X	
Hyperia cf. *macrocephala*		X	X							X	X
Iphimediidae											
Anchiphimedia cf. *dorsalis*					X						
Echiniphimedia barnardi										X	
Echiniphimedia echinata						X				X	
Echiniphimedia hodgsoni "stout spines"										X	
Echiniphimedia hodgsoni "long slender spines"						X					
Gnathiphimedia n.det.	X				X			X		X	
Gnathiphimedia cf. *barnardi*											X
Gnathiphimedia incerta								X		X	
Gnathiphimedia sexdentata var. 1 (smaller dorsal spines)					X						
Gnathiphimedia sexdentata var.2						X				X	
Gnathiphimedia macrops							X				
Gnathiphimedia mandibularis						X		X	X	X	
Gnathiphimedia n. sp.										X	
Iphipmediella n.det.										X	
Maxilliphimedia longipes								X			X
Iphimediid n.sp.										X	
Ischyroceridae											
Jassa n.det.										X	
Jassa goniamera										X	
Ischyrocerid spp.				X	X					X	
Lepechinellidae											
Lepechinella drygalskii										X	
Leucothoidea											
Leucothoe sp	X	X								X	X
Liljeborgidae											
Liljeborgia sp 1 (red eyes, small)						X					
Liljeborgia n.det.						X				X	X
Liljeborgia sp 2 (purple Gn1-2)						X	X	X		X	
Lysianassoidea											
Abyssorchomene plebs			X (T)				X (T)			X	
Abyssorchomene rossi			X (T)		X (T)		X (T)	X		X (T)	
Abyssorchomene "L-shaped eye"						X		X			
Abyssorchomene cf. *scotianensis*	X										
Aristias antarcticus (in sponges)		X				X					
Eurythenes gryllus					X (T)						
Lepidepecrella sp.		X								X	
Lysianassoid n.det.						X		X		X	

Tab. 3.1.9: cont.

Area	BB	SR	SG	SO	KGI	LA	LC	LBS	LAS	WDL	BI
Lysianassoid n.det. (red eyes)	X						X			X	
Lysianassoid n.det. (black eyes)	X									X	
Orchomenella n.det.						X				X	
Orchomenella (*Orchomenopsis*) cf. *acanthurus*										X	
Orchomenella (*O.*) *pinguides*						X			X	X	
Orchomenyx sp (in sponges)										X	
Tryphosella spp		X								X	
Uristes spp	X	X								X	
Waldeckia obesa						X				X	
Melitidae											
Melitid sp		X									
Paraceradocus gibber				X							
Paraceradocus miersii										X	
Melphidippidae											
Melphidippa sp											X
Oedicerotidae										X	
Monoculodes antarcticus (red eye)		X									
Monoculodes sp (white eye)	X					X				X	
Oediceroides calmani								X		X	
Oediceroides n.det.							X			X	
Phoxocephalidae											
sp big black eyes										X	
sp small red eyes	X										
sp small black eyes		X								X	
spp white eyes										X	
n.det.	X	X						X		X	
Podoceridae											
Podocerus septemcarinatus					X			X			
Stegocephalidae											
Stegocephalid n.det		X								X	
Andaniotes sp		X								X	
Stenothoidae											
Stenothoid sp		X									
Stilipedidae											
Alexandrella australis		X							X		
Synopidae											
Syrrhoe sp		X									
Syrrhoe nodulosa										X	

3.1.9 Species delimitation and the role of dispersal for the genetic structure of benthic crustaceans in the Southern Ocean

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* not on board

Alfred-Wegener-Institut

Objectives

In order to understand the distribution of the Antarctic benthic biodiversity and its fate in the rapidly changing environmental conditions, it is imperative to catalogue its entirety using state of the art molecular genetics in addition to the traditional morphometric. Our previous work has shown that many of the taxa previously thought to be one species in fact consist of cryptic species complexes and that the established paradigm of their circumpolar distribution has to be revised. One aim of our project is to test the species identity of key taxa of the Antarctic benthos using molecular methods, thus contributing to the international barcoding of life initiative. Since the formation of new species starts with variation and differentiation at the population level, we are interested to study the within and between population genetic differentiation for outlining the factors driving the "Antarctic Diversity Pump".

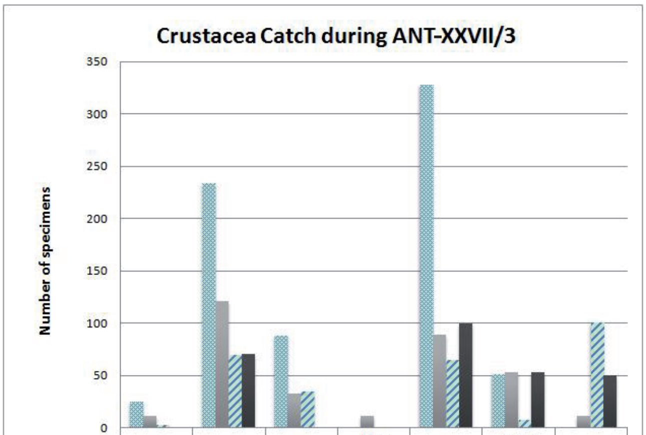
It is therefore intended to study the role of existing current systems, variable climatic oscillations and variance in the evolutionary history of the Antarctic Southern Ocean benthos at several taxonomic levels. Sampling of benthic crustaceans from disjunct Antarctic (continental Antarctic and South Orkney Islands) and Subantarctic (South Georgia and Bouvet Islands) populations and using molecular markers with varied evolutionary rates, we aim to identify the barriers and conduits of gene flow to elucidate the pathways of colonization and mechanisms of speciation prevalent in the Southern Ocean.

Work at sea

Crustacean specimens encompassing the taxa Mysidacea, Euphausiacea, Isopoda, Euphausiida and Decapoda were collected from the sub Antarctic and high Antarctic stations using Agassiz trawls (AGT), bottom trawls (BT) and Rauschert dredge (RD). Additional samples of Euphausiida and Mysida were acquired from Multinet (MN) and Bentho-Pelagic net (BPN). All samples were preserved directly in chilled ethanol (100 - 95 %) for further morphometric and genetic analyses. Specific determination was carried out for the major groups based on morphology, however given the prevalence of cryptic diversity in the Antarctic, species numbers will be determined after thorough genetic analyses.

Preliminary results

After preliminary analyses the samples collected were grouped into 4 major taxonomic groups and sampling sites were classified into 7 major areas (Fig 3.1.4). A major characteristic of the decapod specimens acquired during the expedition was that the distribution of brachyurian crabs was limited to the Subantarctic region (Burdwood Bank and South Georgia Island) and the only decapods found on the continental Antarctic were shrimps (*Notocrangon antarcticus* and *Chorismus antarcticus*). *Notocrangon antarcticus* specimens have helped in completing our inventory of this species from major areas of the Antarctic and even though this species is believed to have a circumpolar distribution, certain Subantarctic (South Georgia Island) populations might be a case of cryptic speciation which will be tested using already established molecular markers (unpublished data). High intra-specific genetic diversity groups like Euphausiida and Mysida will be tested for regional population structure and the influence of currents in maintaining a circumpolar distribution of these species. Our ongoing studies on *Glyptonotus* sp. and *Ceratoserolis* sp. will augment our existing population genetic dataset and answer hypotheses related to the „stepping stone" model of dispersal in the Scotia Arc, the submergence/emergence of benthic species during various glacial periods.



	Burdwood Bank	South Geogia Isl.	South Orkney Isl.	King Geogre Island	Larsen	Eastern Weddell Sea	Bouvet Isl.
Decapoda	24	233	88	0	328	51	0
Isopoda	11	121	33	11	89	53	11
Mysidacea	2	69	34	0	64	7	100
Euphausiacea	0	70	0	0	100	53	50

Fig. 3.1.4: Distribution and abundance of crustacean samples acquired during the ANT-XXVII/3 expedition

3.1.10 Cryptic speciation and population structure within crinoids in the Southern Ocean

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Objectives

Many crinoid species living on the Antarctic shelf are thought to be circumpolar in distribution. This may be due to the fact that some broad-scale ecological conditions are similar around most parts of the continent, and that a circumpolar coastal current transports food particles and supports the dispersal of juveniles. Many species share the same evolutionary constraints. This suggests that rapid radiations or species flocks may have occurred independently in various taxonomic groups, including crinoids. Past glacial/interglacial cycles may have had structural effects on population and species diversity and distribution in the Southern Ocean. In-depth knowledge of the timing of speciation across taxa may help evaluate the consequences of the ongoing global warming. At least three of the most abundant crinoid species, i.e. *Promachocrinus kerguelensis*, *Florometra mawsoni* and *Anthometra adriani* seem to be circumpolar in distribution. They however show very different genetic structure. *Promachocrinus kerguelensis* seems to be a complex of cryptic species, whereas *Anthometra adriani* shows a very low haplotypic and nucleotidic diversity.

Looking at the diversity and distribution of these marine organisms living on the Antarctic continental shelf will increase our understanding of many crucial aspects of Antarctic scientific and environmental issues, such as circumpolarity, species flocks, and the potential effects of global warming and ocean acidification.

Work at sea

Crinoids were collected from AGT, BT and RD. All specimens were stored in 100 % ethanol for a minimum of 3 days (maximum ratio ethanol to specimen volume 5:1) after which they were drained and stored in a barrel containing fresh 100 % ethanol.

Preliminary results

A total of 301 crinoids were collected from the cruise (refer to Table 3.1.3). The morphological identification, molecular barcoding, and the sequencing of other mitochondrial and nuclear markers for the most common species will take place in the lab of Mark Eléaume in Paris.

3.1.11 Biodiversity and zoogeography of demersal fish

Katja Mintenbeck[1], Malte Damerau[2], Timo Hirse[1], Rainer Knust[1], Nils Koschnick[1], Michael Matschiner[3] Lena Rath[4]

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2) Johann Heinrich von Thünen-Institut
3) Universität Basel
4) Universität Hamburg

Objectives

The fish fauna of the Southern Ocean is composed of primarily bottom dwelling species belonging to the perciform suborder Notothenioidei. Composition of the demersal fish community, however, varies between different regions. There are three major abiotic factors determining the zoogeography and dispersal of species and thus composition and diversity of communities: geographical distance, oceanic currents, and ambient water temperatures. The high Antarctic shelf is relatively isolated from other continental shelves, but islands such as those found along the Scotia Arc might serve as stepping stones for north- and/or southward dispersal of fish species. Water temperature at the sea floor differs strongly between Subantarctic and high Antarctic shelf areas and ranges from about +4 °C on the shelves of the northern Scotia Arc to -1.8 °C on the high Antarctic shelf. The zoogeography of particular Southern Ocean species thus most likely also reflects their thermal tolerance window. Studies conducted during earlier expeditions already indicated that some species are widely distributed and are apparently able to cope with a wide temperature range while others are strongly limited in their latitudinal distribution. To investigate the zoogeography of species and the composition and diversity of communities, the demersal fish fauna was sampled from different parts of the Southern Ocean. These ecological studies are closely linked to studies on genetic population structure (see section 3.1.12) and experimental studies on physiological performance of different fish species depending on water temperature (see chapter 3.3).

Work at sea

In total, 24 bottom trawls were carried out during the expedition. Sampling areas included the Scotia Sea, King George Island, the western (Larsen A, B and C) and the eastern Weddell Sea as well as Bouvet Island. Sampling was carried out on the shelf in water depths between 250 and 470 m. Species were identified, and individuals were measured and weighed. Sex, maturity and liver weight were determined from subsamples. From common species otoliths were taken for age determinations, stomachs for diet analyses, and tissue samples from white muscle for stable isotope analyses and genetic studies. To account for differences in trawled area, biomass data of each haul were standardized to an area of 1,000 m^2. Mean biomass was calculated for each of the study areas. For the spatial comparison of fish communities, % biomass contribution of each species, Shannon diversity (H'), Pilou's evenness (J') and Bray Curtis similarity were calculated.

Preliminary results

Mean demersal fish biomass was high on the shelves of the Scotia Sea islands, intermediate at King George Island, the eastern Weddell Sea and Bouvet Island and very low in the entire Larsen areas (Table 3.1.10).

Tab. 3.1.10: Composition, mean biomass, diversity and evenness of demersal fish communities in the study areas

Area	No. of hauls	Species No.	Shannon Diversity H'	Evenness J' (Pilou)	Mean fish biomass [g *1000m^2]
Burdwood Bank	2	7	0.46	0.24	766.73
Shag Rocks	2	9	0.63	0.29	3059.03
South Georgia	2	10	1,75	0.76	3306.02
South Orkneys	2	16	1,88	0.68	997.03
King George Island	2	11	0,44	0.19	143.86
Larsen A	2	8	1.38	0.66	15.19
Larsen B	1	6	0,73	0.40	29.97
Larsen C	2	8	1.73	0.83	22.44
Eastern Weddell Sea	7	21	2.62	0.86	106.35
Bouvet Island	2	4	0.89	0.64	437.81

At Burdwood Bank the fish community was dominated by typical low latitude species such as *Micromesistius australis* (Gadidae) and the nototheniids *Patagonotothen guntheri* and *Dissostichus eleginoides*. At Shag Rocks 87 % of fish biomass was contributed by *Lepidonotothen squamifrons* and 11 % by *D. eleginoides*. Diversity and evenness were low in this northern part of the Scotia Arc. At South Georgia the catches were dominated by large individuals of the marbled notothen *Notothenia rossii*. Other species contributing each more than 3 % to overall biomass were the icefishes *Chaenocephalus aceratus*, *Champsocephalus gunnari* and *Pseudochaenichthys georgianus*, as well as the nototheniids *D. eleginoides* and *Gobionotothen gibberifrons*. At the South Orkneys *C. aceratus*, *C. gunnari* and *P. georgianus* were still represented with an overall biomass of 15 %, but the dominating species in this area were *G. gibberifrons* and *Chionodraco rastrospinosus*. At King George Island diversity and evenness were low due to the high biomass of the Antarctic silverfish, *Pleuragramma antarcticum*, which accounted for 82 % of fish biomass. Other typical components of the King George Island fish community were *C. rastrospinosus*, *Cryodraco antarcticum*, *Chaenodraco wilsoni*, *G. gibberifrons*, *L. squamifrons* and *Trematomus hansoni*. In Larsen A and B the catches were dominated by *Gymnodraco acuticeps*, *P. antarcticum*, *Trematomus eulepidotus* and *T. scotti*. *G. gibberifrons* accounted for 37 % in Larsen A but was absent in Larsen B. The fish community in Larsen C was similar to Larsen B, with *C. wilsoni*, the cryopelagic fishes *Pagothenia borchgrevinki* and *T. hansoni,* additionally contributing more than 10 % each to the overall biomass. Highest species number, diversity and evenness were found on the eastern Weddell Sea shelf. In this area the fish community was dominated by the icefish *C. antarcticum* and several *Trematomus* species. Small *Artedidraco* spp. were common but did not contribute much to overall biomass. At Bouvet Island only 4 fish species were found, *Lepidonotothen kempi*, *L. larseni*, *C. gunnari* and *C. aceratus*, with the latter 3 species dominating the community.

Cluster analysis of similarity between the different fish communities revealed two large clusters, one Subantarctic and one high Antarctic cluster, each with two subgroups (Fig. 3.1.5). Within the high Antarctic cluster the communities of the Larsen area were most similar among each other. Similarity of this cluster to the King George Island and eastern Weddell Sea fish communities was comparatively low.

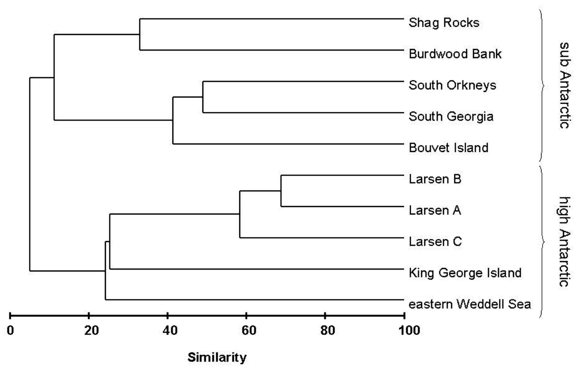

Fig. 3.1.5: Dendrogram of similarity (Bray Curtis similarity, 4th root transformation of biomass [g/1,000 m²]) of fish community composition between the different study areas

Within the Subantarctic cluster the fish community of Shag Rocks was most similar to that found on Burdwood Bank. A second group within the Subantarctic cluster included the fish communities of the South Orkneys, South Georgia and Bouvet Island. All species found at Bouvet Island (see above) were also common in the Scotia Sea, and the similarity of the Bouvet fish fauna to the two more westerly island shelves of South Georgia and the South Orkneys might be the result of a faunal drift via the Antarctic Circumpolar Current. However, whether on-going gene flow occurs between fish populations along the islands of the Scotia Sea and between the South Orkneys/South Georgia and Bouvet Island or whether the populations are completely separated is still unknown for most species, and will be investigated as part of the project described in section 3.1.12. Based on the results of the studies on species' zoogeography we could identify *Patagonotothen guntheri* as a typical Subantarctic species with its distribution limited to the northern (warmer) part of the Scotia Sea. In contrast, the distributional range of *Trematomus* spp. is limited to the cold waters of high Antarctic latitudes. *Lepidonotothen squamifrons* is a species with a wide latitudinal distribution from Shag Rocks down to King George Island, and thus occupies water masses with strongly differing temperatures. These three nototheniid fish species were chosen for studies on temperature dependent physiological performance (see chapters 3.3.2 Sandersfeld et al., 3.3.3 Strobel & Mark, and 3.3.5 Stapp et al.).

3.1.12 Genetic population structures of notothenioid fish along the Scotia Arc

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* not on board

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Objectives

Since the cooling of the Southern Ocean approximately 20 million years ago, a unique ichthyofauna evolved on the shelves of the Antarctic continent and adjacent islands showing low species diversity and high levels of endemism. The majority of fish are bottom dwelling and belong to the suborder Notothenioidei (Perciformes). Their larvae usually develop pelagically over an extended period of several months. During this time, larvae may be dispersed over large distances by strong prevailing current systems, including the Antarctic Circumpolar Current which encircles the Antarctic continent. Indeed, high genetic homogeneity and low differentiation among populations is often found even for species with circum-Antarctic distribution, highlighting the role of protracted larval phases for gene flow. On the other hand, larvae are often found to be retained in neritic waters by local gyres. Also, oceanic fronts and strong currents may act as barriers hindering gene flow by larval dispersal or migration.

In our study, we compared the genetic population structures along the Scotia Arc region of selected notothenioid species with differing life-history strategies and larval durations to elucidate the role of protracted larval phases and prevailing current systems in population structuring and, moreover, the influence of ecology and gene flow on the ongoing adaptive radiation of notothenioids in the Southern Ocean. We further prepared an extensive phylogenetic dataset to assess notothenioid relationships at the genus-level.

Work at sea

Demersal notothenioids were collected at Burdwood Bank, Shag Rocks, South Georgia, South Orkneys, South Shetlands, in the Weddell Sea (Larsen and Bendex areas) and off Bouvet Island employing bottom trawls and Agassiz trawls. In addition, pelagic species and larvae were caught using rectangular midwater trawls and bentho-pelagic nets. After each haul, fish were identified, sorted by species and individual biological data (total length, standard length, weight and if possible gutted weight, liver weight, sex, maturity stage, gonad weight) were taken. For population genetic and phylogenetic analyses, muscle tissue of up to 80 specimens per species and area was sampled and stored in 96 % ethanol. For selected species, additional tissue samples of muscle, liver and brain were taken for RNA analyses and stored at -20 °C in RNA later solution. Otoliths of the blackfin icefish *Chaenocephalus aceratus* were collected at South Georgia for later age determination.

Preliminary results

During ANT-XXVII/3 we collected tissue at 56 stations for genetic analyses from 1,503 individuals and 49 different species of the five notothenioid families Artedidraconidae

(10 species), Bathydraconidae (6), Bovichthidae (1), Channichthyidae (13) and Nototheniidae (19). In addition, tissue was sampled from gadids (1), liparids (1), macrourids (1), muraenolepids (4) and myctophids (1) that can be used as outgroups in phylogenetic analyses. Overall, we sampled 1519 individuals that represented important contributions to our existing population genetic and phylogenetic sample sets. The obtained specimens will allow comparative population genetic analyses of *Gobionotothen gibberifrons*, *Champsocephalus gunnari*, *Chaenocephalus aceratus*, *Pseudochaenichthys georgianus*, and *Chionodraco rastrospinosus* between the Antarctic Peninsula, the South Orkney Islands, and South Georgia. In addition, we were able to add eight notothenioid genera to our sample set (*Dacodraco*, *Akarotaxis*, *Prionodraco*, *Histiodraco*, *Dolloidraco*, *Cygnodraco*, *Patagonotothen*, and *Cottoperca*), which will allow more robust phylogenetic inference and molecular dating of the notothenioid radiation.

3.2 Climate depending processes in pelago-benthic coupling and food webs

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2) Alfred-Wegener-Institut
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4) Göteborgs Universitet - Sven Lovéncentrum för marina vetenskaper
5) Institut de Ciència I Tecnologia Ambientals - Universitat Autònoma de Barcelona
6) Centre d‘Estudis Avancats de Blanes-CISC

The marked environmental differences at the sea surface and close to the seabed inspire interesting questions about how the pelagic and benthic ecosystems work and connect between each other, especially in polar conditions where seasonality is intense in the upper layers of the water column and more constant in the benthic realm. These coupling processes have been studied at the high-latitude southeastern Weddell Sea, where complex epiphytic benthic communities with high biomass and diversity have evolved for thousands of years. The actual climate regime enables the assembly of several biological and physical mechanisms in such synchronicity that the seasonally limited pelagic primary production seems to be sufficient to fuel the rich benthic realm throughout the year due to the summer organic matter pulses enhanced by the wind and redistributed by near bottom currents and tides. These communities are also regulated by iceberg scouring, which regularly erodes the sea floor creating space for recolonization and stimulating the benthic community dynamics. Within this frame, zooplankton communities occupy a central position in the transmission of energy in the food web. Through intense vertical migrations along thousands of meters and by direct feeding relationships zooplankton could be the most dynamic biological agent in the benthic-pelagic coupling. Another important trophic linkage between the pelagic and the benthic part of the food web might be represented by krill and pelagic fishes as the main consumers of zooplankton.

At the western boundary of the Weddell Sea the anthropogenic influence on the global climate has triggered the collapse of ice shelves, which formerly limited primary production in the pelagic system and consequently the development of macrobenthic communities. Recent observations have revealed that since the collapse, pelagic primary production takes place and its consequent flux of organic matter to the seabed. On the one hand, pigment and fatty acid concentrations in the upper centimeters of the sediment column in the Larsen A and B embayments presented similar concentrations as in areas without ice shelf influences such as the Elephant and the South Shetland Islands. On the other hand, currents measured close to the sea floor presented a similar tidal pattern as those observed off Austasen in the southeastern Weddell Sea suggesting that there is enough energy to redistribute the settled organic matter and making it available for benthic suspension feeders.

Given the accelerating pace of climate change and the still lack of knowledge on the functioning of these Antarctic ecosystems, studies on benthic-pelagic coupling are becoming urgent to understand how the Antarctic shelf ecosystems will cope with ongoing environmental changes.

The aim of the present studies was to characterize a series of biological, (e.g. abundance, biomass and distribution of zooplankton and nekton including pelagic fishes, distribution of selected benthic organisms), chemical (e.g., organic matter content in the sediments), geological (e.g., particle fluxes) and physical (e.g., current velocity and direction) variables to assembly a comprehensive picture of the environmental frame that enable developing suspension feeder communities on the south eastern Weddell Sea shelf, where an artificial disturbance experiment was carried out 7 years ago and at the Larsen embayments A and B, where the collapse of the ice shelves took place 9 and 16 years ago, respectively. The strategy to accomplish with our main aim consisted in developing stations where a complete set of measurements could be carried out providing basis for a multidisciplinary holistic approach that may explain the present state and potential fate of the benthic communities in both regions.

3.2.1 Life cycle strategies of calanoid copepods

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Objectives

Polar ecosystems are strongly affected by the distinct seasonality in light regime, ice cover and, hence, primary production. Herbivorous copepod species, which dominate high-polar zooplankton communities both, in abundance and biomass, have developed specific life-cycle adaptations to utilize short-term food pulses and to endure periods of food scarcity during the unproductive winter season. Ontogenetic and seasonal vertical migrations associated with a diapause allow them to escape temporarily from unfavourable conditions. These diapausing copepod species migrate mainly as late copepodite stages to greater depths where they reside for several months in diapause characterized by low swimming activity, cessation of feeding, arrested development and reduced metabolic rates. They accumulate large amounts of depot lipids during spring and summer, almost exclusively composed of wax esters, in order to fuel diapause and reproduction in the following spring partly independent of food intake.

However, in contrast to the Arctic Ocean, only one calanoid copepod in the Southern Ocean, *Calanoides acutus*, has adopted this strategy for sure, *Rhincalanus gigas* is an uncertain ontogenetic migrant. Most Antarctic copepods apparently do not rely on resting stages; they remain active during winter and adjust their feeding behaviour.

Two essential issues related to diapause in calanoid copepods still remain enigmatic: (i) what external and/or internal factors trigger the start and the end of diapause and (ii) how do diapausing copepods with a reduced swimming activity regulate their buoyancy in order to remain at a certain depth over a long period of time.

Our preliminary studies on extracellular ion concentration and composition during the *Polarstern* expedition ANT-XXIII/7 in September-October 2006 showed high concentrations of ammonia/ammonium (NH_3/NH_4^+) in the haemolymph of *C. acutus* and *R. gigas*. All other species investigated did not show elevated ammonium concentrations in their haemolymph. The finding that high levels of ammonia are only found in species undergoing vertical ontogenetic migration, is evidence that ontogenetic migration is related to and/or relies on ammonia aided buoyancy. Dependent on the pH, ammonia exists in solutions as both, NH_3 and NH_4^+. NH_3 is more toxic than NH_4^+ and, in contrast to NH_4^+, it easily penetrates cell membranes. Due to the toxicity and the higher diffusibility of NH_3, we predict a low haemolymph pH in diapausing copepods to favour the formation of ammonium (NH_4^+).

Our studies during ANT-XXVII/3 aim to test the hypotheses on the role of ammonia for triggering metabolic depression and regulating buoyancy during the diapause of polar calanoid copepods during the transition from the summer to the autumn state. It is the first research cruise in the framework of the DFG funded project "Overwintering strategies in polar copepods: Physiological mechanisms and buoyancy regulation by ammonium" carried out in collaboration by AWI and Bremen University.

Work at sea & preliminary results

Ion and pH-regulation: To test the hypothesis that a low extracellular pH in the haemolymph of diapausing copepods is necessary to form NH_4^+ and to prevent it from diffusive loss we measured the extracellular pH and the haemolymph ammonia concentration in different copepod species. To measure the pH in small samples, we developed a new method based on the fluorescent dye HPTS and a nanodrop fluorometer. With this technique we were able to measure the haemolymph pH of copepods in samples from about 400 nl. All individuals of *Calanoides acutus* and *Rhincalanus gigas* had elevated haemolymph ammonia levels and low pH values ranging between pH 5.0 and 6.5 independent from ontogenetic state or sampling depth. In contrast, the pH in non-diapausing copepods was >7.5 and ammonia levels were below detection limits. However, there was no direct correlation between pH and ammonia concentration.

Respiration and excretion: Experiments were conducted with different species and ontogenetic stages of calanoid copepods in order to establish their metabolic activity in relation to ambient temperature, depth of occurrence, lipid content, extracellular pH, and ammonia concentration. Experiments concentrated on the target species *Calanoides acutus*, *Rhincalanus gigas* (both with low pHe and high ammonia concentration) and *Calanus propinquus* as control (normal pHe, low ammonia). The main hypothesis to be tested postulates that species undergoing seasonal/ontogenetic diapause that are characterized by low pHe and high ammonia concentration should show a reduced metabolic activity and, hence, lower respiration and excretion rates than individuals with normal pH and low ammonia levels that remain active during winter.

For the respiration measurements, individuals from different depth layers were incubated in gas-tight glass bottles for 6 to 24 hours depending on size, number of individuals and activity. Their respiration was continuously monitored by optode respirometry using three one-channel optode respirometers (Fibox, PreSens Regensburg). Usually, respiration measurements were carried out at simulated *in-situ* conditions regarding temperature and light. However, some experiments were run with increasing temperature in order to determine the metabolic response of copepods to elevated water temperatures. After the experiments, all individuals were deep-frozen at -80 °C for later determination of dry mass and biochemical composition (C/N ratio, lipid content and composition) in the home lab.

For the excretion analyses, individuals were starved for 24 hours, and then transferred into filtered seawater. The experiments were run at 1 °C for 24 hours. At the end the copepods were removed and the solution frozen at −20 °C for later determination of ammonium, urea, DON, nitrate and phosphate. The excretion rates will be calculated as the difference between dissolved ammonium in the control and experimental bottles before and after the experiment

Feeding and reproduction: The feeding activity of *Calanoides acutus*, *Calanus propinquus* and *Rhincalanus gigas* will be analyzed by the fluorescence method, which measures chlorophyll *a* and derived pigments in the guts of the animals. Individuals of different developmental stages were sampled from different depth layers and immediately frozen at −80 °C for later chlorophyll pigment determinations. *In-situ* egg production experiments were conducted with ripe females of *C. propinquus* and *R. gigas.* Females were incubated individually for several days, half of them fed with phytoplankton and half unfed. Every 24 hours the number of eggs was counted. Females of *C. acutus* did not have ripe gonads, and hence unripe females were fed with high concentrations of phytoplankton to check for potential maturation. No reproduction activity could be observed in *C. propinquus*. However, the fed females produced faecal pellets indicating feeding activitiy. In contrast, eggs as well as faecal pellets were clearly produced by fed *R. gigas*. In *C. acutus,* no development of the gonads and no faecal pellet production were observed. In addition to the experimental work, individuals of *C. acutus, C. propinquus* and *R. gigas* were preserved for analyses of lipids, fatty acids, proteins, stable isotopes ($\delta^{13}C$, $\delta^{15}N$), C/N and digestive enzymes. The animals were starved and then frozen at −80 °C.

Compound specific stable isotope analyses: The major aim was to reveal if triacylglycerol-storing copepods (*Calanus propinquus*) react faster to food availability than wax ester-storing copepods (*Calanoides acutus*).Triacylglycerol-storing copepods are more active during periods of food scarcity than wax ester-storing copepods. Major goal of the feeding experiments were to determine how quick the species with different lipid storing modes start feeding and metabolize internal stores. Carbon uptake, turnover and incorporation of dietary lipids into the internal lipid reserves of the copepods will be measured. Moreover, by using ^{13}C-labelled algae as tracer, information on the assimilation and turnover of individual fatty acid and alcohol compounds will be obtained.

For feeding experiments copepods were carefully collected by bongo net from various depths. For each feeding experiment 150 - 300 specimens were sorted into species (*C. acutus* and *C. propinquus*) and stages (copepodite stage V and females) and stored for 2 days in filtered seawater to empty their guts. Thereafter 20 to 50 copepods, depending on species size, were transferred into 1 L glass bottles, which contained a ^{13}C-enriched diatom culture, and kept for 14 days at dim light and 0 °C in a cool room. Subsamples were taken at day 0 (control, without any feeding), 1, 2, 4, 7, 11, and 14. For measurement of the total carbon 3-5 specimens were each placed in pre-cleaned tin cups and stored at -80 °C. The remaining specimens will be used for compound-specific isotope analysis and stored at -30 °C until analysis in Bremerhaven.

In total nine feeding experiments with copepods from different regions and live cycle statuses have been conducted. Five with *C. acutus* stage V, one with *C. propinquus* females and three with *C. propinquus* V. *C. propinquus* adults and stages responded clearly on food supply with production of faecal pellets. However the feeding activities were different in *C. acutus* depending on region. The specimens from the Larsen area seemed to be more active in terms of faecal pellet production compared to those from the South Georgia region, where less production was observed.

3.2.2 Particle fluxes and distribution of organic matter in sea floor sediments

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Objectives

Analyze grain size and organic matter contents in sediment cores to estimate the availability and potential nutritive quality of sediment for benthic consumers and to integrate the results into a comprehensive picture, which includes the benthic community characteristics.

Work at sea

A total of 14 multicorer (10 cm diameter) stations were developed. One of them off King George Island in the Bransfield Strait, 9 were located in the Larsen A, B and C areas, and the other 4 off Austasen on the southeastern Weddell Sea shelf including the BENDEX region. The set of stations in the Larsen embayments comprised 4 stations, which were visited during the expedition ANT-XXIII/8 enabling unique temporal comparisons of the distribution of organic matter throughout sediment cores after 7 years. The same holds true for one station within the BENDEX area. In addition, two 14- and 9-day moorings equipped with two sediment traps and current-meters were deployed to measure short time particle fluxes and current features in Larsen A and off Austasen, respectively.

Preliminary results

Preliminary results showed that the currents at the southern boundary of Larsen A followed a similar tidal pattern as previously found in Larsen B and the south-eastern Weddell Sea. Further it was found that at 237 m depth there is a flow with a resultant polar vector (Fig. 3.2.1) towards NE close to the shelf ice edge strongly suggesting that there is a connection between both embayments under the ice shelf between them, i.e. this ice shelf is thinner than 237 m. Sediment traps at both sites showed that within a 3-day collecting interval there was accumulation of material suggesting at least moderate particle fluxes, presumably related to the ending of the productive pelagic season.

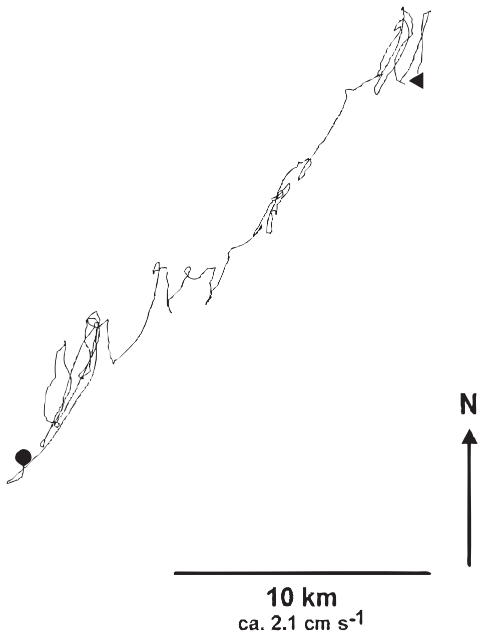

Fig. 3.2.1: Current patterns (polar vector plot) of a 14-day deployment in station Larsen A south at 237 m depth.

3.2.3 Diet and capture rates of microzooplankton in Antarctic and Subantarctic gorgonians

Sergio Rossi[1], Francyne Piera[1]*, Josep-Maria Gili[2]

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Objectives

There is increasing evidence that passive suspension feeders play a significant role in plankton–benthos coupling. Little is known about the diet and capture rates of Antarctic and Subantarctic diet and prey capture rates of passive suspension feeders (Orejas et al. 2001, Orejas et al. 2003). Most of the work has been made on experimental chambers, and little attention has been paid on the gut content studies. It has been shown that pulse-food feeding on microzooplankton is a key role in bentho-pelagic coupling processes (Gili et al. 1996, Rossi et al. 2004, Tsounis et al. 2006), and could be essential to better understand energy input in passive suspension feeders. In Antarctic waters, tidal currents may resuspend organic matter and be essential in zooplankton availability for benthic organisms (Isla et al. 2006). To increase our understanding of energy fluxes in Antarctic and Subantarctic ecosystems, we will examine the spatial temporal variability in zooplankton prey capture rates of several representative gorgonians.

Work at sea

Two different areas will be compared due to the gorgonian collections made during the cruise: Scotia Arc (Burdwood Bank and Shag Rocks), and the eastern Weddell Sea (Austasen) (see Table 3.2.1). Samples have been collected with Agassiz trawl or Bottom trawl, depending on the regions. At each station several colonies were sorted (minimum 10, maximum 15 per species and station) and a small apical piece was fixed in 7 % formaldehyde (total colonies sampled = 163). The fragments were immediately placed in the seawater formaldehyde solution to prevent further digestion.

Table 3.2.1: Sampled populations during the ANT-XXVII/3 cruise for gut contents of different gorgonians species

Area	Zone	Stations	Species	Depths (m)
Scotia Arc	Burdwood Bank	208-2 208-3 208-6	*Armadillogorgia sp.*. *Ophidiogorgia sp.*	280 304 299
	Shag Rocks (South Georgia)	211-5 211-6 211-7 211-8	*Thouarella viridis.* *Thouarella sp.*	320 290 305 310
East Weddell Sea	Austasen	265-2 286-1	*Notisis sp.* *Thouarella sp.* *Primnoisis sp.*	250 570

Expected results

Feeding on zooplankton will be assessed by means of gut content examinations of apical fragments. The contents of 100 - 150 polyps selected at random from each sample and species (ten from each apical fragment) will be isolated by dissection under a binocular microscope, identified to the higher taxon level and counted. The length of all prey will be measured under the microscope. The work will be carried out in the ICM-CSIC laboratories.

3.2.4 Food capture rates and trophic markers in *Anthomastus bathyproctus*: spatial comparisons at King George Island

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Objectives

During the expeditions EASIZ II and EASIZ III carried out with *Polarstern*, a prey, was observed in the gastrovascular cavities of octocorallian Anthomastus bathyproctus colonies (Gili et al. 2006), which was never described before. These results suggest that salps may play an important role as a direct grazer of phytoplankton produced in the surface layers of the water column and being directly transferred to *A. bathyproctus*. An important part of the fresh content of the salps will be assimilated by the octocorallians. Primary production is captured by a benthic suspension feeder through these salps, bypassing the faecal pellet rain. The combined filtering activity and vertical migration of salps produces an 'elevator effect', which reduces the loss of energy through this short food chain, thus making the exchange between top and bottom layers more efficient. The aim during the present ANT-XXVII/3 cruise was a spatial comparison of the gut content, fatty acid markers and stable isotope signal to 1) assess the frequency of capture rates at similar depths, 2) better describe the diet of this alcyonarian, and 3) assess potential differences in the energy transfer and energy storage comparing different areas using indirect methods (i.e. biochemical balance, fatty acid composition and concentration, stable isotope signals). The final target is to make a more accurate study on the variability of energy budgets of this kind of passive suspension feeders in Antarctic environments.

Work at sea

Samples have been collected at King George Island with Agassiz and Bottom Trawls (stations 222-5, 222-6, 222-7), depending on the regions (depths 440 m, 470 m and 470 m, respectively). At each station several colonies were sorted (minimum 12, maximum 20 per station), fixing one piece with formaldehyde (7 %) and freezing the other piece (total colonies sampled = 69). The fragments for gut contents were immediately placed in a seawater formaldehyde solution to prevent further digestion, whilst the biochemical material was deep-frozen.

Expected results

Colonies will be analysed with a binocular microscope for gut content as explained above in the ICM-CSIC laboratories. Biochemical balance (carbohydrate, lipids and protein concentration) will be analyzed in the ICTA-UAB dependencies following Rossi et al. (2006a) protocols. The fatty acid composition and concentration will be analyzed also in the ICTA-UAB laboratories using a Thermo Trace GC instrument fitted with a flame ionization detector, and a DB–5 Agilent column (30 m length, 0.25 mm internal diameter and 0.25 µm phase thickness) and following the Rossi & Fiorillo (2010) protocol with changes (see Gili et al. 2006 and Rossi et al. 2006b for the tissue treatment). Stable isotope analysis will be made following the Jacob et al. (2005) procedures with an Agilent IRMS instrument.

3.2.5 Starvation and pulse food response in Antarctic ophiuroids: an experimental approach

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Objectives

It is widely accepted that, although there is a marked seasonality due to the physical constraints in the Antarctic surface waters (Cripps & Clarke 1998), there is a rich available food content in marine sediments to feed the benthos throughout the year, originated by primary production and remaining for long periods as a consequence of low degradation rates due to the low temperatures (0 ºC to -2 ºC) of Antarctic near-bottom waters (Gutt et al. 1998; Isla et al. 2006). Fatty acids and total lipids mark the quality of phytoplankton (and seston) material from the surface primary production when settling onto the bottom. Even if there is available food especially in summer and autumn, food becomes scarcer in autumn in Antarctic waters due to the bacterial activity and the consumption of resuspended matter by benthic organisms (Isla et al. 2011). It is realistic to think that in late winter early spring, even vagile benthic organisms such as ophiuroids would have food constraints and in some case would have to use the stored energy to face starvation periods. Recent experiments showed this possibility in benthic suspension feeders (Gori & Rossi unpublished data). The aim of the presented experimental set is 1) to observe the potential decay of lipids (and specifically fatty acids) in Antarctic brittle stars in a forced starved situation and 2) to analyse its response to a sudden pulse of available food and the potential biomarker transfer from the seston to the animals. The final target is to better understand response to non-continuous food (patchy distribution of available food and potential asymmetry of resuspension in different areas and seasons) presence in the Antarctic benthos.

Work at sea

Ophiuroids were chosen for this experiment because 1) they are representative for the Antarctic soft bottoms, and 2) they are quite resistant to stress from trawling. The brittle star *Ophionotus victoriae* was taken due to its abundance in the Larsen A area (station 228-4, 320 m depth). Twenty one ophiuroids were sorted and immediately put in an aquarium (40 liters) with seawater in a 0º C cold chamber. The current in the aquarium (electric pumps) was 1 - 3 cm s^{-1}. Three animals were immediately frozen (time point zero) for the biochemical analysis. Three animals were picked up each time after three and ten days. Then animals were divided in two treatments for the food pulse: 1) Six on an aquarium in which we put sediment from the Larsen A area (MUC station, 231-5), and 2) Six on an aquarium with sediment from Larsen A area enriched with a *Thalassiosira* sp. (diatom) culture (20 litres of seawater + 20 litres of culture). In both cases, water was sampled and filtered with glass fibre filters (3 x treatment). Twelve and 48 hours after the food pulse, three ophiuroids of each treatment were picked up and immediately frozen.

Expected results

All analysis will be made in the ICTA-UAB (Sergio Rossi) and the AWI (Martin Graeve) dependencies. Biochemical balance (Rossi et al. 2006a) and fatty acid analysis (Rossi and Fiorillo 2010) will be performed in the filters and in the ophiuroid tissue following the above mentioned protocols.

3.2.6 Bentho-pelagic coupling processes observed in space and time: Comparison of biochemical balances, fatty acid composition and stable isotope analysis in different Antarctic and sub-Antarctic areas

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Objectives

One of the lesser-known facts in Antarctic benthic organisms is undoubtedly the response capacity of energy storage of these organisms in different environmental conditions and in different seasons (Gili et al. 2001). Both the gonadal production and state of health of cnidarians, echinoderms or ascidians (to give some examples), will depend on the quantity, quality and availability of food around them as well as abiotic factors such as temperature or salinity. It has been proved that different food availability indeed affects population dynamics (Gardner 2000). Recent investigations suggest for example that even if the food source is the same (through the stable isotope analysis), Antarctic gorgonians may have significant different energy balances and energy storage capabilities depending not only on the species but also on the area, where they are sampled (Rossi & Piera unpubl. data). The stable isotope signature may also change through the time and space when different populations with different food strategies are considered (Rossi & Tsounis 2007, Gori et al. submitted).

The aim of the present work is to determine the plastic energetic response in different taxonomic groups in different areas of the Scotia Arc, Antactic Peninsula, eastern Weddell Sea, and Bouvet Island and different times [comparing samples of 2003-2004 (spring-summer) with samples of 2011 (summer-autumn)] that potentially differ in terms of food availability. The hypothesis is that patchiness of the different communities could be also due to different food constraint features that can be checked by comparing the biochemical balance, fatty acid composition and stable isotope relationships due to the "memory" of such variables throughout the time.

Work at sea

Four different areas will be compared due to the different taxa collection made during the cruise: Scotia Arc (Burdwood Bank, Shag Rocks, South Georgia, South Orkney; N= 471), Antarctic Peninsula (King George Island, Larsen A, B, C; N= 702), eastern Weddell Sea (Austasen; N= 471) and Bouvet Island (N=60) (see Table 3.2.2). Samples have been collected with Agassiz trawl or Bottom trawl, depending on the regions. At each station several organisms were sorted (minimum 3, maximum 40 per species and station), fixing with absolute ethanol a small piece (total colonies sampled = 430).

Expected results

Samples will be analysed in the ICTA-UAB laboratories. Biochemical balance will be analyzed following Rossi et al (2006) protocols (carbohydrate, lipid and protein concentrations). The fatty acid composition and concentration will be analyzed also in the ICTA-UAB laboratories using a Thermo Trace GC instrument fitted with a flame ionization detector, and a DB–5 Agilent column (30 m length, 0.25 mm internal diameter and 0.25 µm phase thickness) following the Rossi & Fiorillo (2010) protocol with changes (see Gili et al. 2006 and Rossi et al. 2006b for the tissue treatment). Stable isotope analysis will be made following the Jacob et al. (2005) procedures with an Agilent IRMS instrument.

Tab. 3.2.2: Sampling stations

Area	Stations	Taxa	Depths (m)
Scotia Arc	208-2, 208-3, 208-6, 211-5, 211-6, 211-7, 211-8, 214-1, 214-2, 214-5, 217-5, 217-6	*Porifera, Cnidaria, Acidiacea*	From 270 to 390
Antarctic Peninsula	222-5, 222-6, 222-7, 226-7, 228-3, 228-4, 231-3, 237-2, 238-3, 248-2, 248-3, 250-6, 252-3, 252-7, 257-2	*Porifera, Cnidaria, Echinodermata, Ascidiacea*	From 170 to 570
East Weddell Sea	260-6, 265-2, 275-3, 281-1, 284-1, 286-1, 291-1, 292-2, 294-1, 301-1	*Cnidaria, Echinodermata, Pterobranchia, Ascidiacea*	From 250 to 570
Bouvet	312-2, 312-3, 312-4	*Cnidaria, Bryozoa, Echinodermata*	From 260 to 290

3.2.7 Benthic boundary layer dynamics

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Objectives

Antarctic marine life is believed to be governed by the strong seasonality in primary production, resulting in an ample supply of pelagic food to the benthos during the sun-lit summer season and a presumed paucity of food in the dark and ice-covered winter months. Long periods of food deprivation are difficult, however, to reconcile with the observed richness of benthic suspension-feeder communities in many parts of the Antarctic, suggesting that mechanisms may be at work to suspend organic material from the "food banks" previously deposited during the productive period, thus extending the availability of suspended food beyond the pelagic production period. Although tidally induced motions are known to be able to resuspend bedload materials, data on the short-term variability of currents and material supply in the benthic boundary layer near Antarctic sponge beds are so far lacking. The objective of this study was to close this gap and relate boundary layer findings to the processes in the overlaying water column.

Work at sea and preliminary results

Short-term deployments of a benthic boundary layer mooring (BBLAM) were carried out during the cruise. The custom assembled BBLAM system consists of a steel frame deposited on the bottom carrying diverse scientific instrumentation and a steel frame suspended aloft carrying an upward-looking 150 kHz ADCP. A thermistor string with SBE39 temperature loggers spaced at 20 m depth intervals was either attached to the BBLAM or deployed separately at 1 cable distance. The bottom frame held an upward-looking 1,200 kHz ADCP, a CTD equipped with oxygen, pH, chl *a* fluorescence and optical backscatter sensors. Furthermore, it contained two autonomous samplers: a Remote Access Sampler (RAS) collecting up to forty-eight 300 ml water samples at hourly intervals, and a Zooplankton Sampler (ZPS) collecting up to 50 zooplankton samples of 100 - 250 l volume on the meshes of a windowed belt. The BBLAM was deployed with an anchor stone on the sea floor and collected data and samples for periods of one to five days (thermistor chain up to 14 days), at hourly and minute intervals, respectively.

After trial deployments at King George Island, the BBLAM was deployed six times: in the Larsen region, once in every of the three areas (A, B, C). The other three deployments were carried out in the BENDEX area: one near the disturbance experiment, another further south near the grounding line of the Ekström Ice Shelf off Austasen, and the third deployment east of the BENDEX disturbance experiment near the iceberg cemetery.

The time-series collected by BBLAM were complemented by spatial information on water properties in the boundary layer near the sea bed collected with a bottom water sampler (BWS). The BWS is an array of five niskin samplers at 0.2 – 0.35 – 0.65 – 1.25 -2.20 m above bottom. Niskins are triggered synchronously and samples retrieved on deck. In addition to the BBLAM stations, above, BWS samples were obtained from King George Island, Larsen A north, and Larsen B west.

Although there are gaps in the data and sample sets due to malfunctioning of instruments (CTD: junk data in the later parts of many deployments; ZPS: no samples in the early deployments, occasional failures in the other instruments), the temperature logger and ADCP data revealed significant fine-scale variability associated with tides, with the potential of sustained resuspension events in the area. Analyses of samples and data will be correlated with the ROV data on benthic communities to assess the relation of the dynamic events and suspension feeder communities on benthic-pelagic coupling.

3.2.8 Fish and krill

Katja Mintenbeck, Sören Krägefsky Alfred-Wegener-Institut

Objectives

High Antarctic nekton communities are distinctly dominated by krill (*Euphausia* spp.) and the Antarctic silverfish *Pleuragramma antarcticum*. Both represent a major food source for a multitude of predators, including warm-blooded vertebrates as well as demersal fishes. Krill as well as *P. antarcticum* are known to undertake daily vertical feeding migrations within the water column (e.g. Swadling 2006, Plötz et al. 2001, unpublished data) thereby contributing to bentho-pelagic coupling. The aim of the present study was to investigate abundance, distribution and migration behaviour of *P. antarcticum* and its potential interaction with krill.

Work at sea

A combined approach of trawling and hydro-acoustic devices was conducted to study the nekton community. Hydro-acoustic surveys were performed in the western (Larsen A) and eastern Weddell Sea with a ship-mounted multifrequency echosounder (Simrad EK60) with frequencies 70 and 120 kHz. Calibration of the echosounder was done using standard calibration spheres on the 4th of April 2011. For species identification and determination of their abundance, biomass and species length distribution, trawls were carried out during the hydro-acoustic surveys (3 hauls in the western and 13 hauls in the eastern Weddell Sea). Some additional hauls were conducted without hydro-acoustic support.

Hauls were carried out in the free water column on the high Antarctic shelf using a bentho-pelagic net (BPN; opening width 25 m, cod-end mesh size 10 mm). Trawling duration (at depth) was between 15 and 30 min in most cases. Fish, krill and zooplankton were identified, counted and weighed. Individual length and weight data were exclusively collected from fishes.

For stationary hydro-acoustic measurements covering at least a full day record (daily cycle) an upward looking multifrequency echosounder moored near the bottom was deployed additionally during 6 short-term moorings at several locations around King George Island and the BENDEX and Larsen areas.

Preliminary results

In the western Weddell Sea (Larsen area) biomass of the BPN catches were distinctly dominated by ice krill, *Euphausia crystallorophias*, and different life stages of *P. antarcticum*. Early stages and adult *P. antarcticum* were separated within two different depth layers, shown as two distinct sound scattering layers in the hydroacoustic record (Fig. 3.2.2). Larvae and early juveniles were found near the surface in about 20 m water depth. Adults showed an overlapping depth distribution with ice krill, both contributing to the sound backscattering in a patchy sound scattering layer between 60 and 200 m. Length frequency distribution of *P. antarcticum* in these two depth layers is shown in Fig. 3.2.3 (early larvae excluded). In the area of Larsen C juvenile specimens of the cryopelagic fish *Pagothenia borchgrevinki* were associated with swarms of *E. crystallorophias* in about 100 m water depth.

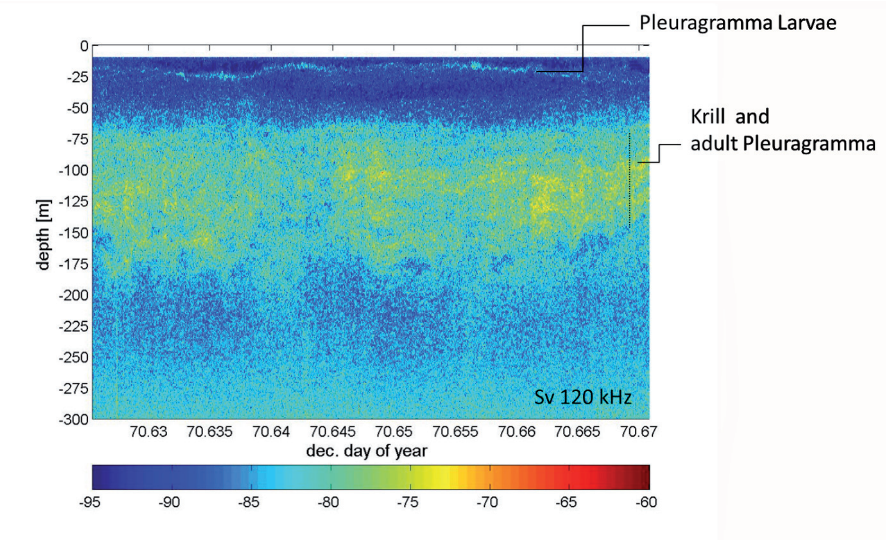

Fig. 3.2.2: Hydro-acoustic record (Mean Volume Backscattering strength (Sv) at 120 kHz) in the Larsen area on 12 March 2011 (decimal day 70 of year 2011) showing two distinct sound scattering layers. In the shallow (narrow) layer Pleuragramma larvae were found. In the patchy sound scattering layer between 60 and 200 m adult P. antarcticum and krill (predominantly Euphausia chrystallorophias) contribute to the sound backscattering.

In the eastern Weddell Sea off Austasen different depth layers of the water column between 50 and 300 m were trawled during the day and during the night. The composition of catches was the same in all depth strata, with krill (*E. superba* and *E. crystallorophias*) and jellyfish dominating the biomass. Beside these, gelatinous zooplankton, polychaetes, pteropods, amphipods and notothenioid fish larvae (Artedidraconidae, Bathydraconidae, Channichthyidae, Nototheniidae) were present in all catches. Single adult icefishes (Channichthyidae) were caught in two hauls. Except for a few larvae, *P. antarcticum* was absent in this area. The composition of catches was similar between day and night.

Southwest of Kapp Norvegia the water column was trawled between 100 - 200 m during the night. In 100 m water depth the caught biomass was low and the community was numerically dominated by salps and early life stages of notothenioid fish including early juveniles of *P. antarcticum*. The catches in the 150 to 200 m water layer were dominated by high amounts of krill (*E. superba* and *E. crystallorophias*) and late juveniles of *P. antarcticum* (7-13 cm standard length), early juveniles were rarely presented. Additionally, some adult icefishes and notothenioid larvae were caught.

Back in the home lab the data will be analyzed more detailed for horizontal biomass distribution and for the vertical and horizontal migration and shoaling behaviour of *P. antarcticum* and krill.

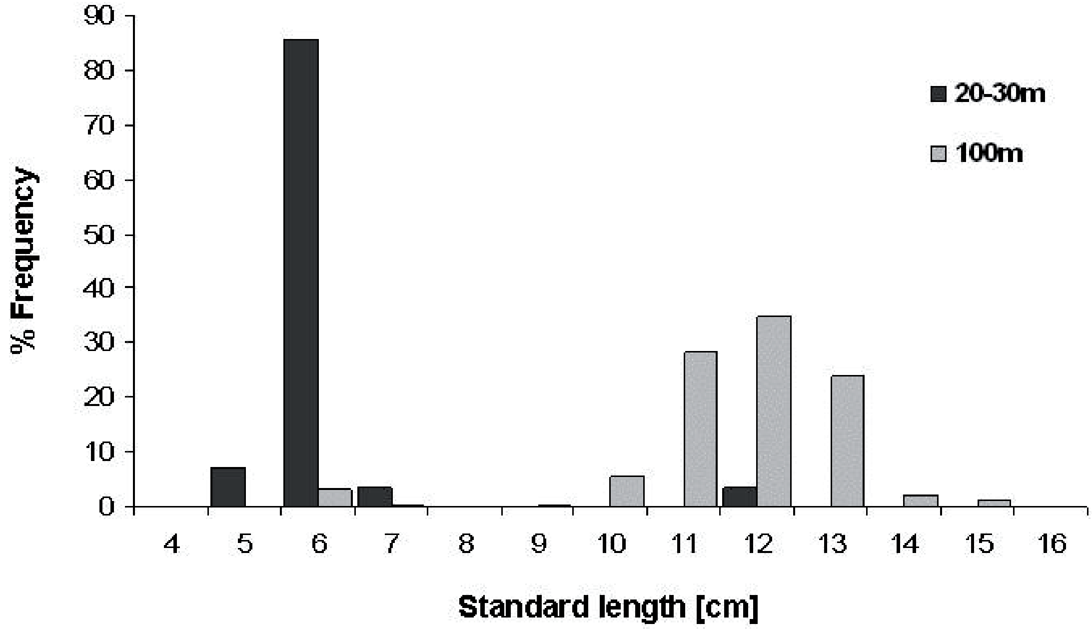

Fig. 3.2.3: Length frequency distribution (standard length, centimeter below) of P. antarcticum caught in two different depth layers during the hydro-acoustic survey in the western Weddell Sea. Early larvae were excluded as the mesh size of the BPN is not appropriate for representative sampling of small-sized larvae.

3.2.9 Functional response of demersal fish to a changing environment

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Objectives

Predator-prey interactions are the driving factors determining food web complexity. Changes in the abiotic environment (e.g. due to climate change) might affect behaviour and fitness of individuals either directly at the physiological level or indirectly through changes in feeding relationships. Functional response experiments are a useful tool to investigate the force-power of predation in shaping the dynamics of prey populations and to identify the mechanisms underlying predator-prey dynamics. In general, functional response describes the relationship between predator feeding rates and prey density. According to Holling (1965) at least three types of predatory feeding behaviour (and thus three different shapes of the relationship) are distinguished: type I is a rare linear relationship and only found in aquatic filter-feeding invertebrates; type II represents a hyperbolic relationship which is found in predators which are constantly feeding at the same level, i.e. the risk of mortality for a particular prey individual decreases with increasing prey density; type III relationships have a sigmoid shape and were supposed to be characteristic for stable predator-prey dynamics at low prey densities (Hassell 1978). As individuals of different species might response differently to fluctuations in their abiotic and biotic environment the shape of the relationship and thus the type of the functional response are most likely species-specific.

Data on functional response measurements of demersal fishes are extremely scarce, and do not at all exist for Antarctic species. In particular off the western Antarctic Peninsula the marine environment is changing due to increasing temperatures followed by increased glacial melting and a reduction of sea water salinity, and these changes are already reflected in the composition of the biotic community (e.g. Moline et al. 2004). In particular organisms living in shallow water might be affected by these changes in the abiotic environment, either directly or indirectly.

Work at sea

Feeding experiments were carried out to study the functional response of the demersal fish *Notothenia coriiceps*, a nototheniid fish species that is common in shallow waters. Individuals were caught by means of traps in the Potter Cove (King George Island, Antarctic Peninsula) between 5 and 25 m water depths in January 2011. As *N. coriiceps* is known to feed mainly on amphipods (Linkowski et al. 1983), the gammarid *Abyssochomene pleps* (length 1 - 2 cm) caught by means of traps near South Georgia were used as live prey species in the experiments.

Fish were kept starving for one month in seawater tanks at the temperature of its natural habitat (about 1.7 °C). For the experiments, 18 individuals were weighed and measured, and transferred individually into 18 l aquariums at constant dimlight conditions and allowed to acclimate for 24 h before the experiment started. 6 different prey densities (N = 5, 10, 100, 150, 200, and 250) were used in the experiments, each of which with 3 replicates. The amphipods were added to the aquarium and time duration until all prey was ingested was noted. Maximum duration of each experiment was 12 h. This long maximum duration allows identifying the absolute saturation plateau of the functional response curve at high prey densities. Remaining amphipods that were not ingested were removed, separated into dead and alive ones, and counted.

Preliminary results

The experiments on board were used to get first insights into the general feeding behaviour of *N. coriiceps*. In the first few minutes feeding was observed to be very aggressive and voracious with extremely high feeding rates followed by vomiting, often more than once. After the first vomiting, feeding activity slowed down; some of the fish were some kind of lethargic for several minutes before continuing to feed. Some fishes ingested more than 200 amphipods within the 12 h period. The saturation plateau, i.e. the mean maximum number of prey ingested at high prey densities, was at 165 amphipods (Fig. 3.2.4).

The highest feeding activities were observed within the first 7 h of the experiments, with a maximum activity during the first 2.5 h. Within this period fishes showed maximum ingestion rates of up to a mean of 20 amphipods per 0.5 h (see Fig. 3.2.5).

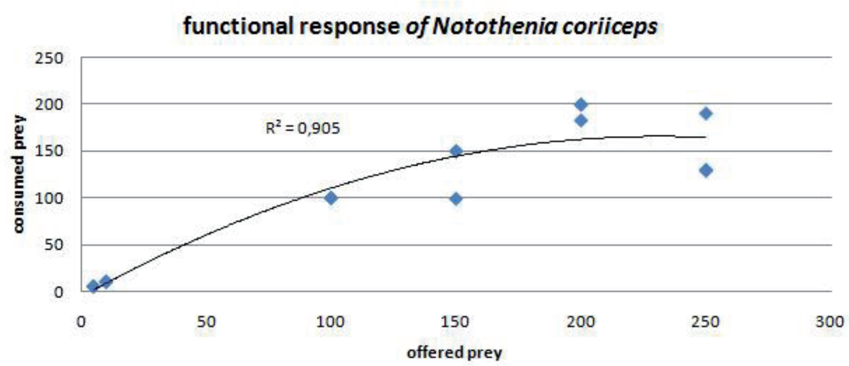
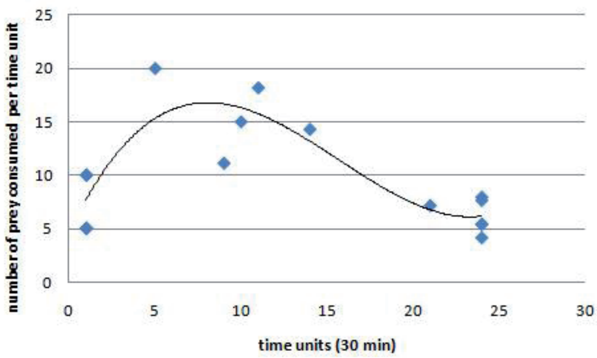


Fig. 3.2.4 Functional response of Notothenia coriiceps depending on prey densities

Fig. 3.2.5 Relative number of prey consumed each per time unit. The number of prey consumed was independent from prey densities offered to the individuals.



Further experiments will include (1) a repetition of the above described experiment with fishes held at a higher water temperature to analyze whether the functional response of *N. coriiceps* is temperature dependent; and (2) similar experiments at different temperatures but with smaller gaps between prey densities and a reduced maximum experimental duration of 30 min. These future experiments will allow the calculation of coefficients necessary for the determination of the functional response type (I-III) and its temperature dependency.

3.2.10 Ecophysiology of peracarid scavengers

Henri Robert[1], Fabienne Nyssen[2]*
*not on board

1) Institut Royal des Sciences Naturelles de Begique
2) Université de Liège

Objectives

With over 850 named species, amphipods are the most speciose animal group in the Southern Ocean, being present at all depths, in all environments and occupying a vast array of trophic niches. The high species richness of amphipods and the dominant role they play in the (sub-) Antarctic ecosystems justifies in depth ecological and biological studies on these crustaceans. Such studies should be carried out without delay, since the biota of the Southern Ocean is expected to undergo major anthropogenic alterations in the near future. There is strong evidence that large food particles ("large food falls") play a significant role in the vertical flux to the sea bottom. On the one hand, there are, albeit few, reports of the encounter of such large food items on the sea floor such as big marine mammal carcasses, fishes, large pelagic invertebrates or their remains. On the other hand, well-developed associations of highly mobile scavengers are present on shelf and deep sea bottoms throughout the world oceans. Those associations are composed mainly of peracarid crustaceans, amphipods and isopods. For about 10 years, University of Liège, in close collaboration with the Royal Belgian Institute of Natural Sciences (RBINS), has been involved in the study of amphipods of the Southern Ocean. Our team is particularly interested in the trophic ecology of amphipods belonging to this pre-cited scavenging trophic guild. Because of the importance of some isopod species in scavenging activities, we have extended our interest to peracarids in general. The trophic link between the pelagic and benthic scavenger assemblages formed by large food falls has been understudied in marine ecological and carbon/energy cycling research, despite its potentially great significance in marine systems, especially at greater depths. Trophic ecology of scavengers is quite particular and they show some interesting features as, for example, a strong resistance to starvation, a very low turnover as well as a unique fatty acid composition, which appears to be a constant.

For an improved understanding of the fate of organic matter in marine food webs, investigation is needed to obtain specific trophic markers. Such markers should be stable during their transfer through the food chain. Unfortunately, stable markers are probably not available, and a combination of different methods, such as fatty acid trophic markers, stable isotope ratios, gut contents, and genetic markers, as well as lipophilic anthropogenic substances (e.g. PCB), appear to be more useful to overcome problems that may arise using a single method. A promising approach in the evaluation of the fate of lipids during feeding is the use of labelled specific fatty acid in diets. Therefore, for this study we focus on the carbon transfer from diet to scavengers at different levels by the use of a ^{13}C labelled diet. Special emphasis is placed on assimilation and incorporation of dietary fatty acids into scavengers' lipids and on *de novo* fatty acid biosynthesis. The application of ^{13}C labelled food makes it possible to follow directly the pathway and transfer of carbon and individual compounds into crustaceans in contrast to previous studies where only changes in composition were taken as evidence for these processes. Our experiment focuses on oleic acid that dominates drastically the fatty acid composition in scavenging crustaceans.

Work at sea and respected results

Scavenger peracarids were collected from the shelf area in the vicinity of South Georgia, King George Island, the Larsen "C" area and the BENDEX area using baited traps. These traps were sent to the sea floor attached to a lander specifically designed to catch amphipods and, at other stations attached to traps designed to catch fish (with a similar hydroacoustic system to release the lost weight and bring the lander back to the surface, see Table 3.2.3). After each catch, animals were immediately transferred into cool container, sorted and identified. While most specimens were properly fixed and stored for further specific trophic marker analyses (stable isotopes, fatty acid, genetic analysis and PCBs analysis), 150 amphipod *Abyssorchomene plebs* and 150 Isopods *Natatolana obtusata* were kept alive for feeding experiments.

Experiment N°1

A system of four aquaria was set in a +0,5 °C and dim light environment, two of these aquaria for isopods and the other ones for amphipods. Each aquarium contained 25 individuals and for each taxon one aquarium was a "Control" sample and the other one the "Experimental" sample. After the catch, a short starvation period of five days was performed before starting the feeding experiment. After that (day 0) each aquarium received a daily amount of prepared food (earth worms) for 30 days. The control sample received normal worms and the experimental sample was fed with worms enriched with ^{13}C labelled oleic acid. From day 31 to day 48 animals received no food at all. During the first phase of the experiment, one individual was taken from each aquarium at day 0, 1, 2, 4, 6, 8, 10, 15, 20, 25 and 30. During phase 2, individuals were taken at day 32, 34, 36, 38, 40, 45 and 48. All along the experiment, specimens were deep frozen and stored at -80 °C for further analysis at ULG.

Experiment N°2

Another system of two aquaria was set in the same environment as experiment N°1 (see above). One aquarium contained 25 amphipods and the other one 25 isopods. After a starvation period of seven days, both amphipods and isopods were daily fed with worms enriched with 13C labelled oleic acid. From the first day of feeding (day 0), 3 individuals were taken from each aquarium and again at day 1, 2, 4, 7, 11, 14, 20 and 25.

All specimens were deep frozen and stored at -80 °C for further analysis at ULG.

Tab. 3.2.3: The list of stations where peracarid scavengers were sampled

Area	Station	Gear	Depth
South Georgia	214-6	Amphipod trap	266 m
South Georgia	215-1	Fish trap	347 m
King George Island	223-1	Fish trap	1020 m
Larsen "C"	243-6	Amphipod trap	349 m
BENDEX	273-1	Fish trap (lost)	
BENDEX	290-1	Amphipod trap (on mooring)	214 m

3.3 Impact of climate change on cold adapted organisms

Daniela Storch, Rainer Knust Alfred-Wegener-Institut

The effects of climate change on marine ecosystems are expected to be particularly strong in Antarctic areas, associated with specific patterns of climate variability and change. Due to the adaptation to low water temperature a large fraction of Antarctic organisms is especially sensitive to this on-going climate change. The response of dominant species and their capacity to adapt to rising temperatures may modulate food web and energy flow processes. Environmental conditions may thereby contribute to bio-geographical patterns and their possible shifts in near future. In a multi-factorial approach, field and experimental studies on board of *Polarstern* were integrated to elucidate the impact of temperature on individual organisms living in sub- and high-Antarctic regions. On this cruise the challenge was to unravel different adaptation strategies of selected organisms (fish, cephalopods and crustaceans), especially by comparing thermal responses along the latitudinal gradient from the Scotia Arc and the Antarctic Peninsula down to the high Antarctic of the western and eastern Weddell Sea. The hierarchical systems approach of this chapter integrates physiological, metabolic and genetic processes, from the molecular and cellular level to whole organisms at different live stages and populations to understand ecosystem functioning.

3.3.1 The impact of environmental change on the Antarctic silverfish *Pleuragramma antarcticum*

Katja Mintenbeck Alfred-Wegener-Institut

Objectives

The Antarctic silverfish, *Pleuragramma antarcticum* (Notothenioidei), is one of the few truly pelagic fish species on the high Antarctic shelf and represents a key component in the food web by providing a major trophic link between zooplankton, and piscivorous fishes and warm-blooded predators (seals, seabirds and penguins). *P. antarcticum* is a shoaling fish species and dominates the pelagic fish biomass in water masses above the high Antarctic shelves by > 95 % (Hubold & Ekau 1987). In the Drescher Inlet (eastern Weddell Sea) *P. antarcticum* was found to undertake extensive nocturnal vertical migrations from the sea floor to the upper water layers, where the dense shoals provide an easy accessible food source for seals (Plötz et al. 2001, unpublished data). In case this species gets lost from the system no other species will be able to provide full functional compensation in terms of size, energy content, abundance and availability for predators. *P. antarcticum* is thus a key species in the high Antarctic food web and occupies a similar ecological position as krill, *Euphausia superba*, does in the seasonal sea ice zone (Hureau 1994).

Climate change in the Antarctic is not a future scenario but a fact, in particular off the western Antarctic Peninsula where increasing temperatures, reduced sea ice and reduced sea water salinity due to increased glacial melt water run-off apparently caused shifts in species composition in the phyto- as well as in the zooplankton community (e.g. Atkinson et al. 2004, Moline et al. 2004). Despite its importance, almost nothing is known about the potential vulnerability of *P. antarcticum* to environmental changes or fluctuations (biotic and abiotic). Accordingly, the aim of the present study was to get first insights into the potential vulnerability of this pelagic Antarctic key species and to investigate if differing environmental conditions affect fish condition and performance.

Work at sea

P. antarcticum was mainly sampled by means of a bottom trawl (BT) and a bentho-pelagic net (BPN). Fishes were measured (total length, TL & standard length, SL) and weighed. Abundance and biomass data from each catch were standardized to an area of 1,000 m^2. Stomachs for dietary analysis and otoliths for determination of age and yearly and/or daily (in larvae and early juveniles) growth increments were taken from subsamples in each region where *P. antarcticum* was caught. Additionally, liver and muscle samples were taken for the analysis of lipid content and lipid and fatty acid composition. To compare the condition of individuals between the different sampling locations, the condition index K was calculated (K= (gutted weight/(SL^3))*100). Data on water temperature and salinity are available for all sampling areas from the CTD.

Preliminary results

P. antarcticum was caught south of the South Orkneys, at King George Island, in the western (Larsen area) and in the eastern Weddell Sea. Individuals were found in water masses with temperatures ranging from +0.6 (King George Island) to -1.92 °C (Larsen) and a salinity of 34.3 to 34.6. Mean abundance and biomass per 1,000 m^2 was highest at King George Island (Table 3.3.1). In the western and eastern part of the Weddell Sea abundance and biomass in catches varied strongly.

Tab. 3.3.1: Mean abundance and biomass (standardized to 1,000 m^2) ± standard deviation in catches at different regions of the Southern Ocean. Catches where P. antarcticum was absent were not considered. BT = bottom trawl, BPN = bentho-pelagic net.

	South Orkneys	King George Island	Western Weddell Sea	Western Weddell Sea	Eastern Weddell Sea
No. of trawls	1 BT	2 BT	4 BT	4 BPN	4 BPN
Abundance	1,37	4,92 ± 0,39	0,40 ± 0,44	2,84 ± 2,64	3,46 ± 2,73
Biomass	42,35	118,55 ± 6,86	8,69 ± 11,25	26,28 ± 41,22	24,37 ± 29,85

On the shelf of the South Orkney Islands 2 cohorts were found, with larger individuals between 13 and 17 cm SL dominating. At King George Island most individuals were between 11 and 16 cm SL, smaller individuals were rarely presented. In the western part of the Weddell Sea (Larsen area) three cohorts were found, larvae (larvae not shown in Fig. 3.3.1), early juveniles (5 - 6 cm SL) and adults. In the eastern Weddell Sea (southwest of Kapp Norvegia) individuals were mainly between 7 and 11 cm SL, only few larvae were found.

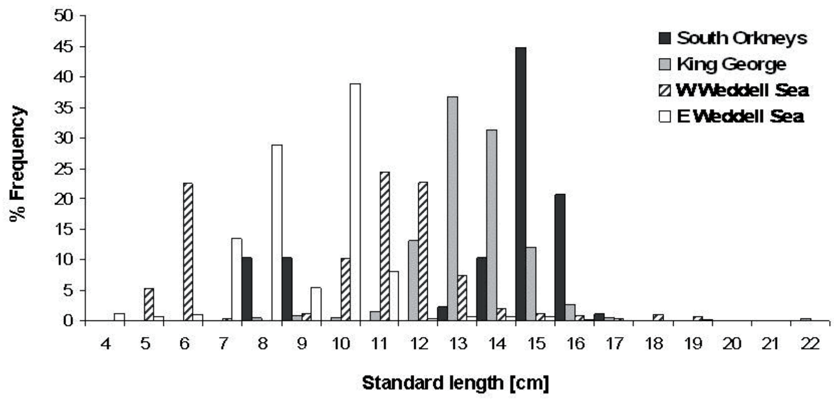


Fig. 3.3.1: Length frequency distribution (standard length, cm below) of P. antarcticum caught in different regions of the Southern Ocean. Early larvae (<4 cm SL) were excluded as the mesh size of the gears is not appropriate for representative sampling of small-sized larvae.

Comparison of condition indices between the different sampling locations indicate pronounced differences, with individuals from the South Orkney Islands being in the best condition, followed by individuals from King George Island (Fig. 3.3.2). Individuals from the western and eastern Weddell Sea shelf showed comparatively poor condition. These differences most likely reflect differences in condition due to nutritional state or unfavourable abiotic conditions, but might be affected by differences in size distribution. This will be clarified back in the home lab.

The analyses of otoliths' growth increments, stomach contents and tissues' lipid and fatty acid content and composition will provide further insights into *P. antarcticums* condition and performance in the different regions and into causes and consequences of the observed differences.

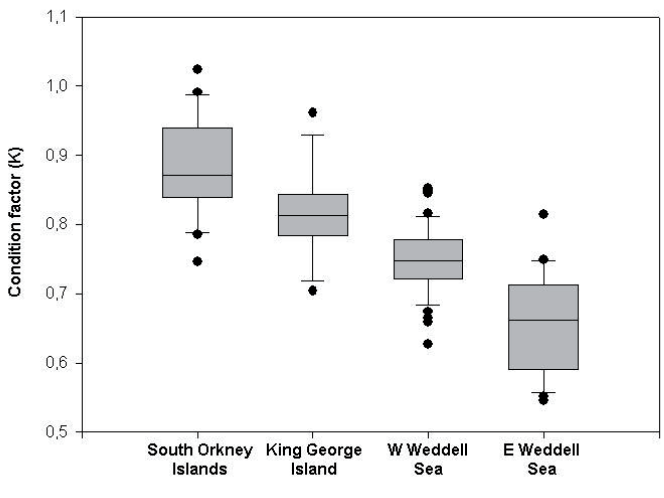


Fig. 3.3.2: Box-Whisker plot of condition indices K of P. antarcticum from the South Orkneys (N=20), King George Island (N=15), the western (N=46) and eastern (N=22) Weddell Sea. Median, 10th, 25th, 75th and 90th percentiles are shown. Outliners are indicated by dots

3.3.2 Energy and lipid metabolism of sub-Antarctic and Antarctic fishes

Tina Sandersfeld, Christian Bock*, Timo Hirse, Nils Koschnick, Rainer Knust
*not on board

Alfred-Wegener-Institut

Objectives

A trend towards increased lipid accumulation has been found in different fish species from high to low latitudes. High cellular lipid contents are suggested to be related to a preference of lipid metabolism in Antarctic fish. Additionally, the composition and ratios of certain lipids and fatty acids respectively, were shown to play an important role in the cold by affecting the biophysical attributes of membranes, thus influencing membrane-associated processes on a cellular level. The main objectives of this project are to evaluate the acute temperature dependency of the organism's maintenance costs and possible implications of cellular energy metabolism in terms of lipid metabolism. In terms of maintenance costs, temperature dependent routine metabolic rate should be measured in comparable fish species from high- and sub-Antarctic regions. Additionally, tissue samples will be taken and brought to Bremerhaven for an analysis of the metabolic and lipid profile using ^{1}H-NMR spectroscopy.

Work at sea

Live animals were caught by bottom and Agassiz trawl for respiration experiments. As a sub-Antarctic model species, *Lepidonotothen squamifrons* was caught in sufficient numbers near South Georgia. As comparable species from high-Antarctic regions, *Trematomus hansoni* and *Trematomus penneli* were caught in the eastern Weddell Sea. Additionally, *Patagonotothen guntheri* was caught near Burdwood Bank. Due to the bad conditions of this species, animals were not kept for respiration experiments, but tissue samples were taken for laboratory analysis in Bremerhaven.

Live animals were kept in an aquarium container at habitat temperature and allowed to recover from handling stress. For experimental procedure the fishes were placed in a flow-through respirometry system, where oxygen consumption was measured. After an acclimation period at habitat temperature, the unfed animals were exposed to an acute increase of temperature (1 °C/ 24 hrs). Experimental temperatures for sub-Antarctic species ranged from 2 to up to the highest temperature tolerable for the animals. Additionally activity level was monitored by a video camera. Respiration data obtained in time periods without any spontaneous activity will be used for assessment of standard metabolic rate. Besides, tissue samples of white and red muscle, heart, gills, liver and brain were taken from fishes after respiration experiments, as well as of a control group kept at habitat temperature. Tissue samples will be brought to Bremerhaven for further analysis.

The respiration experiments with *L. squamifrons* could be completed on cruise ANT-XXVII/3, whereas experiments with high-Antarctic species will be continued on cruise ANT-XXVII/4 using the same experimental setup.

Preliminary results

Temperature dependent whole animal oxygen consumption was successfully measured for the sub-Antarctic species *Lepidonotothen squamifrons*. From preliminary data evaluation, a routine metabolic rate of 0,805 µmol O_2*g^{-1}*h^{-1}, was determined at habitat temperature of 2 °C. Temperature dependent oxygen consumption measurements showed a steady increase of respiration rate with rising temperature. Most animals showed signs of exhaustion, loss of balance and a rapid increase of respiration rates around 7 °C. Accordingly, most measurements were finished at this temperature, besides 2 out of 7 animals which seemed to be in good condition up to a temperature of 9 °C. At 7 °C, respiration rates increased to a 2,3 fold value of 1,845 µmol O_2*g^{-1}*h^{-1}, while a temperature rise up to 9 °C lead to an increase of oxygen consumption of 2,525 µmol O_2*g^{-1}*h^{-1}, the 3,1 fold of the respiration rate at habitat temperature (Fig. 3.3.3).

Routine metabolic rates likewise temperature dependent respiration rates obtained in this study for *L. squamifrons* revealed comparable data as recorded by Van Dijk et al. (1999) for the Antarctic eelpout *Pachycara brachycephalum*, a species with a comparable benthic lifestyle, but circum-Antarctic distribution. However, these preliminary results have to be confirmed by further data evaluation.

3.3.3 Whole animal and mitochondrial respiration in response to changing temperature in Antarctic fish and octopods

Anneli Strobel, Felix Mark*, Alfred-Wegener-Institut
*not on board

Objectives

Mitochondria are a key element in shaping whole organism energy turnover and functional capacity. Recent insight into the special molecular characters of Antarctic fish mitochondria provides a unique opportunity to develop and test hypotheses explaining the role of these characters in setting thermal tolerance. In this project, we intended to test the different metabolic responses of Antarctic fish and octopods towards increasing temperature. In Antarctic waters, the highly developed octopods share the same spatial and ecological niche as benthic notothenioids and thus directly compete for the same resources in the ecosystem. We therefore compared the metabolic plasticity of high-Antarctic (fish: *Trematomus nicolai*; octopus: *Pareledone sp.*) and sub-Antarctic species (fish: *Lepidonotothen squamifrons;* octopus: *Adelieledone sp.*). Elaboration of the contribution of mitochondria to the special features of stenothermy and climate sensitivity in Antarctic fishes and cephalopods appears as a highly relevant and timely contribution to the field of climate sensitivity of Antarctic ecosystems.

Work at sea

By means of bottom trawls (GSN) and Agassiz trawls (AGT) we caught sub-Antarctic octopods and notothenioids during the first days of the cruise. Antarctic specimens of octopods were caught around King George Island. In the high-Antarctic waters in the Weddell Sea (BENDEX site), we could catch the high Antarctic fish species *Trematomus nicolai*. On board, animals were kept in aquaria systems, and the sub-Antarctic notothenioid *L. squamifrons* was acclimated to higher temperatures for determination of a possible metabolic long-term compensation. Temperature drives the velocity of biochemical and enzymatic processes and hence is a key factor defining the performance of ectothermic organisms. We analysed the effect of changing temperature at the whole animal and the mitochondrial level. The oxygen consumption of the whole animal was measured via intermittent-flow respirometry to determine standard metabolic rate (SMR) of control vs. long-term acclimated animals and at acute thermal challenge. Moreover, mitochondrial oxygen consumption was determined with an oxygraph (Oroboros, Innsbruck, Austria), as a measurement for metabolic capacities. Particularly, we measured mitochondrial parameters such as ATP synthesis capacities during ADP stimulated respiration, mitochondrial coupling ratios, and proton leak rates as parameters for the efficiency of mitochondrial energy turnover. Another aim was to collect tissue samples from fishes and octopods for molecular biological analysis at the Alfred Wegener Institute (e.g. gene expression studies, lipid analysis, enzyme capacities).

Preliminary results

First results indicate a clear difference in mitochondrial capacities between sub-Antarctic and high-Antarctic fish species. The sub-Antarctic fish *L. squamifrons* showed more tightly coupled mitochondria and less phosphorylation capacity than the high-Antarctic *T. nicolai*, reflecting a loss of efficiency for ATP synthesis. Furthermore, Antarctic fish are likely to possess higher capacities for efficient energy turnover than Antarctic octopods. SMR measurements of long-term acclimated sub-Antarctic fish showed a partial metabolic compensation towards higher temperature.

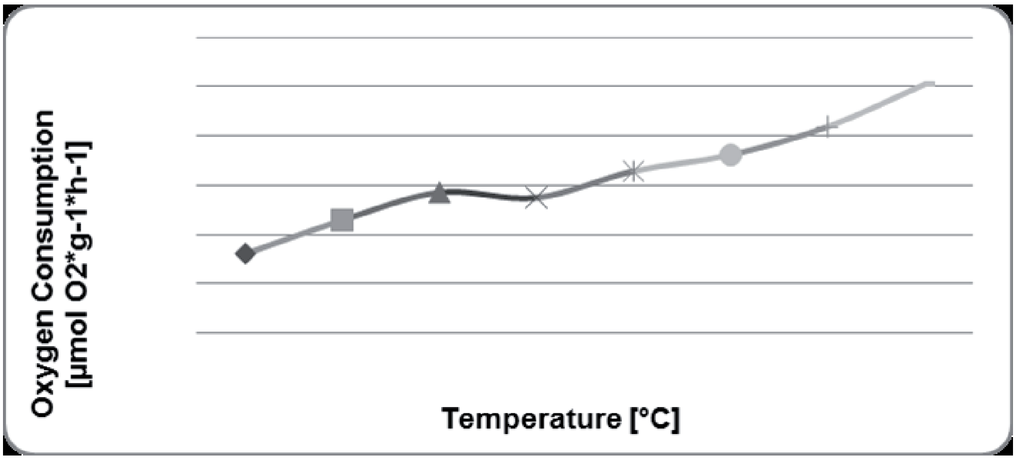


*Fig. 3.3.3: Temperature dependent oxygen consumption in [µmolO_2*g^{-1}*h^{-1}] of L. squamifrons (preliminary results for n=3)*

3.3.4 Evolution of haemocyanin and its influence on thermal sensitivity in cold adapted cephalopods

Michael Oellermann, Felix Mark*, *not on board | Alfred-Wegener-Institut

Objectives

Our research topic aims to shed light on the links between physiological adaptation and the phylogeny of octopod haemocyanin during the adaptive radiation of these animals in Antarctic waters and to assist in explaining the recent biogeography of Antarctic octopods. By means of an integrative physiological and molecular genetic approach, this study will investigate the evolution of this Antarctic group in the light of changing climatic conditions and the radiation of cephalopods into the Southern Ocean. Temperature, pH and oxygen concentration are the three most important parameters that influence oxygen-binding capacities of cephalopod blood and for survival at nearly -2 °C, a cephalopod requires a highly specialized blood-gas exchange. By using extracellular haemocyanin, cephalopods possess a less effective respiratory protein than fishes (which have intracellular haemoglobin). In order to successfully compete with fishes, cephalopods have developed a high level of haemocyanin adaptability. Despite their prominent position in Antarctic food webs and being highly abundant, very little is known about Antarctic octopod physiology in general and specifically of the role of haemocyanin as a mediator between the organism and an extreme environment.

The aim of the experiments on board was to physiologically characterize the ability of haemocyanin to adapt to varying environmental temperatures. Blood samples from octopods caught in bottom- and Agassiz trawls in sub- and high-Antarctic waters will be used for determination of pH and temperature dependent *in vitro* oxygen-binding curves. Tissue samples will be preserved for molecular studies of haemocyanin expression that will be performed upon return to Bremerhaven and linked to the oxygen-binding curves generated on board *Polarstern*.

Work at sea

By means of bottom- and Agassiz trawls we caught sub-Antarctic octopods as well as squids at the stations along the Scotia Arc during the first days of the cruise towards King George Island. In waters east of the Antarctic Peninsula (Larsen A/B) and in the eastern Weddell Sea (BENDEX site), we caught high-Antarctic octopods for further comparative work. On board, depending on their condition, animals were culled directly after trawling or kept in aquaria systems for respiration experiments. At the end, all animals were dissected to sample blood and other tissues for physiological and genetic analysis. Investigation of morphological characters and photographic documentation has helped for crucial identification of the cephalopod genus or species. We investigated potential adaptation of the oxygen carrying blood pigment haemocyanin to the cold Southern Ocean environment by means of oxygen-binding curves at different pH, oxygen concentrations and temperatures as well as by native gel electrophoresis. Small animals yielded either no or only small amounts of blood that were insufficient for measurements on board and will therefore be shipped to and analyzed in Bremerhaven.

Preliminary results

During this journey we caught 58 octopods and ten squids. I identified nine different species so far. In Bremerhaven we will further examine individuals with uncertain taxonomic status to accurately determine the species affiliation. None of the species were caught at all locations suggesting a rather restricted distribution that could be due to e.g. dispersal barriers or adaptation to particular environmental factors such as temperatures, which decreased from 4.9 °C degrees at the sub-Antarctic Burdwood Bank down to very stable -1.9 °C degrees at the Antarctic BENDEX area (Fig. 3.3.4).

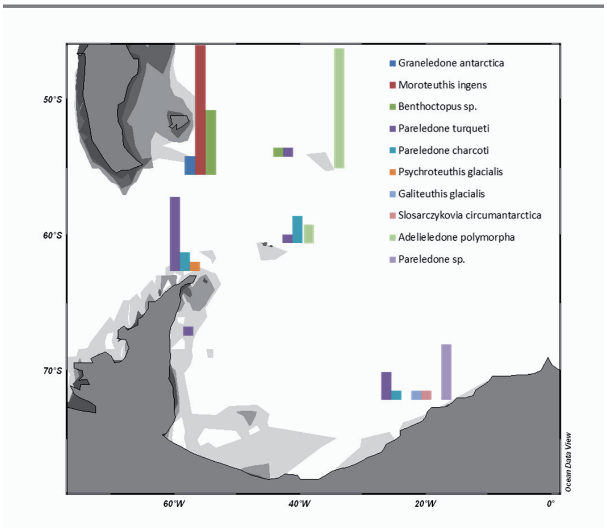


Fig. 3.3.4: Cephalopods caught on the Polarstern cruise ANT-XXVII/3.

Oxygen binding curves of the octopod blood pigment haemocyanin did not show major differences between a sub- and high-Antarctic octopod at 0 °C experimental temperature (Fig. 3.3.5). In contrast, native electrophoresis revealed clear structural differences of haemocyanin proteins with two distinct isoform types in the high-Antarctic *Parledone turqueti* but non-distinguishable isoforms in the sub-Antarctic octopod *Graneledone antarctica* (Fig. 3.3.6). Further experiments will test if oxygen binding characteristics remain similar at higher experimental temperatures and hold true for additional species collected on this cruise. Follow-up sequencing of the haemocyanin gene will help resolving the discrepancy between the so far observed structural but lacking functional differences, by identifying and analyzing coding regions of the gene as well as to distinguish between selective adaptation and phylogeny of octopod haemocyanin. This cruise yielded substantial data from cold-adapted octopods that together with data from warm-adapted octopods will allow conclusions about haemocyanin function and its consequences for species distribution over a latitudinal cline.

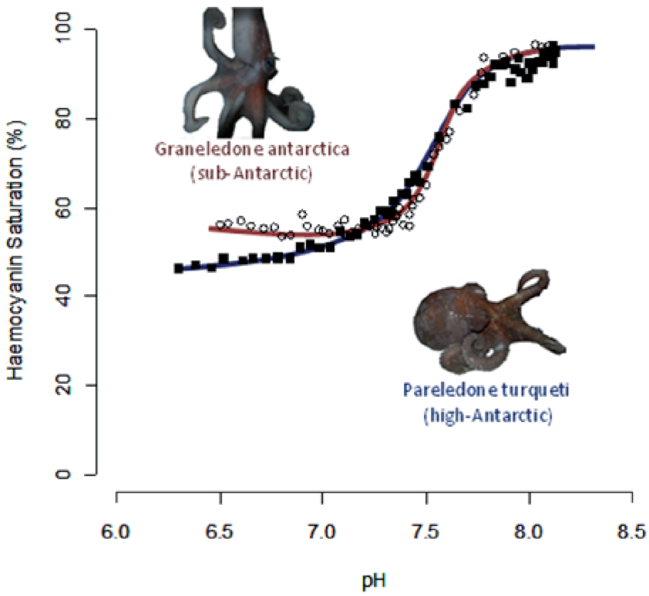


Fig. 3.3.5: Comparison of oxygen binding curves (at 0 °C and 9kPa PO_2) of the blood pigment haemocyanin between the sub-Antarctic octopod Graneledone antarctica and the high-Antarctic octopod Pareledone turqueti caught on the Polarstern cruise ANT-XXVII/3.

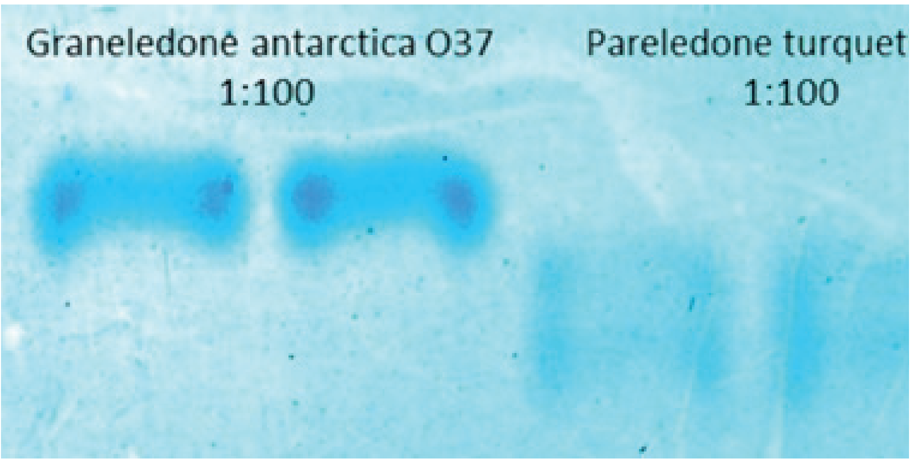


Fig. 3.3.6: Native electrophoresis of the blood pigment haemocyanin in comparison between the sub-Antarctic octopod Graneledone antarctica and the Antarctic octopod Pareledone turqueti caught on the Polarstern cruise ANT-XXVII/3.

3.3.5 Cellular sensitivity of Antarctic fish species to environmental parameters

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*not on board

Alfred-Wegener-Institut

Objectives

This project focused on metabolic adaptability of cells of eurythermal versus cold-stenothermal Antarctic fish species. Since temperature has a major impact on cellular processes many organisms have developed several compensatory mechanisms that enable them to adjust and regulate their cellular energy budget and catabolic processes. Living in the cold requires special adaptations and is often reflected in low baseline energy costs for the sake of growth rates (Pörtner 2006). Using a low cost diffusive oxygen supply is one mechanism for saving energy by e.g. increasing the density of lipids in tissues. The white-blooded Channichthyidae, which lack any myoglobin and hemoglobin are expected to be most sensitive to changes in temperature since a high degree of cold-stenothermy is reflected in a narrow thermal window (Di Prisco 2000). This project aimed to determine temperature dependent energy allocation to the most important metabolic processes in hepatocytes of thermally sensitive notothenioids.

Work at sea

During ANT-XXVII/3 experiments were performed with two different species, *Lepidonotothen squamifrons* and *Chionodraco hamatus*. The sub-Antarctic species *L. squamifrons* belongs to the family of the Nototheniidae and was caught along the Scotia Arc. This species is distributed around the sub-Antarctic islands in the

Indian Ocean sector and Bouvet Island and South Georgia in the Atlantic part of the Southern Ocean (Gon and Heemstra 1990). *Ch. hamatus,* caught on the eastern Weddell Sea shelf, belongs to the family of the Channichthyidae and is believed to be highly stenotherm.

1. Approach: Primary hepatocytes of both species were isolated on board and respiration rates were measured for two different temperatures (0 °C; 5 °C) by using BIONAS 2500 analyzing system (CMOS chip technology). Energy allocation of two cellular key processes, protein synthesis and ion regulation, were measured using inhibitors at different temperatures to determine the temperature dependent energy budget.

2. Approach: Primary hepatocytes of *L. squamifrons* and *Ch. hamatus* were incubated with ^{13}C-labelled substrates (palmitate and glucose) at two different temperatures (0 °C; 5 °C) for an observation of substrate specific catabolism. Samples were taken after 0 h, 1 h, 3 h and 6 h and directly frozen in liquid nitrogen. Determination of uptake rates and incorporation into the glycolytic pathway or TCA-cycle will be done at the AWI using NMR spectroscopy.

Preliminary results

Tables 3.3.2 and 3.3.3 show a summary of the experiments conducted during ANT-XXVII/3. The final data analysis and measurements will be done later at the AWI in Bremerhaven.

Tab. 3.3.2: List of collected data using the BIONAS analyzing system (1. Approach)

species	area	data	inhibitor	temp.	n
L. squamifrons	Scotia Arc (sub-Antarctic)	respiration rates, cell adhesion	cycloheximide (protein synthesis)	0°C, 5°C	6
L. squamifrons	Scotia Arc (sub-Antarctic)	respiration rates, cell adhesion	ouabain (Na+/K+-ATPase)	0°C, 5°C	5
Ch. hamatus	eastern Weddell Sea	respiration rates, cell adhesion	cycloheximide (protein synthesis)	0°C, 5°C	6
Ch. hamatus	eastern Weddell Sea	respiration rates, cell adhesion	ouabain (Na+/K+-ATPase)	0°C, 5°C	3

Tab. 3.3.3: List of cell incubation experiments performed (2. Approach)

species	area	experiment	substrate	temp.	n
L. squamifrons	Scotia Arc (sub-Antarctic)	cell incubation	^{13}C -potassium palmitate (0,5mM); 1,6-^{13}C -C-glucose (5mM)	0°C	7
L. squamifrons	Scotia Arc (sub-Antarctic)	cell incubation	^{13}C -potassium palmitate (0,5mM); 1,6-^{13}C -C-glucose (5mM)	5°C	7
Ch. hamatus	eastern Weddell Sea	cell incubation	^{13}C -potassium palmitate (0,5mM); 1,6-^{13}C -C-glucose (5mM)	0°C	6
Ch. hamatus	eastern Weddell Sea	cell incubation	^{13}C -potassium palmitate (0,5mM); 1,6-^{13}C -C-glucose (5mM)	5°C	6

3.3.6 Thermal tolerance of life history stages and their relevance for the biodiversity and biogeography of decapod crustaceans

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Objectives

The latitudinal gradient of increasing biodiversity from the poles to the equator is one of the most prominent but least understood features of life on Earth. Reptant decapod crustaceans for example are found in high abundance throughout all world oceans on a wide latitudinal cline from tropical to polar waters, with the exception of Antarctic waters. Natant decapoda, amphipoda and isopoda, in turn, are very abundant in the extremely cold waters of the Antarctic shelf. One reason for this pattern could be that the group of reptant decapoda mainly exhibits planktotrophic larvae and taxa exhibiting extended planktotrophic developmental modes always show a clear decrease toward high latitudes. In turn, lecithotrophic larvae seem to be favoured at high latitudes. Interestingly the King crabs (Lithodidae), which can be found in sub-Antarctic and Antarctic waters, mainly show lecithotrophy with abbreviated larval developmental modes and might be able to recolonize Antarctic waters. Warming, especially along the Antarctic Peninsula, opens up the possibility of extinct species like the reptant decapod crustaceans to recolonize Antarctic waters. It has been hypothesized that the Scotia Arc can be considered as a key zone for the study of changes in decapod life history and distribution patterns. The Scotia Arc and Bouvet Island could be potential invasion ways for the recolonization of cold adapted sub-Antarctic species. The aim of this proposal is to detect the distribution and biodiversity of the decapod crustaceans along the Scotia Arc, Weddell Sea and Bouvet Island, to test the thermal tolerance of various stages by sampling all life history stages, including eggs, larval stages and adult species. Our goal is to unravel the relevance of developmental modes and thermal tolerance for the biodiversity and biogeography of decapod crustaceans in the study area and to identify potential invader species. Furthermore, we would like to compare our findings of this cruise to earlier distribution and biodiversity patterns to see if we can already observe changes in the study area.

Work at sea

Sampling and maintenance

Benthic and pelagic crustaceans were sampled by means of bottom and Agassiz trawls as well as Bongo nets. This subproject in cooperation with subproject 3.1.9 collected benthic and pelagic crustaceans and preserved them in ethanol for identification by DNA barcoding and/or morphological at AWI. Living *Lithodes centolla* exhibiting lecitotrophic development (caught close to Punta Arenas) and *Eurypodius* spec. and *Pagurus* spec., both with planctotrophic development (caught close to Burdwood Bank), were immediately transferred to aquaria containing filtered, well aerated seawater and were kept at constant salinity of 34 and a temperature of 3 °C at least 2 weeks prior to experiments.

Experiments

Experiments to determine the thermal tolerance windows of males, ovigerous females and eggs of *Lithodes centolla* and ovigerous females and eggs of *Eurypodius* spec. were conducted. Animals were kept in a temperature-controlled aquarium with air-saturated seawater. Arterial PO_2 was monitored on-line in the pericardial sinus by implanted optodes (PreSens, Neuburg/Donau, Germany). Heart and ventilation activity were monitored by gluing Photoplethysmographs (isiTEC) onto the carapace above the heart and on both sides below the scaphognathite. Data were recorded by a MacLab system (AD Instruments). Animals were fixed during the experiments. They had a minimum of 4 hours at 3 °C before gradually being cooled to -1 °C within 12 hours. After 1 hour at -1 °C temperature was risen at 1 °C/hour. In adult *L. centolla* heart beat and ventilation rates and hemolymph-PO_2 were measured. In adult *Eurypodius* spec. the heart rate was detected. Tissue samples of gill, hepato-pancreas and muscle were taken from control animals and at the end of the thermal tolerance experiment for later analysis of lactate and antioxidant parameters. Experiments were stopped when heart rates started to decrease.

Oxygen consumption of eggs was determined for both species using an electrode. Experiments were stopped when oxygen consumption started to decrease.

Preliminary results

During the ANT-XXVII/3 cruise we caught benthic and pelagic crustaceans in cooperation with the subproject 3.1.9 (for further detail see Fig. 3.1.4). Samples will be determined by barcoding and morphology back at the AWI. *L. centolla* adults exhibited great variability in hemolymph-PO_2 (data not shown). Heart rates increased from -1 °C to 11 °C in adults of *L. centolla* (Fig. 3.3.7 A) and from -1 °C to 8 °C in females of *Eurypodius* (Fig. 3.3.8 A) indicating a lower temperature tolerance in the latter species. There was no further increase of heart rates of *L. centolla* upon 10 °C and of *Eurypodius* females upon 8 °C. A broader temperature tolerance window in adult *L. centolla* in comparison to *Eurypodius* can be explained by lower fluctuations in environmental temperatures at Burdwood Bank in comparison to Punta Arenas.

Oxygen consumption rates of the eggs increased upon warming in both species (Fig. 3.3.7 B and Fig. 3.3.8 B). The increase in oxygen consumption of eggs from *L. centolla* was more profound in comparison to the eggs of *Eurypodius*. There was no further increase in oxygen consumption at 7 °C in eggs of *L. centolla* and at 5 °C in eggs of *Eurypodius*. The lower temperature tolerance of *Eurypodius* eggs in comparison to eggs of *L. centolla* is in line with the results on adults. The comparison between adults and eggs in both species showed that limits to temperature tolerance were apparent first in eggs then in ovigerous females.

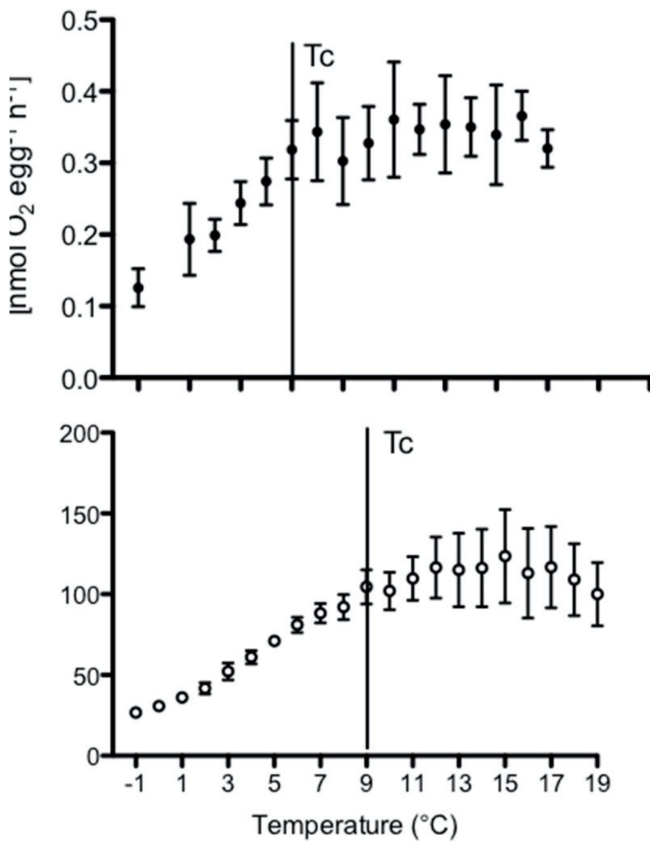

Fig. 3.3.7: Lithodes centolla. (A) heart rate (beats min-1) of males (closed circles) and ovigerous females (open circles) and (B) oxygen consumption rates of eggs at varying temperatures. Each data point represents mean ± standard error (n=5).

Threshold temperatures (TcI, TpI, TpII, and TcII) defining the thermal tolerance window (Frederich & Pörtner 2000) will be identified by break points in ventilation rate and corresponding changes in PO_2 and heart rate of *L. centolla* males and females upon further analysis of the data. Living ovigerous females will be brought back to the institute. Upon hatching tolerance windows for the larvae will be determined.

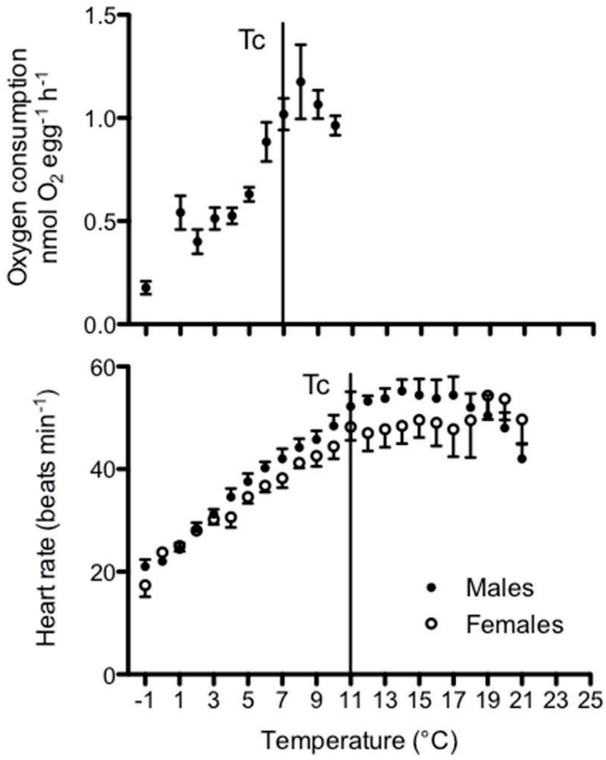

Fig. 3.3.8: Eurypodius spec. (A) heart rate of ovigerous females (open circles) and (B) oxygen consumption rates of eggs at varying temperatures. Each data point represents mean ± standard error (n=5).

3.3.7 Thermal niche evolution in Magellanic and Antarctic amphipods

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2) Università degli Studi di Firenze

Objectives

The rapid variation of global climate occurring in the last decades together with the consequential effects on the whole life forms has originate an accurate multidisciplinary exploration on the causes, the status and the potential relapse of these environmental alterations (Walther et al. 2002; Hansen et al. 2006). During the last decade, the physiological mechanisms that define thermal sensitivity and limit thermal tolerance have gained wider interest in the context of climate change and their implications for organisms and ecosystems (Etterson & Shaw 2001; Helmuth 2002; Pörtner & Knust 2007).

Ectothermal organisms do not actively regulate their body temperature and are hence directly subjected to temperature effects that influence and limit all physical and biochemical processes in their cells (e.g. Hochachka & Somero 2002).

Especially in the light of global warming, the significance of thermal tolerance becomes evident (Pörtner 2002), as can be witnessed in thermally induced shift in zooplankton species (Southward et al. 1995) or the decline of cod stocks in the warming North Sea (O'Brien et al. 2000). Thermal tolerance differs between species and populations depending on latitude or seasonal temperature acclimatization and, consequently, are related to geographical distribution (Sokolova & Pörtner 2003; Sommer & Pörtner 1999).

The main objective of this research is to define and compare the tolerance windows of Magellanic and high Antarctic amphipods, taken at two latitudes and sites, in order to assess the different flexibility towards environmental solicitations and to trace the thermal niche evolution of species inhabiting these extreme environments.

Work at Sea

Collection and rearing of experimental specimens

Animals were collected by means of specific traps baited with fish flesh, which were left in place for 24 - 48 h. Experimental specimens were collected in a depth range between 300 and 700 m.

After the traps were recovered animals were quickly collected and put in stocked in tanks at controlled temperature. Animals from the Scotia Arc islands were kept at a temperature of 1 °C, and animals collected from the Antarctic Peninsula (King George Island and Larsen area) at -1 °C.

Experimental techniques

Temperature ramps. All the following listed experiments were carried out along ramps with temperature shift of 1 °C per hour. Depending on the available number of specimens and the response exhibited, measurements were carried out from once every two degrees or to once every six degrees. Minimum and maximum experimental temperatures were chosen every time depending on the specific physiological/performance response shown by the animals. The water temperature ranged from -1.5 °C to +11 °C.

Oxygen consumption rates

Respirometric measures were carried out by using an electrode Micro-Respiration System, MRS-8 (Unisense, Aarhus, Denmark). All measurements of oxygen consumption rates were carried out on single amphipod specimen. When the system reached the stable experimental temperature, amphipods were introduced in the glass chambers and the oxygen concentration measure began. A second measure was performed after 15-20 min and the oxygen consumption rate was calculated from the difference of the two measurements.

Heart beat frequency

Heart rates were recorded using the non-invasive photoplethysmograph technique introduced by Depledge (1984). The photosensor (isiTEC, Bremerhaven, Germany) was placed on the carapace of the amphipods in correspondence to the pericardial sinus and firmly fixed using cyanoacrylate glue and dental periphery wax. The photosensor was connected to a computer system and monitored with the programme CHART 4 (PowerLab, AD Instruments, Australia). Heart frequency was calculated from an average of two minutes data recording per 0.2 °C.

Aerobic performance (haemolymph oxygen concentration)

Samples of arterial haemolymph were extracted using Pasteur sharpened pipette, whose tip was introduced under the dorsal thoracic IV tergite to reach the heart. From bigger specimens venous blood could be extracted from a ventral lacuna present in the ventral part of the abdomen, just in correspondence of the pleonal appendages. Measurements of arterial and venous PO_2 were carried out with microoptodes (NTH-PSt1-L5lTF-PC3,1-NS 35x1,20-YOP, PreSens GmbH, 93053 Regensburg, Germany). Data were recorded on-line with TX2-A oxygen meters and software (Oxy View TX2 C 4.02 PreSens Regensburg, Germany) and implementing temperature compensation throughout. Before each experiment optodes were calibrated in air-saturated seawater (100 %) and in oxygen-free seawater, using sodium dithionite (0 %). Oxygen values were recorded as % air saturation and converted to PO_2 and $[O_2]$.

In function of the number of specimens collected per species and their size we applied the different methodologies previously described. Thus, we measured temperature dependence of the heart rate only in *Eurythenes gryllus* because it was the only species large enough to hold the sensor of the pletismograph. On the opposite we measured the thermal response of the standard metabolic rate in all other species because they were small enough to fit in the respiratory chambers.

Preliminary results

Amphipods were collected at two stations along the Scotia Arc, at King George Island and in high Antarctic waters at Larsen C (Table 3.3.4). From the analyses of the preliminary results emerges that the thermal niche of Antarctic and Magellanic amphipods is wider than expected, especially towards the warmer side of the performance curve. Moreover, in contrary to species inhabiting temperate latitudes, the optimal temperature of these polar species is closer to the cold end of the thermal niche.

Tab. 3.3.4: List of amphipod species used for the thermal niche characterization grouped for sampling station, type of physiological measurement, temperature range and number of replicate (n).

Species	Station	Type of data	Temp. range	n
Hyperia macrocephala	**PS77 / 213-4**	Oxygen consumption	0.5°-12.5°	16
Abyssorchomene plebs	**PS77 / 215-1**	Oxygen consumption	-1°- 8.5°	16
Abyssorchomene plebs	**PS77 / 215-1**	Locomotor performance	-1.4° - 15.4°	30
Abyssorchomene plebs	**PS77 / 215-1**	Aerobic performance	-1°- 8.8°	10
Eurythenes gryllus	**PS77 / 223-1**	Aerobic performance	-1.9° - 6.9°	10
Eurythenes gryllus	**PS77 / 223-1**	Heart rate	0° - 12°	10
	PS77 / 223-1	Oxygen consumption	-1° - 13°	16
Abyssorchomene plebs	**PS77 / 246-2**	Oxygen consumption	-1°- 9°	16
Abyssorchomene plebs	**PS77 / 246-2**	Locomotor performance	-1.9° - 11°	30
Abyssorchomene plebs	**PS77 / 246-2**	Aerobic performance	-1.9° - 8.9°	10

3.3.8 Male and female reproductive apparatus: a comparative analysis on Magellanic fish fauna

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*not on board

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Objectives

Teleost fish present a large variability in their reproductive apparatus and gametes. Variation in morphology of male reproductive apparatus and investment in sperm has been shown to be related to reproductive modalities. On the other hand, females present wide interspecific variability in fecundity and egg size. For what is known about their reproductive strategies, Antarctic fish, in particular notothenioids (Kock & Kellermann 1991) appear to show high reproductive investment, documented by high gonadosomatic indices, large egg sizes and, in some cases, long male parental care. The comparative study of male and female reproductive apparatus and investment in gametes is particularly interesting from an evolutionary biology point of view, given the adaptations shown by Antarctic fish to their peculiar environment, and for their conservation, since the knowledge of reproductive characteristics of exploited species is recognized crucial for their management. This study aimed to comparatively analyze male and female reproductive apparatus of Antarctic fish in terms of structure, function, gametogenesis and egg size.

Work at sea

According to species and samples availability, samples of gonads or whole body cavities or trunks of males and females of different species were removed and fixed in Dietrich solution. Each sample was marked with species name, date and site of collection, sex (if visible) and size, and stored at room temperature. In order to relate reproductive status (mature *vs* immature) to size and age of fish, heads of samples were removed and frozen for collection of otoliths.

Preliminary results

Fish of four species were collected in different stations along the Scotia Arc from bottom and Agassiz trawls. Tissue sampling and conservation were performed according to procedure previously described (Table 3.3.5).

Tab. 3.3.5: List of notothenioid species collected grouped for sampling station, type of tissue sampled and number of specimens.

Species	Station	Trunk	Gonads	Otolith
Patagonotothen guntheri	**PS77 / 208-3**	20	31	107
Lepidonotothen squamifrons	**PS77 / 211-7**	10	40	109
Notothenia rossii	**PS77 / 214-1**		28	65
Gobionotothen gibberifrons	**PS77 / 214-1**	11		

3.4 The impact of climate induced ice shelf disintegration and iceberg disturbance on benthic biodiversity

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2) Institut de Ciencies del Mar-CSIC

The Antarctic shelf ecosystem is not only shaped by oceanographic conditions including sea-ice and biological interactions but also by the continental ice-cap. On the one hand floating ice shelves covered 1/3 of the entire continental shelf, on the other hand icebergs calve at the ice shelf edge, which forms almost half of the total Antarctic coastline. In the latter case local environmental conditions, especially current patterns providing food for the benthos, are assumed to be highly dynamic and when icebergs run aground they devastate the fauna. Investigations during earlier expeditions to the Weddell Sea showed that the subsequent recolonization creates an obvious benthic patchiness. Two major questions rise from these Antarctic-specific conditions: How is the biodiversity affected by these processes and what is the pace of corresponding ecological developments. Both questions can comprehensively be answered only if the succession of benthic assemblages is observed over a longer period. This is the reason, why two projects have been started during the earlier expeditions ANT-XXI/2 to the eastern Weddell Sea in 2003/2004 (BENDEX) and ANT-XXIII/8 to the Larsen area in the Western Weddell Sea in 2006/2007 having been a major contribution to the Census of Antarctic Marine Life (CAML). ANT-XXVII/3 provided for the first time the opportunity to revisit these key areas of interest in order to study long-term benthic ecosystem dynamics directly.

3.4.1 Environmental settings

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2) Alfred-Wegener-Institut

Objectives

In the case of the Larsen A and B embayments, we attempted to identify changes in the organic matter distribution along sediment cores after 5 years and to verify whether these changes may have a relationship with the benthic fauna and its transformation during the same time period. In the BENDEX area we tried to develop an idea of the sedimentary setting through one transect of sediment cores from the ice shelf edge to the continental shelf edge across the disturbed area. This approach also includes the analyses of organic matter to provide an environmental setting that helps to explain changes in the benthic fauna within the frame of recolonization/recovery patterns.

Work at sea

We revisited three stations in Larsen B, namely, Larsen B South, Larsen B West and Larsen B Central and one station in Larsen A, the so called, Larsen A South. In the BENDEX area we revisited the central station 187.

For further information see description in the chapter "Climate depending processes in pelago-benthic coupling and food webs", chapter 3.2.

Preliminary (expected) results

Results on sediment chemistry and grain size are expected to be available during 2012.

3.4.2 Zooplankton

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Objectives

Studies on horizontal and vertical distribution patterns of zooplankton with special reference to calanoid copepods have been carried out in the Weddell Sea since 1985. Most of the studies were done in the eastern part and only a few in the western part which is covered by multiyear ice and only difficult to reach. The results indicate differences in the abundance, biomass and species composition. In the western Weddell Sea, the abundance seems to be only about half of that of the eastern part, whereas species number is slightly higher due to the occurrence of subantarctic species (e.g. *Clausocalanus brevipes*). However, *Calanus propinquus* and *Ctenocalanus citer*, two dominant species in the eastern Weddell Sea, seem to play only a minor role in the copepod community in the western part. The aim of the study during ANT-XXVII/3 was to deepen our knowledge on the abundance and species composition in the Larsen (western part) as well as in the BENDEX region (eastern part).

Work at sea

As standard devices for the quantitative collection of the zooplankton two multiple opening and closing nets (multinet, 0.25 m^2 and 0,5 m^2 mouth opening) equipped with 5 and 9 nets, respectively, of 100 µm were used. The multinets were towed vertically, sampling standard layers between 2,000 - 1,000 m and the surface, at the shelf between sea floor and surface.

Species composition, abundances, vertical distribution patterns and population structure of the pelagic copepod community will be analysed from these samples as well as the maturity stage of gonads and the gut contents of dominant species.

For each of the plankton stations, water from a CTD was filtered for subsequent analyses of chlorophyll *a*, POC and PON concentrations and phytoplankton counts. Species composition, abundance, biomass, population structure and vertical distribution, maturity of gonads and gut contents will be analysed from these samples.

Preliminary results

The net samples on the Larsen shelf revailed high phytoplankton and relatively low zooplankton standing stocks. The zooplankton was dominated numerically by small cyclopoid and calanoid copepods. The species composition of the zooplankton did not differ between Larsen A, B and C, but the total abundance decreased from north to south. In the eastern Weddell Sea, abundance was clearly higher than in the western part. A thorough investigation of the samples will elucidate the regional and vertical distribution of the zooplankton community, and the data will be discussed with respect to the life strategies of the dominant species, relationships to hydrography and ice cover and to the pelago-benthic coupling.

3.4.3 Meiobenthos

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2) Ghent University

Objectives

LARSEN: Due to its functional distinctness and intermediate size between macrofauna and microbiota, meiofauna is assumed to play an important role in marine benthic food webs. Little is known about benthic meiofaunal communities living beneath the Antarctic iceshelves. Is a suggested lower productivity limiting diversity in those environments? The disintegration of Larsen A and B (mainly 1995, 2002) gave way to study benthic areas formerly covered by iceshelves for several thousand years, and to compare these with long-term uncovered and probably more productive reference areas. Main goal is to investigate the succession of meiobenthic communities in the Larsen A and B areas. A first benchmark study in January 2007 showed that nematode communities near the former Larsen B iceshelf margin differed from those in the innermost parts in terms of diversity and composition. The same was true for Harpacticoida family composition (Rose, unpublished data). All stations from this first study, including a mud volcano site, were intended to be repeated during ANT-XXVII/3 in order to see how things have developed since then. Results will enhance our understanding of meiofaunal colonisation speed after catastrophic events caused by regional climate warming. Comparisons with other oligotrophic areas (ANDEEP samples from the Antarctic deep sea) will be of special interest according to diversity models (e.g. productivity-diversity relationship). Also environmental factors correlating strongest with meiofaunal major taxa abundance and harpacticoid species diversity are to be untangled. Furthermore, diversity differences will be evaluated on multiple scales. Finally, unknown species and life forms are to be expected which will enhance our understanding of Antarctic biodiversity. This study will contribute to a deduction of general rules concerning the resilience of Antarctic marine benthic ecosystems in times of increased climate change.

BENDEX: Few papers deal with the influence of iceberg disturbance on meiobenthos (e.g. Peck et al. 1999; Lee et al. 2001). These demonstrated that catastrophic iceberg disturbances lead to impoverished meiofaunal assemblages in fresh scours. Meiofaunal abundance and taxonomic diversity were significantly reduced in those. Older scours showed highest abundance and diversity values, even higher than those for an undisturbed area. The return of major meiofauna groups was accomplished 30 days after a disturbance event, compared to a control site. Since under normal circumstances it is difficult to assess the age of natural iceberg scours and the time scale of the ongoing succession, an experimental approach was chosen that was supposed to lead to a disturbed area with a defined starting point in time (December 2003, ANT-XXI/2). The BENDEX (benthos disturbance experiment) area was intended to be visited by later expeditions in order to assess the time scale of the ongoing succession of benthic organisms and the development of environmental parameters. This will be done during the actual cruise leg. BENDEX was mainly designed for the removal of macrofauna. It is suggested that a lot of meiofauna were whirled into the water column during bottom trawling and re-sedimentated afterwards. Hence, at least for meiofauna bottom trawling did not resemble a real iceberg disturbance event. Since it was not possible to remove all material from the area and some stripes had been left undisturbed, central stations of the area probably resembled marginal stations in so far that edge effects occurred. Therefore, the process of trawling did not allow a clearly defined disturbed area. Finally and taking into account the mentioned literature, seven years is probably a too long interval to assess the process of meiobenthic succession after a disturbance of this scale.

Work at sea

LARSEN: Five multicorer (MUC) stations from the Larsen A and B areas (*Polarstern* expedition ANT-XXIII/8, January 2007) were intended to be revisited. This was not always possible due to weather and ice conditions. Only the most important stations 'B South' and 'B West' could be fully worked up. Here the repetition of the benchmark study included intense sampling with five MUC replicates in order to get reliable results. From station 'A South' four replicated MUCs were hauled. The former station 'B Seep' was under thick pack ice in March 2011. Therefore a station close to the cold seep (distance about one nautical mile) with similar depth was chosen ('B Seep Ref'). 'B North' could not be reached due to expected bad weather conditions. As additional references two stations outside the Northern part of the Larsen C iceshelf ('Larsen C1', 'Larsen C2') and a station outside the former Larsen A iceshelf near Robertson Island ('A RobIsl') were sampled for the first time. For comparative purposes (first study and former ANDEEP programmes), the MUC6 (12 tubes: inner diameter 57 mm) was used. In one case (Larsen C2: station 243-4) 57 mm subcores were taken from 10 cm megacorer (MUC10) cores. The MUC cores were processed in different ways onboard. Always some cores of each haul were used for community analysis. Of these the upper 5 cm of sediment were taken as a bulk (plus 5 cm supernatant water) and fixed with 4 - 8 % formalin. One further core for community analysis was sliced from 0 - 1 cm (plus water), 1 -2 cm, 2 - 3 cm, 3 - 4 cm, 4 - 5 cm, 5 - 10 cm, 10 - 15 cm and fixed with 4 - 8 % formalin. One core was sliced similarly (but without water) for sediment and phytopigment analysis. Slices were frozen at –20 °C. Some cores from one haul of selected stations were processed for small-scale analysis. The upper 3 cm (plus 2 cm water) and the layer from 3 - 5 cm were cut into six cake-shaped pieces of equal size. Three non-adjacent pieces were taken for community analysis and preserved with 4 - 8 % formalin. One piece was taken for sediment and phytopigment analysis and stored at –20 °C. Additional qualitative meiofauna samples were taken by sieving disturbed cores and sponges. These samples were preserved in 70 - 80 % ethanol.

All organisms sampled quantitatively with the MUC will be sorted and counted on major taxa level at the labs of Senckenberg am Meer, Dept DZMB (Wilhelmshaven, Germany), and the Marine Biology Section of Ghent University. Harpacticoid copepods will be identified to species level at DZMB, nematodes down to genus level at the Marine Biology Section of Ghent University.

BENDEX: During the ANT-XXI/2 campaign in December 2003 three benchmark sample series had been taken in order to assess the impact of the experimental disturbance on meiobenthic assemblages. Since the preferred multicorer (MUC6) did not work properly due to thick sponge spicule mats, subsamples from the multibox corer (MG) were taken. Within the experimental area, stations were sampled both in central and marginal parts. Additionally, two of five pre-disturbance stations and three reference stations were sampled around the disturbed area at some distance.

The pre-disturbance series consisted of three multibox corer (MG) hauls taken on December 11th, 2003 (PS65/116, 124, 125), of which eight subcores of 10 cm^2 area were taken out of two adjacent boxes. Furthermore, two giant boxcorers (BC) were deployed on December 10th and 11th, 2003 (PS65/107, 123), of which the same number of subcores was taken. Two stations (116, 124) were positioned outside and three stations (107,123,125) inside the subsequently disturbed area. The initial post-disturbance series one week later consisted of four MG hauls (PS65/183, 187, 199, 202), of which eight subcores á 10 cm^2 were taken out of two adjacent boxes, and of one BC haul (PS65/203) with the same number of subcores. In the surrounding of the experimental area three reference MGs were deployed after the disturbance. Eight resp. seven subcores out of two adjacent boxes, and four cores out of one box were taken and processed on December 17th to 18th, 2003.

Of these initial BENDEX stations three MG hauls of the post-disturbance (old 183, 187, 199; now 288-4, 280-1, 289-1), two of the reference sampling series (old 185, 197; now 297-1, 279-3), and one post-disturbance MG station (old 106; now 295-2) were resampled during the actual cruise leg. Furthermore, three new reference stations (274-3, 283-5, 285-1) were sampled by the MG (Table 3.4.2). Regarding meiobenthos, six 10 cm^2 subcores were taken out of one MG box at each of these nine stations. These were processed as follows: two cores were prepared for quantitative morphological analysis of meiofaunal diversity and fixated with formaldehyde (4-8 %). One of these was split into 5 layers (0-1 + water, 1 - 3, 3 - 5, 5 - 10, 10 - 15 cm), the other one was taken as a bulk (0 - 5 cm + water). Another bulk core (0 - 5 cm + water) was reserved for molecular analysis of nematode diversity (conservation with ethanol 80 %). The last three cores were processed for analysis of chemical and physical parameters. One core for stable isotope analysis was split into two layers (0 - 1, 1 - 2 cm). One core was prepared for analysis of phytopigments (layers: 0 - 1, 1 - 2 cm, rest), and the last one for organic matter and sediment structure (layers: 0 - 1, 1 - 2, 2 - 3, 3 - 4, 4 - 5 cm, rest). These three cores were kept deep-frozen (-20 °C).

In addition, four multicorer stations (MUC6: 57 mm inner diameter of tubes) were sampled: one (288-4) near an old post-disturbance MG station (183), one (274-2) near an old MG reference station (197), and two deeper stations in the surrounding (260-4, 265-3). The obtained cores were treated as follows: Some cores of each haul were used for community analysis. Of these the upper 5 cm of sediment were taken as a bulk (0 - 5 cm + 5 cm supernatant water) and fixed with 4 - 8 % formalin. One further core for community analysis was sliced from 0 - 1 cm (+ water), 1 - 2 cm, 2 - 3 cm, 3 - 4 cm, 4 - 5 cm, 5 - 10 cm, 10 - 15 cm and fixed with 4 - 8 % formalin. One core was sliced similarily (but without water) for sediment and phytopigment analysis. Slices were frozen at –20 °C. Two cores of station 265-3 were processed for small-scale analysis. The upper 3 cm (plus 2 cm water) and the layer from 3 - 5 cm were cut into six cake-shaped pieces of equal size. Three non-adjacent pieces were taken for community analysis and preserved with 4 - 8 % formalin. One piece was taken for sediment and phytopigment analysis and stored at –20 °C.

All organisms sampled quantitatively with the MUC6 and MG will be sorted and counted on major taxa 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.

Tab. 3.4.1: ANT-XXIII/8 (2007) and ANT-XXVII/3 (2011) multicorer (MUC6) stations in the Larsen region with quantitative meiofauna samplings.

	2007				2011			
Station	Drop no.	Latitude	Longitude	Depth cable	Drop no.	Latitude	Longitude	Depth cable
B South	PS69/700-8	65° 54.98' S	60° 20.54' W	422	PS77/246-3	65° 54.95' S	60° 20.43' W	424
	PS69/700-9	65° 54.95' S	60° 20.88' W	417	PS77/246-4	65° 54.95' S	60° 21.49' W	395
	PS69/702-4	65° 55.12' S	60° 19.96' W	427	PS77/246-5	65° 54.99' S	60° 20.70' W	419
	PS69/702-7	65° 54.49' S	60° 21.37' W	405	PS77/247-3	65° 55.12' S	60° 19.83' W	428
	PS69/702-8	65° 54.95' S	60° 20.95' W	410	PS77/247-4	65° 55.15' S	60° 20.01' W	425
B Seep	PS69/706-5	65° 26.09' S	61° 26.48' W	819				
	PS69/706-6	65° 26.10' S	61° 26.53' W	820				
	PS69/709-5	65° 26.09' S	61° 26.51' W	819				
	PS69/709-7	65° 26.07' S	61° 26.48' W	818				
	PS69/709-8	65° 26.07' S	61° 26.49' W	818				
B Seep Ref					PS77/250-3	65° 25.66' S	61° 26.03' W	800
					PS77/250-4	65° 25.32' S	61° 25.70' W	775
B West	PS69/710-2	65° 33.03' S	61° 36.98' W	277	PS77/233-4	65° 32.99' S	61° 36.94' W	277
	PS69/710-3	65° 33.04' S	61° 37.18' W	281	PS77/233-5	65° 32.97' S	61° 36.94' W	278
	PS69/710-7	65° 33.03' S	61° 37.01' W	275	PS77/235-4	65° 32.96' S	61° 36.88' W	276
	PS69/710-8	65° 33.03' S	61° 37.00' W	283	PS77/235-5	65° 33.01' S	61° 36.96' W	280
	PS69/710-9	65° 33.07' S	61° 37.06' W	288	PS77/235-6	65° 33.01' S	61° 37.00' W	279
B North	PS69/715-2	65° 6.39' S	60° 45.04' W	308				
	PS69/715-4	65° 6.44' S	60° 45.07' W	307				
	PS69/718-1	65° 6.33' S	60° 45.17' W	306				
	PS69/718-3	65° 6.43' S	60° 44.93' W	303				
	PS69/718-5	65° 6.40' S	60° 45.60' W	304				
A South	PS69/723-1	64° 56.07' S	60° 38.57' W	242	PS77/226-9	64° 56.00' S	60° 38.63' W	235
	PS69/723-2	64° 56.06' S	60° 38.58' W	242	PS77/226-10	64° 56.01' S	60° 38.61' W	237
	PS69/725-7	64° 56.01' S	60° 38.69' W	232	PS77/231-4	64° 56.06' S	60° 39.03' W	223
	PS69/725-9	64° 56.04' S	60° 38.93' W	242	PS77/231-5	64° 56.16' S	60° 38.66' W	236
A RobIsl					PS77/254-4	65° 00.19' S	59° 25.83' W	290
					PS77/254-5	65° 00.08' S	59° 25.91' W	292
Larsen C1					PS77/237-8	66° 09.75' S	60° 13.20' W	355
					PS77/237-9	66° 09.66' S	60° 13.05' W	355
Larsen C2					PS77/239-8	66° 16.62' S	60° 15.51' W	399
					PS77/243-4	66° 15.79' S	60° 14.69' W	390

Preliminary results

LARSEN: It is expected that some change took place in the Larsen A and B areas during the last four years. This might be more dramatic in the Larsen A area, since an ROV video showed a significant shift in the macro-epibenthic community at station 'A South'. However, since extraction of meiofauna out of the sediment has to be done in a standardised way in the lab, no preliminary results are available for the meiobenthos for now.

BENDEX: Due to the chosen method of disturbance by bottom trawling only epi-macrofauna could be effectively removed during BENDEX. Meiofauna might just have been whirled into the water column during trawling operations and re-settled afterwards. Hence, regarding meiofauna bottom trawling might not have adequately simulated a real iceberg disturbance event. According to the data of Lee et al. (2001) seven years could be a too long time interval to assess the process of meiobenthic succession after a disturbance event of this spatial extent. However, since the removal of epi-macrofauna by bottom trawling was quite effective as shown by an ROV video survey, the environment and the currents situation directly over the seafloor probably has changed. This might well have affected the meiofaunal composition seven years after the disturbance event. No preliminary results are available for the meiobenthos which has to be processed in a standardised way in the home institutes.

3.4.4 Macrobenthic soft-bottom in- and epifauna

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Objectives

LARSEN: Macroecological investigations on the impact of disintegrating ice shelves to the marine ecosystem in the Larsen A and B areas east of the Antarctic Peninsula started in 2006/2007 during ANT-XXIII/8, twelve and five years, respectively, after the ice shelf collapsed, (Gutt et al. 2011). The majority of the sampled and directly observed macrobenthos could be attributed to the old oligotrophic ice-covered situation. The meiobenthos seemed to respond faster to the change in environmental conditions but did not yet reach a new equilibrium. Sediment parameters also showed that the system was still in a transitional phase. In addition, first hints of a species turnover were found to be interpreted as a response to the drastical changes in the environmental conditions following the ice shelf collapse. The main aim during the Larsen-survey was to study different components of the ecosystem, mainly benthic, compare these with the results from 2006/2007 and identify changes in the structure and functioning of this Antarctic ecosystem under extreme environmental stress. Being a follow-up study most of the core-stations sampled in 2006/2007 had to be revisited and a variety of different sampling equipment was deployed at the same spot in order to obtain a synoptic view covering a broad variety of ecosystem components. Two additional (new) stations off the northern margin of Larsen C (South of Larsen B) were selected in order to search for the origin of recruits to be expected in the formerly ice shelf covered Larsen A and B embayments. The comparison between results from 2006/2007 and those from ANT-XXVII/3 should answer the following key questions: (1) Can any changes between 2007 and 2011 be found (2) Did the fauna associated to the old oligotrophic situation diminish? (3) Did pioneer species increase in abundance and in terms of species richness? (4) Is the area south of Larsen B a potential home of parental stocks for recruits in the Larsen A/B?

BENDEX: Iceberg scours inflict substantial damage on established communities of endo- , epi-benthos and the demersal fish fauna. In the course of recovery, it is possible to distinguish different successional stages of recolonization although these never could be placed yet in an absolute temporal sequence. As iceberg scouring destroys older and mature community stages, it creates space for ´pioneer species´ which initiate recolonization. Various hypotheses in the literature have attempted to describe the effect of such processes on biodiversity. As a general result appears an enhancement of diversity on larger scales due to the co-existence of a variety of recolonization stages with different sets of species inventories. Beside this effect on biodiversity, the time scale of the recolonization process after a disturbance is considered as an important question, because in comparison with community recovery in lower latitudes it illustrates the vulnerability and resilience capacity of polar systems. To set a time stamp for recolonization processes an artificial mechanical disturbance experiment (BENDEX) was carried out during *Polarstern* Expedition ANT-XXI/2 in December 2003. To simulate the impact of grounding icebergs on benthic and demersal fish communities, we destroyed a seabed area of approximately 100 x 1000 m artificially by means of 11 densely placed hauls with a modified bottom trawl. As a result benthic biomass was drastically reduced by a factor of 10, while abundances were only slightly reduced. Demersal fish biomass and abundance were only slightly reduced after disturbance, the composition of the fish fauna, however, revealed changes with *Trematomus pennelli* and *T. hansoni* being dominant in disturbed sites, whereas *Chonodraco myseri* dominated in trawl catches from undisturbed stations.

The goal of our planned studies was to follow the recolonization and succession processes in the disturbed area thus getting insights into the spatially and temporally recovery of benthic communities in a high Antarctic environment after disturbance. To achieve these goals we I) re-evaluate the Bendex site and adjacent reference stations by means of quantitative (MG) and visual methods (high resolution UW still photography) ii) describe the benthic communities in – and outside the experimental site via densities, biomass, production, composition in comparison to the situation at the beginning (cf. Gerdes et al. 2008) iii) apply normalized biomass size spectra and stable isotopes as ecological tools for the differentiation of benthic community structures in and outside disturbed areas.

Work at sea

LARSEN: In the Larsen A and B embayments the multibox corer was deployed successfully at 4 and 5 stations, respectively, covering a depth range from 200 to 808 m and at 2 stations off the northern edge of Larsen C (Table 3.4.2). Seven stations were repeated from the 2007 expedition, 4 stations were new.

BENDEX: For the BENDEX programme the multibox corer with attached UW-camera was deployed at 8 stations in the BENDEX site and 4 reference stations adjacent to this area, covering a depth range between 250 and 630 m. From these drops a total of 79 cores resulted mainly for the analysis of the benthic macroinfauna, but also for meiofauna studies. Additionally at each station high resolution pictures were obtained for accompanying analyses of the benthic communities.

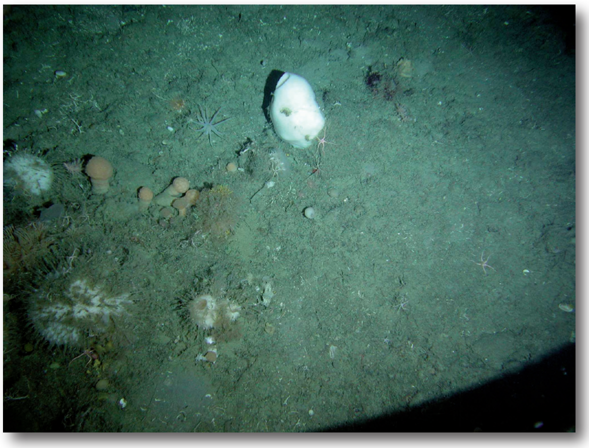
Based on the corer data biomass size spectra will be constructed for comparing the community structures in disturbed and undisturbed areas. Numerous samples for stable isotope measurements were collected from 20 major taxa; these data will be used to assess the position of the organisms in the food web.

Tab 3.4.2: Multibox corer stations worked up during ANT-XXVII/3 in the LARSEN embayments and in- and outside the BENDEX site

St. No.	Position	Date	Cores	Depth (m)	Area
LARSEN					
226	64°55,68´S 60°36,84´W	26.02.11	8	261	Larsen A South
231	64°55,35´S 60°30,60´W	28.02.11	7(1)	352	east Larsen A South
233	65°30,70´S 61°42,01´W	01.03.11	8	364	Larsen B West I
235	65°33,07´S 61°37,04´W	02.03.11	7	299	Larsen B West II
237	66°09,89´S 60°13,48´W	03.03.11	8	382	off Larsen C
239	66°16,58´S 60°15,54´W	04.03.11	8	379	off Larsen C
247	65°19,92'S 60°55,07´W	07.03.11	3	437	Larsen B South I
248	65°56,20´S 60°25,39´W	07.03.11	6	366	Larsen B South II
250	65°25,45´S 61°25,37´W	08.03.11	6(1)	808	Larsen B Seep
252	64°32,75´S 60°41,21´W	10.03.11	8	200	Larsen A North
254	65°00,39´S 59°25,71´W	11.03.11	8	300	Robertson Island
BENDEX					
274	70°56,58´S 10°34,27´W	25.03.11	7(1)	333	reference
275	70°56,42´S 10°31,62´W	25.03.11	8	283	old 125
279	70°56,22´S 10°30,33´W	28.03.11	7(1)	250	reference
280	7ß°56,63´S 10°32,08´W	28.03.11	7(1)	261	old 187
283	70°58,00´S 10°30,30´W	29.03.11	7(1)	284	reference
285	70°56,75´S 10°32,40´W	29.03.11	7(1)	307	Bendex site south, new
288	70°56,56´S 10°31,86´W	30.03.11	7(1)	288	old 183
289	70°56,77´S 10°32,33´W	30.03.11	7(1)	303	old 199
293	70°56,57,S 10°31,91´W	31.03.11	0	285	old 202
295	70°56,63´S 10°32,01´W	31.03.11	6(1)	303	old106
297	70°56,60´S 10°31,63´W	31.03.11	7(1)	276	old 185
310	70°47,23'S 10°45,11´W	05.04.11	0	630	reference

a)

b)



c)

Fig.3.4.1: The BENDEX site
a) plough mark of the modified Otter Trawl
b) islands with accumulated biogenic material incl. 1st pioneers
c) plough marks with fish
(Photos: D.Gerdes, AWI)

Preliminary results

LARSEN: Station LARSEN A South appeared as the most diverse station of all with brittlestars, and sponges (mostly juveniles) contributing most. In comparison with the situation 5 yrs ago the densities were comparable, but sponges appeared less abundant in 2006/7, whereas the ascidian *Molgula pedunculata* occurred in distinct higher densities with up to 7 specimens per picture. At station LARSEN A North the macrofauna appeared less diverse and abundant, dominating elements were brittlestars and echiurids.

At LARSEN B stations the visible fauna appeared less diverse and rich. At the station LARSEN B South I, few brittlestars, sea stars and sea urchins beside some serpulid polychaetes on the stones on the seafloor were most conspicuous. Station LARSEN B South II evidenced some first recolonization signs with numerous small specimens of the hydrocoral *Errina laterorifa* growing on the stony seafloor. In the first LARSEN campaign 5 yrs ago the fauna at this station still was clearly dominated by brittlestars. At the two LARSEN B West stations, the fauna was clearly dominated by different holothurians - among them the eurybathic species cf. *Peniagone vignioni* and the deep-sea species *Protelpidia murray* ("Sparschwein") – followed by brittlestars and echiruids. The organism density at the deep LARSEN B ´seep´ station was less than that of stations West but higher than at the two South stations. On the muddy sediments at this station holothurians, brittlestars, and echiurids were most obvious; worth mentioning is the stalked crinoid *Dumetocrinus antarcticus* of the deep-sea family Hyocrinidae on 2 pictures.

The fauna at the two LARSEN C stations, which were selected in order to search for the origin of recruits to be expected in the formerly ice shelf covered Larsen A and B embayments, was extremely poor. On the stone covered sediments only few brittlestars and holothurians, one specimen of *Dumetocrinus antarcticus* and tubes of serpulid polychaetes were observed.

BENDEX: Because our main objectives rely especially on the quantitative corer samples, which however, have to be sorted and evaluated in the home laboratory, our contribution to this chapter is based exclusively on visual checks of 7 by chance selected UW-pictures, which were taken at the different stations. At a first glance the disturbed BENDEX area still showed hardly any signs of recolonization. Eight years after the disturbance inside the BENDEX area clear trials of the fishing gear were visible, whereas epifauna was rare or totally absent. In between the gear spurs the trawl activities accumulated locally benthic material (Fig. 3.4.1), in many cases with living specimens of sponges, ascidians and especially motile taxa such as brittlestars, crinoids, seastars, etc. On the epifauna free bottoms in the devastated ploughed areas, *Prionodraco evansii*, a fish occurring typically in disturbed areas (pers. com. K. Mintenbeck), was the most conspicuous organism. At the margin of the experimental field, sponge spicules were piled up and served as a microhabitat for several other epibenthic species such as ascidians, crinoids, brittlestars, seastars, etc., thus creating a seedground for species invading into the disturbed area. At 2 marginal stations in the experimental site (St. Nos. 289 and 293) the MG collected 1 - 3 cm small, juvenile specimens of the demosponge *Tethyopsis* cf. *longispinus.* These sponges, which are assumed to be max. 3 years old (pers. com. D. Janussen), probably belong to the first pioneer species within the BENDEX area.

In the surrounding of the BENDEX core area several semidisturbed stations (St. No 279, 283, 297) were studied with locally dense and diverse sponge communities

(Demospongiae and Hexactinellida), representing different stages of recolonisation after natural iceberg devastation.

3.4.5 Megabenthos surveyed by ROV

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Objectives

The ROV was deployed to reach the general objectives of the topic "The impact of climate induced ice shelf disintegration and iceberg disturbance on benthic biodversity" (see above chapter 3.4) with the support of results from *in-situ* sea-bed images.

Work at sea

The survey work was carried out with a Sperre SubFighter 7500 DC, a 380 kg 175 X 88 X 96 cm inspection class Remotely Operated Vehicle (ROV) equipped i.a. with a HD videocamera (1080i and 720p), a still camera (Canon Powershot G9, 12 Mpixel), two 200 W Sperre HMI and two 250 W halogen lights as well as two lasers for scaling. Environmental data were collected with a SAIV SD 204 CTD with sensors for temperature, conductivity, pressure, turbidity and oxygen (optode). Samples were taken with a HYDRO-LEK 5-function hydraulic manipulator type EH5 and stored in an aluminium box in front of the ROV, that can be opened and closed.

The use of the POSIDONIA navigation system along with the OFOP software allowed to follow the track of both, the ship and the ROV in order to ensure a georeferenced analysis of the transects. The casts included several short transects for the faunistical analyses interrupted by periods when the ROV remained in one smaller area for detailed observations, to take still pictures, carry out experiments and for operational reasons. Some of the transects were performed with an almost vertical angle of the main camera to the bottom in order to apply later mosaiking techniques. Conspicuous objects such as larger sponges and drop stones overgrown by a rich benthos were circled by the ROV at constant speed and distance for subsequent 3D-digital reconstruction.

In the western Weddell Sea the ROV was deployed at three stns in Larsen A, three in Larsen B, and one off the northern margin of Larsen C. In the eastern Weddell Sea one transect crossed the core BENDEX area, which had been artificially disturbed in 2003/2004. Another five stations are situated in the broader neighbourhood within the Austasen iceberg resting-place and close to the glaciated coast. At one additional station the south-eastern slope and top of the „hilltop" in the northern part of the Norsel Bank was surveyed.

Preliminary results

LARSEN-SURVEY. In general, the megafauna observed directly by the video-equipped ROV showed obvious similarities with the situation in 2006/2007. Deep-sea animals attributed to the old oligotrophic situation such as elasipode holothurians were found. Few pioneers were also observed. They are assumed having invaded the area or responded with successfull recruitment to the environmental changes following the ice-shelf collapse e.g. small sponges. Unfortunately the Larsen B-North station of ANT-XXIII/8 could not be revisited due to difficult sea-ice conditions. Thus, a reconstruction of an exchange between two populations of ascidians having been abundant at both stations, Larsen A-South and the adjacent Larsen B-North cannot finally be answered. However the results from the oceanographic mooring suggests that both populations are connected to each other. The station off the northeastern margin of Larsen C, which was probably never ice-shelf covered during the holocene and located „upstream" of Larsen B, was selected as a reference station to the previously shelf ice-covered Larsen A and B areas. The putative source area for recolonization showed, however, the lowest abundances of megabenthos of all stations in all, ROV, MG and trawl catches. It cannot be decided at this stage whether this counter-intuitive finding was due to a large-scale disturbance, or the reflection of local oceanographic conditions (e.g. outflow area of subshelf water), or of high Antarctic benthic patchiness. Only detailed quantitative biodiversity and community analyses of the videotransects and the sea-bed inhabiting megafauna might allow a final conclusion of whether a significant species turnover happened in the past four years or not. Thus, conclusions about the pace of the development of a high latitude Antarctic benthic system under environmental stress are only possible after application of statistically sound methods considering also the technical and operational differences of the ROV operation in 2006/2007 and 2011.

BENDEX. The transect crossing the artificially disturbed area showed high similarity to a similar transect, which was performed immediately after the experiment was carried out. In the centre, sessile epifauna was rare or totally absent. Instead, trails of the fishing gear were visible. At the margin of the experimental field, large organisms such as sponges were laying on the side but were obviously alive. Sponge spicules were piled up and served as microhabitat for several other epibenthic species. The surrounding of the BENDEX core area was characterised by both, rich undisturbed sponge communities (Demospongiae and Hexactinellida) and assemblages, which represented different stages of recolonization after natural iceberg devastation.

3.4.6 Demersal fish community

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3) Universität Basel
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Objectives

Fishes are an integral part of the Antarctic shelf ecosystem and composition of demersal communities vary depending on location and habitat structure (Gerdes et al. 2008). The demersal fish fauna in Larsen B was sampled for the first and so far only time in 2007 during the expedition ANT-XXIII/8. The results from the survey revealed a fish fauna that was composed of high latitude as well as lower latitude species (Gutt et al. 2011). During the current expedition the same areas were re-sampled to check whether the composition of the fish community changed within the last four years. Additionally, the fish fauna in a previously unsampled area in Larsen C was sampled.

Work at sea

The demersal fish fauna in the Larsen area was sampled using a standard bottom trawl. Two hauls were carried out in Larsen A, one haul in Larsen B and two hauls in Larsen C. All hauls were between 300 and 450 m water depth. Some fishes were additionally caught by AGTs. Fishes were determined to species level, measured and weighed. To account for differences in trawled areas, abundance and biomass data of each haul were standardized to an area of 1,000 m^2. Otoliths, stomachs and tissue samples were taken from various species for age determination and the analysis of diet composition and stable isotope signatures.

Preliminary results

Compared to the shelves of the Scotia Arc Islands, the western Antarctic Peninsula and the eastern Weddell Sea, the fish fauna in the whole Larsen area was poor in terms of species number as well as abundance. Species number ranged from 5 in A south to a maximum of 8 in C north, diversity and evenness were lowest in B west and highest in C north (see Table 3.4.3). Overall fish biomass was highest in B west and lowest in A south.

Tab. 3.4.3: Species number, diversity, evenness and standardized biomass of the demersal fish community at different bottom trawl stations in the Larsen area

Area	Station	Species No.	Shannon Diversity H'	Evenness J' (Pilou)	Fish biomass [g *1000m^2]
Larsen A south	PS77/228-3	5	1,33	0,83	16,54
Larsen A south	PS77/231-3	7	1,20	0,62	13,83
Larsen B west	PS77/235-8	6	0,77	0,40	29,97
Larsen C north	PS77/237-2	8	1,81	0,87	20,69
Larsen C north	PS77/237-3	6	1,54	0,86	24,19

Fish species composition and abundance (N/1,000 m^2) were similar to those found during the expedition ANT-XXIII/8 in 2007 (see Gutt et al. 2011 & Table 3.4.4). The fish communities were distinctly dominated by typical high Antarctic species such as *Pleuragramma antarcticum* and *Trematomus* spp., but also included species that are typical representatives of lower latitudes, such as *Gobionotothen gibberifrons* and *Lepidonotothen larseni* (*L. larseni* was not represented in the bottom trawls, only in two AGT hauls).

Tab. 3.4.4: Composition of demersal fish communities [N/1,000 m²] in Larsen A, B and C. Families are given brackets (BAT: Bathydraconidae, CHA: Channichthyidae, NOT: Nototheniidae)

	Larsen A south		**Larsen B west**	**Larsen C north**	
Species	**PS77 228-3**	**PS77 231-3**	**PS77 235-8**	**PS77 237-2**	**PS77 237-3**
Bathydraco macrolepis (BAT)	-	-	0,01	-	-
Gymnodraco acuticeps (BAT)	0,02	-	0,01	0,05	0,01
Chaenodraco wilsoni (CHA)	-	0,01	-	0,03	0,04
Pagetopsis maculatus (CHA)	-	0,04	-	-	-
Gobionotothen gibberifrons (NOT)	0,04	0,03	-	-	-
Pagothenia borchgrevinki (NOT)	-	0,01	0,01	0,05	0,09
Pleuragramma antarcticum (NOT)	0,12	0,45	1,0	0,03	-
Trematomus bernacchii (NOT)	-	-	-	0,02	
Trematomus eulepidotus (NOT)	0,04	0,04	0,06	0,13	0,13
Trematomus hansoni (NOT)	-	-	-	0,02	0,03
Trematomus scotti (NOT)	0,18	0,10	0,15	0,13	0,16

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APPENDIX

A.1 PARTICIPATING INSTITUTIONS

A.2 CRUISE PARTICIPANTS

A.3 SHIP‘S CREW

A.4 STATION LIST

A.5 ABBREVIATIONS OF GEAR

A.1 PARTICIPATING INSTITUTIONS

	Address
AWI	Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz Gemeinschaft Postfach 120161 27515 Bremerhaven Germany
BAS	British Antarctic Survey Natural Environment Research Council High Cross, Madingley Road Cambridge CB3 0ET United Kingdom
CADIC-CONICET	Centro Austral de Investigaciones Científicas Houssay 200 V9410CAB Ushuaia - Tierra del Fuego Argentina
CEAB-CISIC	Centre d‘Estudis Avançats de Blanes-CSIC Access a la Cala St. Fransesc 14 17300 Blanes Spain
DWD	Deutscher Wetterdienst Geschäftsbereich Wettervorhersage Seeschifffahrtsberatung Bernhard Nocht Str. 76 20359 Hamburg Germany
ECM-UCV	Escuela de Ciencias del Mar Pontificia Universidad Católica de Valparaíso. Av.Altamirano #1480 Valparaiso Chile
FS	Forschungsinstitut und Naturmuseum Senckenberg Sektion Marine Evertebraten I Senckenberganlage 25 61350 Frankfurt am Main Germany

	Address
FS-DZMB	Forschungsinstitut Senckenberg Abt. DZMB - Deutsches Zentrum für Marine Biodiversitätsforschung Südstrand 44 26382 Wilhelmshaven Germany
GU-LOVEN	Göteborgs Universitet Sven Lovén centrum för marina vetenskaper 452 96 Strömstad Sweden
HELISERVICE	HeliService international GmbH Am Luneort 15 27572 Bremerhaven Germany
ICM-CISIC	Institut de Ciencies del Mar-CSIC Passeig Maritim de la Barceloneta 37-49 08003 Barcelona Spain
ICTA-UAB	Institut de Ciència I Tecnologia Ambientals ICTA Universitat Autònoma de Barcelona UAB UAB Campus Cn s/n Cerdanyola del Vallés 08193 Barcelona Spain
IRSNB	Institut royal des Sciences naturelles de Belgique 29, rue Vautier 1000 Bruxelles Belgium
ISITEC	iSiTEC GmbH Bussestr. 27 27570 Bremerhaven Germany
MNHN	Museum national d‘Histoire naturelle Departement Milieux et Peuplements Aquatiques CP 26 43, Rue Cuvier 75005 Paris France

	Address
UBAS	Universität Basel Zoologisches Institut Vesalgasse 1 4051 Basel Switzerland
UGENT	Ghent University Marine Biology Research group Sterrecampus Krijgslaan 281 (S8) 9000 Ghent Belgium
UHB	Universität Bremen NW2A Fachbereich 2: Biologie / Chemie Marine Zoologie (MarZoo) Leobener Straße 28359 Bremen Germany
UHH-IHF	Universität Hamburg Institut für Hydrobiologie und Fischereiwissenschaften Grosse Elbstrasse 133 22767 Hamburg Germany
ULG	Université de Liège Institut de Chimie B6 Laboratoire de systématique et diversité animale Chargée de recherches FNRS 4000 LIEGE Belgium
UMAG	Universidad de Magallanes Instituto de la Patagonia Av. Bulnes #01855 Punta Arenas Chile
UNIFI	Università degli Studi di Firenze Laboratori di Zoologia integrata ed applicata Via Romana, 17 50125 Firenze Italy

	Address
UNIPD	Università di Padova Dipartimento di Biologia Via U.Bassi 58/ B 35121 Padova Italy
VTI	Johann Heinrich von Thünen-Institut Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei Institut für Fischereiökologie Palmaille 9 22767 Hamburg Germany

A.2 CRUISE PARTICIPANTS

Last name	First name	Institute	Profession
Agrawal	Shobhit	AWI	Scientist
Arntz	Wolf	AWI	Scientist
Auel	Holger	UHB	Scientist
Bartolini	Fabrizio	UNIFI	Scientist
Bohlmann	Harald	ISITEC	Technician
Brauer	Jens	HELISERVICE	Helicopter, Technician
Büchner	Jürgen	HELISERVICE	Helicopter, Pilot
Damerau	Malte	VTI	Scientist
Fillinger	Laura	AWI	Scientist
Funke	Tobias	AWI	Engineer
Gerdes	Dieter	AWI	Scientist
Giomi	Folco	AWI	Scientist
Graeve	Martin	AWI	Scientist
Gutt	Julian	AWI	Scientist
Hauquir	Freija	UGent	Scientist
Havermans	Charlotte	IRSNB	Scientist
Helber	Stephanie	AWI	Student
Hirse	Timo	AWI	Technician
Isla	Enrique	ICM-CSIC	Scientist
Janussen	Dorte	FS	Scientist
Kathöver	Raphaela	AWI	Student
Knobelsdorf	Michael	DWD	Meteorologist
Knust	Rainer	AWI	Scientist
Koschnick	Nils	AWI	Engineer
Krägefsky	Sören	AWI	Scientist
Lundälv	Tomas	GU-LOVEN	ROV-Pilot
Matschiner	Michael	UNIBAS	Scientist
Mintenbeck	Katja	AWI	Scientist
Möllendorf	Carsten	HELISERVICE	Helicopter, Technician
Montiel	Americo	UMAG	Scientist
Oellermann	Michael	AWI	Scientist
Quiroga	Eduardo	ECM-UCV	Scientist
Rath	Lena	UHH-IHF	Student
Richter	Claudio	AWI	Scientist
Robert	Henri	IRSNB / ULG	Scientist

Last name	First name	Institute	Profession
Rose	Armin	FS-DZMB	Scientist
Rossi	Sergio	ICTA-UAB	Scientist
Sandersfeld	Tina	AWI / UHB	Student
Sands	Chester	BAS	Scientist
Sartoris	Franz-Josef	AWI	Scientist
Schiel	Sigrid	AWI	Scientist
Schmidt	Joerg	HELISERVICE	Helicopter, Pilot
Schründer	Sabine	AWI	Student
Schvenzov	Natasha	CADIC-CONICET	Scientist
Sonnabend	Hartmut	DWD	Technician, Meteorology
Stapp	Laura	AWI	Student
Storch	Daniela	AWI	Scientist
Strobel	Anneli	AWI	Scientist
Tillmann	Anette	AWI	Technician
Uriz	Iosune	ICM-CEAB	Scientist
Wang	Chen	AWI	Scientist

A.3 SHIP'S CREW

Name	Rank
Pahl, Uwe	Master
Spielke, Steffen	1st Offc.
Ziemann, Olaf	Ch. Eng.
Gumtow, Philipp	2nd Offc.
Lauber, Felix	2nd Offc.
Peine. Lutz G.	2nd Offc.
Stüwe, Ursula	Doctor
Koch, Georg	R. Offc.
Kotnik, Herbert	2nd Eng.
Schnürch, Helmut	2nd Eng.
Westphal, Henning	2nd Eng.
Holtz, Hartmut	ElecEng.
Dimmler, Werner	ELO
Feiertag, Thomas	ELO
Hebold, Catharina	ELO
Nasis, Ilias	ELO
Clasen, Burkhard	Boatsw.
Neisner,Winfried	Carpenter
Burzan, Gerd-Ekkehard	A.B.
Guse, Hartmut	A.B.
Hartwig-Lab., Andreas	A.B.
Kreis, Reinhard	A.B.
Kretzschmar, Uwe	A.B.
Moser, Siegfried	A.B.
Scheel, Sebastian	A.B.
Schröder, Norbert	A.B.
Schultz, Ottomar	A.B.
Beth, Detlef	Storek.
Dinse, Horst	Mot-man
Fritz, Günter	Mot-man
Kiem. Peter	Mot-man
Krösche, Eckard	Mot-man
Watzel, Bernhard	Mot-man
Fischer, Matthias	Cook
Tupy,Mario	Cooksmate
Völske, Thomas	Cooksmate
Dinse, Petra	1. Stwdess

Name	Rank
Hennig, Christina	Stwdess/N.
Chen, Quan Lun	2. Stwdess
Hischke, Peggy	2. Steward
Möller, Wolfgang	2. Stwdess
Streit, Christina	2. Steward
Wartenberg, Irina	2. Stwdess
Ruan, Hui Guang	Laundrym.

A.4 STATION LIST PS 77

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 208-1	11.02.2011	08:01	54° 33.16‘S	56° 10.08‘W	295.7	CTD/RO	in the water
PS77 208-1	11.02.2011	08:17	54° 33.19‘S	56° 9.96‘W	299.2	CTD/RO	max depth
PS77 208-1	11.02.2011	08:31	54° 33.21‘S	56° 9.93‘W	299.0	CTD/RO	on deck
PS77 208-2	11.02.2011	10:10	54° 34.04‘S	56° 10.64‘W	299.5	BT	profile start
PS77 208-2	11.02.2011	10:13	54° 33.90‘S	56° 10.56‘W	296.5	BT	in the water
PS77 208-2	11.02.2011	10:35	54° 32.27‘S	56° 9.78‘W	281.7	BT	on ground
PS77 208-2	11.02.2011	10:55	54° 30.84‘S	56° 9.06‘W	282.5	BT	hoisting
PS77 208-2	11.02.2011	10:59	54° 30.67‘S	56° 8.96‘W	281.0	BT	off ground
PS77 208-2	11.02.2011	11:25	54° 29.87‘S	56° 8.17‘W	291.7	BT	on deck
PS77 208-2	11.02.2011	11:25	54° 29.87‘S	56° 8.17‘W	291.7	BT	profile end
PS77 208-3	11.02.2011	12:29	54° 34.13‘S	56° 10.41‘W	300.0	BT	profile start
PS77 208-3	11.02.2011	12:32	54° 33.83‘S	56° 10.22‘W	304.2	BT	in the water
PS77 208-3	11.02.2011	12:45	54° 33.01‘S	56° 9.77‘W	297.0	BT	in the water
PS77 208-3	11.02.2011	12:59	54° 31.78‘S	56° 9.11‘W	285.5	BT	on ground
PS77 208-3	11.02.2011	13:21	54° 30.17‘S	56° 8.29‘W	280.2	BT	hoisting
PS77 208-3	11.02.2011	13:24	54° 30.06‘S	56° 8.23‘W	290.5	BT	off ground
PS77 208-3	11.02.2011	13:47	54° 29.35‘S	56° 7.45‘W	287.0	BT	on deck
PS77 208-3	11.02.2011	13:47	54° 29.35‘S	56° 7.45‘W	287.0	BT	profile end
PS77 208-4	11.02.2011	14:39	54° 33.02‘S	56° 10.06‘W	300.5	MUC	action
PS77 208-4	11.02.2011	14:46	54° 33.03‘S	56° 10.02‘W	300.2	MUC	on ground
PS77 208-4	11.02.2011	14:47	54° 33.03‘S	56° 10.01‘W	300.7	MUC	hoisting

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 208-4	11.02.2011	14:55	54° 33.06'S	56° 9.93'W	299.2	MUC	at surface
PS77 208-4	11.02.2011	14:57	54° 33.07'S	56° 9.91'W	298.2	MUC	on deck
PS77 208-5	11.02.2011	16:00	54° 33.39'S	56° 10.39'W	293.7	AGT	in the water
PS77 208-5	11.02.2011	16:13	54° 32.87'S	56° 10.08'W	292.0	AGT	on ground
PS77 208-5	11.02.2011	16:17	54° 32.81'S	56° 10.00'W	293.7	AGT	profile start
PS77 208-5	11.02.2011	16:28	54° 32.62'S	56° 9.78'W	292.5	AGT	profile end
PS77 208-5	11.02.2011	16:28	54° 32.62'S	56° 9.78'W	292.5	AGT	hoisting
PS77 208-5	11.02.2011	16:36	54° 32.57'S	56° 9.65'W	289.7	AGT	off ground
PS77 208-5	11.02.2011	16:52	54° 32.19'S	56° 9.33'W	287.7	AGT	on deck
PS77 208-6	11.02.2011	18:55	54° 33.01'S	56° 9.98'W	300.2	MG	in the water
PS77 208-6	11.02.2011	19:56	54° 32.97'S	56° 10.01'W	298.5	MG	on ground
PS77 208-6	11.02.2011	20:19	54° 33.00'S	56° 10.06'W	298.2	MG	on deck
PS77 PS77 209-1	12.02.2011	00:42	54° 27.52'S	55° 5.70'W	1131.5	CTD	in the water
PS77 PS77 209-1	12.02.2011	01:08	54° 27.71'S	55° 5.75'W	1085.0	CTD	max depth
PS77 PS77 209-1	12.02.2011	01:10	54° 27.73'S	55° 5.77'W	1081.0	CTD	hoisting
PS77 209-1	12.02.2011	01:35	54° 27.90'S	55° 5.96'W	1041.5	CTD	on deck
PS77 209-2	12.02.2011	01:54	54° 28.01'S	55° 6.15'W	1028.2	MN	in the water
PS77 209-2	12.02.2011	02:34	54° 28.16'S	55° 6.41'W	1005.7	MN	max depth
PS77 209-2	12.02.2011	02:35	54° 28.16'S	55° 6.42'W	1006.2	MN	hoisting
PS77 209-2	12.02.2011	03:11	54° 28.19'S	55° 6.73'W	1003.2	MN	on deck
PS77 209-3	12.02.2011	03:15	54° 28.19'S	55° 6.76'W	1001.0	MN	in the water
PS77 209-3	12.02.2011	03:29	54° 28.16'S	55° 6.85'W	1001.0	MN	max depth

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 209-3	12.02.2011	03:30	54° 28.16‘S	55° 6.86‘W	999.7	MN	hoisting
PS77 209-3	12.02.2011	03:47	54° 28.17‘S	55° 6.95‘W	996.5	MN	on deck
PS77 210-1	14.02.2011	02:18	53° 25.84‘S	43° 1.11‘W	1056.0	CTD/RO	in the water
PS77 210-1	14.02.2011	02:44	53° 25.87‘S	43° 1.04‘W	1061.0	CTD/RO	max depth
PS77 210-1	14.02.2011	02:45	53° 25.87‘S	43° 1.04‘W	1063.0	CTD/RO	hoisting
PS77 210-1	14.02.2011	03:11	53° 25.92‘S	43° 1.08‘W	1070.0	CTD/RO	on deck
PS77 210-2	14.02.2011	03:29	53° 25.84‘S	43° 1.10‘W	1057.0	MN	in the water
PS77 210-2	14.02.2011	04:06	53° 25.97‘S	43° 1.15‘W	1081.0	MN	max depth
PS77 210-2	14.02.2011	04:07	53° 25.97‘S	43° 1.15‘W	1081.0	MN	hoisting
PS77 210-2	14.02.2011	04:40	53° 26.00‘S	43° 1.09‘W	1086.0	MN	on deck
PS77 210-3	14.02.2011	04:58	53° 26.00‘S	43° 1.16‘W	1086.0	SWS	action
PS77 210-3	14.02.2011	05:05	53° 26.01‘S	43° 1.17‘W	0.0	SWS	on ground/ max depth
PS77 210-3	14.02.2011	05:08	53° 26.01‘S	43° 1.18‘W	1088.0	WSB	on deck
PS77 210-3	14.02.2011	05:08	53° 26.01‘S	43° 1.18‘W	1088.0	SWS	on deck
PS77 211-1	14.02.2011	06:53	53° 24.13‘S	42° 38.03‘W	362.0	CTD/RO	in the water
PS77 211-1	14.02.2011	07:09	53° 24.12‘S	42° 38.12‘W	360.0	CTD/RO	max depth
PS77 211-1	14.02.2011	07:18	53° 24.10‘S	42° 38.16‘W	359.0	CTD/RO	on deck
PS77 211-2	14.02.2011	07:33	53° 24.03‘S	42° 38.08‘W	374.0	MG	in the water
PS77 211-2	14.02.2011	08:00	53° 24.01‘S	42° 37.98‘W	372.0	MG	on ground
PS77 211-2	14.02.2011	08:10	53° 23.99‘S	42° 37.93‘W	371.0	MG	off ground
PS77 211-2	14.02.2011	08:30	53° 24.01‘S	42° 37.90‘W	371.0	MG	on deck
PS77 211-3	14.02.2011	08:42	53° 23.99‘S	42° 37.90‘W	368.0	MUC	action
PS77 211-3	14.02.2011	08:48	53° 23.99‘S	42° 37.92‘W	368.0	MUC	on ground

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 211-3	14.02.2011	09:04	53° 24.03'S	42° 38.00'W	387.5	MUC	at surface
PS77 211-3	14.02.2011	09:07	53° 24.04'S	42° 38.01'W	372.5	MUC	on deck
PS77 211-3	14.02.2011	09:17	53° 24.08'S	42° 38.03'W	367.7	MUC	action
PS77 211-3	14.02.2011	09:19	53° 24.08'S	42° 38.04'W	371.7	MUC	in the water
PS77 211-3	14.02.2011	09:28	53° 24.11'S	42° 38.06'W	363.2	MUC	on ground
PS77 211-3	14.02.2011	09:28	53° 24.11'S	42° 38.06'W	363.2	MUC	hoisting
PS77 211-3	14.02.2011	09:40	53° 24.14'S	42° 38.07'W	359.5	MUC	on deck
PS77 211-5	14.02.2011	10:19	53° 24.53'S	42° 40.70'W	317.0	AGT	profile start
PS77 211-5	14.02.2011	10:24	53° 24.49'S	42° 40.94'W	324.2	AGT	in the water
PS77 211-5	14.02.2011	10:34	53° 24.22'S	42° 41.39'W	320.0	AGT	on ground
PS77 211-5	14.02.2011	10:44	53° 24.21'S	42° 41.65'W	326.5	AGT	hoisting
PS77 211-5	14.02.2011	11:08	53° 24.06'S	42° 42.58'W	345.2	AGT	profile end
PS77 211-5	14.02.2011	11:08	53° 24.06'S	42° 42.58'W	345.2	AGT	on deck
PS77 211-6	14.02.2011	11:59	53° 24.81'S	42° 40.03'W	314.7	AGT	profile start
PS77 211-6	14.02.2011	11:59	53° 24.81'S	42° 40.03'W	314.7	AGT	in the water
PS77 211-6	14.02.2011	12:07	53° 24.43'S	42° 40.06'W	301.2	AGT	lowering
PS77 211-6	14.02.2011	12:11	53° 24.27'S	42° 40.07'W	295.5	AGT	lowering
PS77 211-6	14.02.2011	12:23	53° 24.10'S	42° 40.08'W	290.2	AGT	on ground
PS77 211-6	14.02.2011	12:34	53° 23.94'S	42° 40.10'W	285.0	AGT	hoisting
PS77 211-6	14.02.2011	12:40	53° 23.86'S	42° 40.11'W	284.7	AGT	off ground
PS77 211-6	14.02.2011	12:51	53° 23.71'S	42° 40.13'W	290.2	AGT	at surface
PS77 211-6	14.02.2011	12:57	53° 23.64'S	42° 40.12'W	293.2	AGT	on deck
PS77 211-6	14.02.2011	12:58	53° 23.60'S	42° 40.12'W	295.0	AGT	profile end

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 211-7	14.02.2011	14:16	53° 25.86‘S	42° 38.57‘W	336.7	BT	in the water
PS77 211-7	14.02.2011	14:19	53° 25.74‘S	42° 38.78‘W	357.5	BT	action
PS77 211-7	14.02.2011	14:38	53° 24.63‘S	42° 40.40‘W	309.0	BT	on ground
PS77 211-7	14.02.2011	14:40	53° 24.54‘S	42° 40.55‘W	297.0	BT	profile start
PS77 211-7	14.02.2011	14:59	53° 23.79‘S	42° 42.01‘W	308.7	BT	profile end
PS77 211-7	14.02.2011	15:07	53° 23.64‘S	42° 42.38‘W	303.5	BT	off ground
PS77 211-7	14.02.2011	15:23	53° 23.40‘S	42° 43.08‘W	330.0	BT	on deck
PS77 211-8	14.02.2011	16:09	53° 25.47‘S	42° 38.56‘W	329.5	BT	in the water
PS77 211-8	14.02.2011	16:16	53° 25.22‘S	42° 39.04‘W	320.7	BT	action
PS77 211-8	14.02.2011	16:32	53° 24.43‘S	42° 40.57‘W	311.0	BT	on ground
PS77 211-8	14.02.2011	16:33	53° 24.39‘S	42° 40.65‘W	308.7	BT	profile start
PS77 211-8	14.02.2011	16:53	53° 23.58‘S	42° 42.15‘W	298.2	BT	profile end
PS77 211-8	14.02.2011	16:58	53° 23.50‘S	42° 42.37‘W	301.0	BT	off ground
PS77 211-8	14.02.2011	17:18	53° 23.26‘S	42° 43.25‘W	326.0	BT	on deck
PS77 212-1	16.02.2011	04:58	54° 22.92‘S	35° 34.51‘W	270.7	TRAPF	in the water
PS77 212-1	16.02.2011	04:58	54° 22.92‘S	35° 34.51‘W	270.7	TRAPF	on ground/ released?
PS77 212-2	16.02.2011	05:14	54° 23.05‘S	35° 34.61‘W	270.2	ATC	in the water
PS77 212-2	16.02.2011	05:14	54° 23.05‘S	35° 34.61‘W	270.2	ATC	on ground/ max depth/ released?
PS77 212-3	16.02.2011	06:54	54° 17.46‘S	35° 14.38‘W	701.7	TRAPF	in the water
PS77 212-3	16.02.2011	06:54	54° 17.46‘S	35° 14.38‘W	701.7	TRAPF	on ground/ released?
PS77 213-1	16.02.2011	07:32	54° 13.77‘S	35° 14.36‘W	1021.7	CTD/RO	action
PS77 213-1	16.02.2011	07:59	54° 13.69‘S	35° 14.34‘W	1010.7	CTD/RO	max depth
PS77 213-1	16.02.2011	08:25	54° 13.65‘S	35° 14.40‘W	1002.7	CTD/RO	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 213-2	16.02.2011	08:41	54° 13.66'S	35° 14.45'W	1003.5	BONGO	action
PS77 213-2	16.02.2011	09:01	54° 13.64'S	35° 14.45'W	998.0	BONGO	max depth
PS77 213-2	16.02.2011	09:02	54° 13.65'S	35° 14.45'W	998.2	BONGO	hoisting
PS77 213-2	16.02.2011	09:18	54° 13.67'S	35° 14.44'W	1000.5	BONGO	at surface
PS77 213-2	16.02.2011	09:19	54° 13.67'S	35° 14.44'W	1000.5	BONGO	on deck
PS77 213-3	16.02.2011	09:20	54° 13.67'S	35° 14.44'W	1000.5	BONGO	action
PS77 213-3	16.02.2011	09:22	54° 13.67'S	35° 14.44'W	1000.7	BONGO	in the water
PS77 213-3	16.02.2011	09:41	54° 13.73'S	35° 14.42'W	1010.7	BONGO	max depth
PS77 213-3	16.02.2011	09:41	54° 13.73'S	35° 14.42'W	1010.7	BONGO	hoisting
PS77 213-3	16.02.2011	09:59	54° 13.71'S	35° 14.56'W	996.7	BONGO	at surface
PS77 213-3	16.02.2011	10:00	54° 13.71'S	35° 14.57'W	994.5	BONGO	on deck
PS77 213-4	16.02.2011	10:10	54° 13.75'S	35° 14.74'W	970.2	BONGO	action
PS77 213-4	16.02.2011	10:14	54° 13.76'S	35° 14.81'W	963.2	BONGO	in the water
PS77 213-4	16.02.2011	10:20	54° 13.79'S	35° 14.90'W	953.0	BONGO	max depth
PS77 213-4	16.02.2011	10:31	54° 13.88'S	35° 15.28'W	909.7	BONGO	hoisting
PS77 213-4	16.02.2011	10:35	54° 13.88'S	35° 15.38'W	894.0	BONGO	action
PS77 213-4	16.02.2011	10:37	54° 13.89'S	35° 15.48'W	880.5	BONGO	on deck
PS77 214-1	16.02.2011	12:17	54° 24.01'S	35° 34.18'W	555.2	BT	action
PS77 214-1	16.02.2011	12:18	54° 23.92'S	35° 34.23'W	553.7	BT	in the water
PS77 214-1	16.02.2011	12:24	54° 23.42'S	35° 34.16'W	537.5	BT	action
PS77 214-1	16.02.2011	12:32	54° 23.34'S	35° 35.01'W	549.5	BT	action
PS77 214-1	16.02.2011	12:47	54° 24.42'S	35° 36.85'W	274.7	BT	on ground
PS77 214-1	16.02.2011	12:48	54° 24.47'S	35° 36.95'W	275.0	BT	profile start

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 214-1	16.02.2011	12:56	54° 24.86‘S	35° 37.76‘W	277.7	BT	action
PS77 214-1	16.02.2011	13:08	54° 25.42‘S	35° 38.95‘W	272.2	BT	profile end
PS77 214-1	16.02.2011	13:08	54° 25.42‘S	35° 38.95‘W	272.2	BT	hoisting
PS77 214-1	16.02.2011	13:16	54° 25.68‘S	35° 39.41‘W	271.2	BT	off ground
PS77 214-1	16.02.2011	13:32	54° 26.17‘S	35° 40.18‘W	267.7	BT	on deck
PS77 214-2	16.02.2011	14:13	54° 23.62‘S	35° 34.83‘W	274.7	BT	in the water
PS77 214-2	16.02.2011	14:23	54° 24.07‘S	35° 36.08‘W	275.5	BT	action
PS77 214-2	16.02.2011	14:39	54° 25.06‘S	35° 37.94‘W	278.7	BT	on ground
PS77 214-2	16.02.2011	14:39	54° 25.06‘S	35° 37.94‘W	278.7	BT	profile start
PS77 214-2	16.02.2011	14:59	54° 25.99‘S	35° 39.78‘W	270.5	BT	profile end
PS77 214-2	16.02.2011	14:59	54° 25.99‘S	35° 39.78‘W	270.5	BT	hoisting
PS77 214-2	16.02.2011	15:06	54° 26.20‘S	35° 40.17‘W	267.7	BT	off ground
PS77 214-2	16.02.2011	15:27	54° 26.80‘S	35° 41.32‘W	263.7	BT	on deck
PS77 214-3	16.02.2011	16:10	54° 25.64‘S	35° 41.73‘W	265.7	MUC	action
PS77 214-3	16.02.2011	16:18	54° 25.61‘S	35° 41.79‘W	264.5	MUC	on ground
PS77 214-3	16.02.2011	16:18	54° 25.61‘S	35° 41.79‘W	264.5	MUC	hoisting
PS77 214-3	16.02.2011	16:27	54° 25.60‘S	35° 41.86‘W	263.5	MUC	on deck
PS77 214-4	16.02.2011	16:42	54° 25.62‘S	35° 41.90‘W	264.5	MUC	in the water
PS77 214-4	16.02.2011	16:52	54° 25.62‘S	35° 41.86‘W	265.2	MUC	on ground
PS77 214-4	16.02.2011	16:52	54° 25.62‘S	35° 41.86‘W	265.2	MUC	hoisting
PS77 214-4	16.02.2011	17:00	54° 25.65‘S	35° 41.86‘W	265.0	MUC	on deck
PS77 214-5	16.02.2011	17:23	54° 25.85‘S	35° 41.75‘W	265.2	AGT	in the water
PS77 214-5	16.02.2011	17:28	54° 25.99‘S	35° 41.63‘W	266.2	AGT	on ground

Station PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 214-5	16.02.2011	17:35	54° 26.12'S	35° 41.54'W	266.2	AGT	profile start
PS77 214-5	16.02.2011	17:45	54° 26.31'S	35° 41.43'W	266.7	AGT	profile end
PS77 214-5	16.02.2011	17:53	54° 26.33'S	35° 41.43'W	266.2	AGT	off ground
PS77 214-5	16.02.2011	18:11	54° 26.32'S	35° 41.49'W	266.2	AGT	on deck
PS77 214-6	16.02.2011	19:03	54° 22.83'S	35° 34.61'W	267.2	TRAPF	released
PS77 214-6	16.02.2011	19:11	54° 22.82'S	35° 34.63'W	266.2	TRAPF	at surface
PS77 214-6	16.02.2011	19:26	54° 22.91'S	35° 34.93'W	260.0	TRAPF	released
PS77 214-6	16.02.2011	19:27	54° 22.90'S	35° 34.94'W	259.5	TRAPF	on deck
PS77 214-7	16.02.2011	19:36	54° 22.96'S	35° 34.76'W	262.5	ATC	released
PS77 214-7	16.02.2011	19:36	54° 22.96'S	35° 34.76'W	262.5	ATC	on ground/ max depth
PS77 214-7	16.02.2011	19:45	54° 23.01'S	35° 34.72'W	268.2	ATC	at surface
PS77 214-7	16.02.2011	19:54	54° 23.09'S	35° 34.89'W	266.7	ATC	on deck
PS77 214-8	16.02.2011	20:20	54° 24.04'S	35° 34.06'W	286.0	MG	in the water
PS77 214-8	16.02.2011	20:33	54° 24.14'S	35° 34.12'W	280.5	MG	on ground
PS77 214-8	16.02.2011	20:53	54° 24.33'S	35° 34.24'W	280.2	MG	hoisting
PS77 214-8	16.02.2011	20:54	54° 24.34'S	35° 34.25'W	280.0	MG	off ground
PS77 214-8	16.02.2011	21:04	54° 24.45'S	35° 34.21'W	279.2	MG	at surface
PS77 214-8	16.02.2011	21:08	54° 24.52'S	35° 34.19'W	280.0	MG	on deck
PS77 214-9	16.02.2011	21:19	54° 24.61'S	35° 34.21'W	282.0	CTD	action
PS77 214-9	16.02.2011	21:21	54° 24.62'S	35° 34.23'W	286.2	CTD	in the water
PS77 214-9	16.02.2011	21:31	54° 24.65'S	35° 34.25'W	285.7	CTD	max depth
PS77 214-9	16.02.2011	21:32	54° 24.65'S	35° 34.25'W	281.0	CTD	hoisting
PS77 214-9	16.02.2011	21:38	54° 24.69'S	35° 34.30'W	296.2	CTD	at surface

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 214-9	16.02.2011	21:39	54° 24.70‘S	35° 34.30‘W	282.2	CTD	on deck
PS77 215-1	16.02.2011	23:23	54° 17.42‘S	35° 14.29‘W	0.0	TRAPF	action
PS77 215-1	16.02.2011	23:23	54° 17.42‘S	35° 14.29‘W	0.0	TRAPF	hydrophone into the water
PS77 215-1	16.02.2011	23:24	54° 17.43‘S	35° 14.29‘W	0.0	TRAPF	released
PS77 215-1	16.02.2011	23:25	54° 17.44‘S	35° 14.29‘W	0.0	TRAPF	hydrophone on deck
PS77 215-1	16.02.2011	23:42	54° 17.53‘S	35° 14.36‘W	25.0	TRAPF	at surface
PS77 215-1	16.02.2011	23:55	54° 17.31‘S	35° 14.67‘W	0.0	TRAPF	on deck
PS77 216-1	19.02.2011	00:04	60° 35.66‘S	43° 59.29‘W	1047.0	CTD	in the water
PS77 216-1	19.02.2011	00:34	60° 35.51‘S	43° 59.31‘W	1058.0	CTD	max depth
PS77 216-1	19.02.2011	00:36	60° 35.50‘S	43° 59.30‘W	1060.0	CTD	hoisting
PS77 216-1	19.02.2011	01:02	60° 35.36‘S	43° 59.28‘W	1070.0	CTD	on deck
PS77 216-2	19.02.2011	01:19	60° 35.34‘S	43° 59.15‘W	1089.0	MN	action
PS77 216-2	19.02.2011	01:48	60° 35.23‘S	43° 59.17‘W	1094.0	MN	max depth
PS77 216-2	19.02.2011	01:50	60° 35.23‘S	43° 59.17‘W	1094.0	MN	hoisting
PS77 216-2	19.02.2011	02:23	60° 35.02‘S	43° 59.32‘W	1071.0	MN	on deck
PS77 216-3	19.02.2011	08:22	61° 8.48‘S	43° 58.41‘W	395.5	POS	profile start
PS77 216-3	19.02.2011	08:43	61° 8.48‘S	43° 58.31‘W	402.7	POS	in the water
PS77 216-3	19.02.2011	08:48	61° 8.48‘S	43° 58.31‘W	397.7	POS	on ground/ max depth
PS77 216-3	19.02.2011	08:54	61° 8.48‘S	43° 58.32‘W	402.2	POS	profile end
PS77 217-1	19.02.2011	08:55	61° 8.48‘S	43° 58.32‘W	398.2	ROV	profile start
PS77 217-1	19.02.2011	08:56	61° 8.48‘S	43° 58.32‘W	402.2	ROV	in the water
PS77 217-1	19.02.2011	09:34	61° 8.49‘S	43° 58.13‘W	399.0	ROV	on ground/ max depth
PS77 217-1	19.02.2011	09:35	61° 8.49‘S	43° 58.12‘W	399.5	ROV	action

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 217-1	19.02.2011	10:10	61° 8.51'S	43° 57.94'W	417.5	ROV	action
PS77 217-1	19.02.2011	10:42	61° 8.59'S	43° 58.00'W	401.5	ROV	at surface
PS77 217-1	19.02.2011	10:52	61° 8.61'S	43° 58.03'W	402.0	ROV	on deck
PS77 217-1	19.02.2011	10:53	61° 8.61'S	43° 58.03'W	400.7	ROV	profile end
PS77 217-2	19.02.2011	11:03	61° 8.63'S	43° 58.04'W	417.2	MG	action
PS77 217-2	19.02.2011	11:08	61° 8.63'S	43° 58.07'W	401.2	MG	in the water
PS77 217-2	19.02.2011	11:29	61° 8.67'S	43° 58.12'W	405.5	MG	on ground
PS77 217-2	19.02.2011	11:53	61° 8.70'S	43° 58.11'W	402.0	MG	hoisting
PS77 217-2	19.02.2011	12:13	61° 8.68'S	43° 58.07'W	400.7	MG	on deck
PS77 217-3	19.02.2011	12:29	61° 8.67'S	43° 58.04'W	401.0	MUC	action
PS77 217-3	19.02.2011	12:40	61° 8.66'S	43° 58.00'W	401.7	MUC	on ground
PS77 217-3	19.02.2011	13:02	61° 8.67'S	43° 57.98'W	406.2	MUC	on deck
PS77 217-4	19.02.2011	13:12	61° 8.67'S	43° 57.99'W	401.2	MUC	in the water
PS77 217-4	19.02.2011	13:27	61° 8.67'S	43° 57.97'W	402.0	MUC	on ground
PS77 217-4	19.02.2011	13:52	61° 8.67'S	43° 57.92'W	403.0	MUC	on deck
PS77 217-5	19.02.2011	14:10	61° 8.74'S	43° 58.15'W	417.0	AGT	in the water
PS77 217-5	19.02.2011	14:22	61° 8.82'S	43° 59.46'W	407.7	AGT	on ground
PS77 217-5	19.02.2011	14:26	61° 8.84'S	43° 59.70'W	389.2	AGT	profile start
PS77 217-5	19.02.2011	14:36	61° 8.88'S	44° 0.11'W	384.7	AGT	profile end
PS77 217-5	19.02.2011	14:43	61° 8.91'S	44° 0.24'W	398.2	AGT	off ground
PS77 217-5	19.02.2011	15:02	61° 8.98'S	44° 0.61'W	377.7	AGT	on deck
PS77 217-6	19.02.2011	16:12	61° 8.59'S	43° 58.37'W	397.2	BT	in the water
PS77 217-6	19.02.2011	16:20	61° 8.61'S	43° 59.22'W	390.2	BT	action

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 217-6	19.02.2011	16:24	61° 8.62‘S	43° 59.82‘W	370.5	BT	alter course
PS77 217-6	19.02.2011	16:28	61° 8.83‘S	44° 0.36‘W	376.7	BT	information
PS77 217-6	19.02.2011	16:44	61° 9.62‘S	44° 2.37‘W	354.0	BT	profile start
PS77 217-6	19.02.2011	16:44	61° 9.62‘S	44° 2.37‘W	354.0	BT	on ground
PS77 217-6	19.02.2011	17:04	61° 10.34‘S	44° 4.57‘W	350.2	BT	profile end
PS77 217-6	19.02.2011	17:04	61° 10.34‘S	44° 4.57‘W	350.2	BT	hoisting
PS77 217-6	19.02.2011	17:10	61° 10.52‘S	44° 4.91‘W	351.5	BT	off ground
PS77 217-6	19.02.2011	17:20	61° 10.62‘S	44° 5.56‘W	354.7	BT	information
PS77 217-6	19.02.2011	17:29	61° 10.63‘S	44° 6.18‘W	346.5	BT	on deck
PS77 218-1	20.02.2011	08:16	61° 11.00‘S	45° 43.95‘W	338.7	CTD	action
PS77 218-1	20.02.2011	08:23	61° 10.98‘S	45° 43.93‘W	337.2	CTD	in the water
PS77 218-1	20.02.2011	08:35	61° 10.94‘S	45° 43.72‘W	340.7	CTD	max depth
PS77 218-1	20.02.2011	08:36	61° 10.94‘S	45° 43.71‘W	339.5	CTD	hoisting
PS77 218-1	20.02.2011	08:43	61° 10.92‘S	45° 43.71‘W	338.2	CTD	at surface
PS77 218-1	20.02.2011	08:45	61° 10.91‘S	45° 43.70‘W	337.0	CTD	on deck
PS77 218-2	20.02.2011	09:00	61° 10.85‘S	45° 43.87‘W	337.7	BT	profile start
PS77 218-2	20.02.2011	09:06	61° 10.90‘S	45° 44.56‘W	337.5	BT	in the water
PS77 218-2	20.02.2011	09:08	61° 10.95‘S	45° 44.84‘W	337.0	BT	alter course
PS77 218-2	20.02.2011	09:23	61° 10.36‘S	45° 44.62‘W	338.0	BT	lowering
PS77 218-2	20.02.2011	09:39	61° 10.61‘S	45° 41.91‘W	336.7	BT	on ground
PS77 218-2	20.02.2011	10:03	61° 10.87‘S	45° 38.73‘W	330.7	BT	off ground
PS77 218-2	20.02.2011	10:14	61° 10.67‘S	45° 38.03‘W	330.7	BT	action
PS77 218-2	20.02.2011	10:25	61° 10.40‘S	45° 37.06‘W	325.2	BT	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 218-2	20.02.2011	10:25	61° 10.40'S	45° 37.06'W	325.2	BT	profile end
PS77 218-3	20.02.2011	11:29	61° 11.10'S	45° 43.27'W	340.5	AGT	profile start
PS77 218-3	20.02.2011	11:33	61° 11.11'S	45° 43.22'W	339.2	AGT	in the water
PS77 218-3	20.02.2011	11:36	61° 11.17'S	45° 43.35'W	337.7	AGT	action
PS77 218-3	20.02.2011	12:00	61° 11.56'S	45° 44.13'W	335.0	AGT	on deck
PS77 218-3	20.02.2011	12:15	61° 11.67'S	45° 44.36'W	332.0	AGT	in the water
PS77 218-3	20.02.2011	12:29	61° 11.98'S	45° 45.20'W	327.0	AGT	on ground
PS77 218-3	20.02.2011	12:33	61° 12.03'S	45° 45.30'W	323.5	AGT	profile start
PS77 218-3	20.02.2011	12:43	61° 12.09'S	45° 45.48'W	324.5	AGT	profile end
PS77 218-3	20.02.2011	12:53	61° 12.08'S	45° 45.51'W	324.0	AGT	off ground
PS77 218-3	20.02.2011	13:14	61° 12.38'S	45° 46.22'W	318.7	AGT	on deck
PS77 219-1	22.02.2011	06:48	62° 17.21'S	58° 17.49'W	1033.0	TRAPF	in the water
PS77 219-1	22.02.2011	06:48	62° 17.21'S	58° 17.49'W	1033.0	TRAPF	on ground/ max depth
PS77 220-1	22.02.2011	19:08	62° 18.83'S	58° 34.52'W	328.5	LANDER	in the water
PS77 220-1	22.02.2011	19:19	62° 18.81'S	58° 34.50'W	320.7	LANDER	action
PS77 220-1	22.02.2011	19:45	62° 18.75'S	58° 34.46'W	296.5	LANDER	on ground/ max depth
PS77 220-1	22.02.2011	19:52	62° 18.74'S	58° 34.43'W	293.0	LANDER	on deck
PS77 220-2	22.02.2011	20:11	62° 18.84'S	58° 35.14'W	281.7	BWS	action
PS77 220-2	22.02.2011	20:13	62° 18.84'S	58° 35.12'W	282.5	BWS	in the water
PS77 220-2	22.02.2011	20:29	62° 18.84'S	58° 35.11'W	282.5	BWS	on ground/ max depth
PS77 220-2	22.02.2011	20:32	62° 18.83'S	58° 35.12'W	280.0	BWS	hoisting
PS77 220-2	22.02.2011	20:41	62° 18.83'S	58° 35.11'W	280.2	BWS	at surface
PS77 220-2	22.02.2011	20:42	62° 18.83'S	58° 35.10'W	283.2	BWS	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 221-1	23.02.2011	00:58	62° 19.99'S	58° 27.33'W	1105.2	CTD/RO	in the water
PS77 221-1	23.02.2011	01:30	62° 19.96'S	58° 26.98'W	1215.2	CTD/RO	max depth
PS77 221-1	23.02.2011	01:32	62° 19.96'S	58° 26.97'W	1208.5	CTD/RO	hoisting
PS77 221-1	23.02.2011	02:07	62° 19.96'S	58° 27.04'W	1199.5	CTD/RO	on deck
PS77 221-2	23.02.2011	02:19	62° 20.07'S	58° 27.32'W	1091.5	MN	in the water
PS77 221-2	23.02.2011	02:50	62° 19.95'S	58° 26.82'W	1223.5	MN	max depth
PS77 221-2	23.02.2011	02:50	62° 19.95'S	58° 26.82'W	1223.5	MN	hoisting
PS77 221-2	23.02.2011	03:23	62° 19.83'S	58° 26.39'W	1286.5	MN	on deck
PS77 221-3	23.02.2011	03:32	62° 20.02'S	58° 27.44'W	1061.0	BONGO	in the water
PS77 221-3	23.02.2011	03:51	62° 19.93'S	58° 27.11'W	1178.0	BONGO	max depth
PS77 221-3	23.02.2011	03:52	62° 19.92'S	58° 27.09'W	1173.2	BONGO	hoisting
PS77 221-3	23.02.2011	04:07	62° 19.89'S	58° 26.71'W	1235.2	BONGO	on deck
PS77 221-4	23.02.2011	04:16	62° 19.96'S	58° 27.11'W	1175.7	BONGO	action
PS77 221-4	23.02.2011	04:27	62° 19.91'S	58° 26.94'W	1189.7	BONGO	max depth
PS77 221-4	23.02.2011	04:27	62° 19.91'S	58° 26.94'W	1189.7	BONGO	hoisting
PS77 221-4	23.02.2011	04:38	62° 19.94'S	58° 26.73'W	1229.2	BONGO	on deck
PS77 221-5	23.02.2011	04:41	62° 19.93'S	58° 26.76'W	1227.0	BONGO	action
PS77 221-5	23.02.2011	05:07	62° 19.84'S	58° 26.47'W	1260.2	BONGO	max depth
PS77 221-5	23.02.2011	05:28	62° 19.74'S	58° 26.25'W	1263.0	BONGO	on deck
PS77 222-1	23.02.2011	07:24	62° 13.21'S	58° 50.74'W	268.2	MG	in the water
PS77 222-1	23.02.2011	07:57	62° 13.25'S	58° 50.83'W	262.5	MG	on ground
PS77 222-1	23.02.2011	08:10	62° 13.25'S	58° 50.83'W	266.5	MG	at surface
PS77 222-1	23.02.2011	08:18	62° 13.25'S	58° 50.82'W	262.7	MG	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 222-2	23.02.2011	08:26	62° 13.26‘S	58° 50.81‘W	276.7	CTD	in the water
PS77 222-2	23.02.2011	08:40	62° 13.27‘S	58° 50.85‘W	257.5	CTD	max depth
PS77 222-2	23.02.2011	08:43	62° 13.28‘S	58° 50.88‘W	253.5	CTD	hoisting
PS77 222-2	23.02.2011	08:52	62° 13.28‘S	58° 50.88‘W	252.7	CTD	at surface
PS77 222-2	23.02.2011	08:54	62° 13.28‘S	58° 50.88‘W	252.0	CTD	on deck
PS77 222-3	23.02.2011	09:07	62° 13.28‘S	58° 50.91‘W	249.2	MUC	action
PS77 222-3	23.02.2011	09:07	62° 13.28‘S	58° 50.91‘W	249.2	MUC	action
PS77 222-3	23.02.2011	09:11	62° 13.29‘S	58° 50.92‘W	247.2	MUC	in the water
PS77 222-3	23.02.2011	09:21	62° 13.28‘S	58° 50.95‘W	244.2	MUC	on ground
PS77 222-3	23.02.2011	09:22	62° 13.28‘S	58° 50.95‘W	244.7	MUC	hoisting
PS77 222-3	23.02.2011	09:32	62° 13.28‘S	58° 50.93‘W	246.5	MUC	on deck
PS77 222-4	23.02.2011	09:46	62° 13.26‘S	58° 50.96‘W	251.5	MUC	action
PS77 222-4	23.02.2011	09:47	62° 13.26‘S	58° 50.96‘W	252.0	MUC	in the water
PS77 222-4	23.02.2011	09:49	62° 13.25‘S	58° 50.96‘W	252.0	MUC	lowering
PS77 222-4	23.02.2011	09:58	62° 13.25‘S	58° 50.96‘W	253.7	MUC	on ground
PS77 222-4	23.02.2011	09:59	62° 13.25‘S	58° 50.96‘W	253.0	MUC	hoisting
PS77 222-4	23.02.2011	10:06	62° 13.24‘S	58° 50.95‘W	254.5	MUC	at surface
PS77 222-4	23.02.2011	10:10	62° 13.24‘S	58° 50.94‘W	256.2	MUC	on deck
PS77 222-5	23.02.2011	11:22	62° 18.23‘S	58° 39.86‘W	870.0	AGT	action
PS77 222-5	23.02.2011	11:23	62° 18.21‘S	58° 39.90‘W	871.7	AGT	profile start
PS77 222-5	23.02.2011	11:27	62° 18.10‘S	58° 40.15‘W	864.2	AGT	in the water
PS77 222-5	23.02.2011	11:37	62° 17.84‘S	58° 40.68‘W	873.0	AGT	on ground
PS77 222-5	23.02.2011	11:37	62° 17.84‘S	58° 40.68‘W	873.0	AGT	lowering

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 222-5	23.02.2011	11:54	62° 17.60'S	58° 41.19'W	889.0	AGT	action
PS77 222-5	23.02.2011	12:04	62° 17.49'S	58° 41.46'W	445.2	AGT	profile end
PS77 222-5	23.02.2011	12:04	62° 17.49'S	58° 41.46'W	445.2	AGT	hoisting
PS77 222-5	23.02.2011	12:47	62° 17.22'S	58° 41.38'W	439.7	AGT	on deck
PS77 222-6	23.02.2011	14:26	62° 19.09'S	58° 36.44'W	360.2	BT	in the water
PS77 222-6	23.02.2011	14:34	62° 18.88'S	58° 37.40'W	372.0	BT	action
PS77 222-6	23.02.2011	14:53	62° 18.15'S	58° 40.50'W	459.2	BT	on ground
PS77 222-6	23.02.2011	14:53	62° 18.15'S	58° 40.50'W	459.2	BT	profile start
PS77 222-6	23.02.2011	15:00	62° 17.83'S	58° 41.26'W	460.2	BT	lowering
PS77 222-6	23.02.2011	15:07	62° 17.47'S	58° 41.99'W	469.2	BT	lowering
PS77 222-6	23.02.2011	15:13	62° 17.18'S	58° 42.60'W	483.2	BT	profile end
PS77 222-6	23.02.2011	15:13	62° 17.18'S	58° 42.60'W	483.2	BT	hoisting
PS77 222-6	23.02.2011	15:19	62° 16.98'S	58° 43.00'W	486.5	BT	off ground
PS77 222-6	23.02.2011	15:41	62° 16.47'S	58° 44.02'W	464.0	BT	on deck
PS77 222-7	23.02.2011	16:33	62° 19.10'S	58° 36.62'W	361.7	BT	in the water
PS77 222-7	23.02.2011	16:39	62° 18.91'S	58° 37.15'W	361.2	BT	action
PS77 222-7	23.02.2011	17:01	62° 18.12'S	58° 40.58'W	451.5	BT	on ground
PS77 222-7	23.02.2011	17:01	62° 18.12'S	58° 40.58'W	451.5	BT	profile start
PS77 222-7	23.02.2011	17:11	62° 17.64'S	58° 41.76'W	465.7	BT	profile end
PS77 222-7	23.02.2011	17:18	62° 17.37'S	58° 42.18'W	473.0	BT	off ground
PS77 222-7	23.02.2011	17:30	62° 16.96'S	58° 43.07'W	485.2	BT	information
PS77 222-7	23.02.2011	17:39	62° 16.62'S	58° 43.34'W	440.0	BT	on deck
PS77 222-8	23.02.2011	17:44	62° 16.44'S	58° 43.50'W	447.0	CTD	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 222-8	23.02.2011	18:17	62° 16.18‘S	58° 43.82‘W	403.5	CTD	max depth
PS77 222-8	23.02.2011	18:30	62° 16.17‘S	58° 43.89‘W	417.0	CTD	on deck
PS77 222-9	23.02.2011	19:35	62° 18.80‘S	58° 36.94‘W	298.2	MG	in the water
PS77 222-9	23.02.2011	19:47	62° 18.79‘S	58° 36.93‘W	292.0	MG	on ground
PS77 222-9	23.02.2011	19:58	62° 18.80‘S	58° 36.92‘W	295.2	MG	hoisting
PS77 222-9	23.02.2011	20:10	62° 18.81‘S	58° 36.90‘W	298.2	MG	at surface
PS77 222-9	23.02.2011	20:15	62° 18.80‘S	58° 36.91‘W	296.0	MG	on deck
PS77 223-1	24.02.2011	09:03	62° 17.13‘S	58° 16.95‘W	940.0	TRAPF	In position
PS77 223-1	24.02.2011	09:05	62° 17.12‘S	58° 16.88‘W	950.0	TRAPF	Hydrophone in the water
PS77 223-1	24.02.2011	09:07	62° 17.10‘S	58° 16.82‘W	980.0	TRAPF	released
PS77 223-1	24.02.2011	09:09	62° 17.09‘S	58° 16.69‘W	982.0	TRAPF	Hydrophone on deck
PS77 223-1	24.02.2011	09:35	62° 17.18‘S	58° 17.25‘W	1024.0	TRAPF	at surface
PS77 223-1	24.02.2011	10:01	62° 16.83‘S	58° 15.32‘W	894.0	TRAPF	on deck
PS77 224-1	24.02.2011	11:09	62° 14.24‘S	58° 16.21‘W	440.0	MG	action
PS77 224-1	24.02.2011	11:12	62° 14.23‘S	58° 16.24‘W	440.0	MG	in the water
PS77 224-1	24.02.2011	11:29	62° 14.20‘S	58° 16.25‘W	439.5	MG	on ground
PS77 224-1	24.02.2011	11:46	62° 14.21‘S	58° 16.26‘W	441.0	MG	hoisting
PS77 224-1	24.02.2011	12:08	62° 14.24‘S	58° 16.20‘W	438.5	MG	on deck
PS77 225-1	24.02.2011	13:30	62° 18.68‘S	58° 34.31‘W	264.5	LANDER	action
PS77 225-1	24.02.2011	13:31	62° 18.67‘S	58° 34.29‘W	258.5	LANDER	action
PS77 225-1	24.02.2011	13:35	62° 18.64‘S	58° 34.09‘W	261.0	LANDER	information
PS77 225-1	24.02.2011	13:47	62° 18.66‘S	58° 33.83‘W	293.5	LANDER	action
PS77 225-1	24.02.2011	13:55	62° 18.55‘S	58° 33.50‘W	269.0	LANDER	action

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 225-1	24.02.2011	13:58	62° 18.54'S	58° 33.33'W	289.0	LANDER	action
PS77 225-1	24.02.2011	13:58	62° 18.54'S	58° 33.33'W	289.0	LANDER	on ground/ max depth
PS77 226-1	26.02.2011	13:49	64° 56.24'S	60° 36.36'W	296.0	CTD/RO	in the water
PS77 226-1	26.02.2011	14:06	64° 56.31'S	60° 36.31'W	286.7	CTD/RO	max depth
PS77 226-1	26.02.2011	14:06	64° 56.31'S	60° 36.31'W	286.7	CTD/RO	hoisting
PS77 226-1	26.02.2011	14:24	64° 56.31'S	60° 36.40'W	285.2	CTD/RO	on deck
PS77 226-2	26.02.2011	14:29	64° 56.30'S	60° 36.40'W	285.5	BONGO	in the water
PS77 226-2	26.02.2011	14:41	64° 56.28'S	60° 36.35'W	288.2	BONGO	max depth
PS77 226-2	26.02.2011	14:42	64° 56.27'S	60° 36.34'W	283.5	BONGO	hoisting
PS77 226-2	26.02.2011	14:53	64° 56.23'S	60° 36.33'W	282.5	BONGO	on deck
PS77 226-3	26.02.2011	14:56	64° 56.24'S	60° 36.33'W	568.7	BONGO	in the water
PS77 226-3	26.02.2011	15:08	64° 56.25'S	60° 36.32'W	564.2	BONGO	max depth
PS77 226-3	26.02.2011	15:08	64° 56.25'S	60° 36.32'W	564.2	BONGO	hoisting
PS77 226-3	26.02.2011	15:19	64° 56.22'S	60° 36.28'W	564.5	BONGO	on deck
PS77 226-4	26.02.2011	15:20	64° 56.21'S	60° 36.28'W	565.0	BONGO	in the water
PS77 226-4	26.02.2011	15:33	64° 56.21'S	60° 36.25'W	563.5	BONGO	max depth
PS77 226-4	26.02.2011	15:33	64° 56.21'S	60° 36.25'W	563.5	BONGO	hoisting
PS77 226-4	26.02.2011	15:43	64° 56.24'S	60° 36.06'W	577.7	BONGO	on deck
PS77 226-5	26.02.2011	15:46	64° 56.25'S	60° 36.01'W	317.0	LANDER	in the water
PS77 226-5	26.02.2011	16:05	64° 56.39'S	60° 35.86'W	309.5	LANDER	in the water
PS77 226-5	26.02.2011	16:28	64° 56.41'S	60° 35.78'W	320.2	LANDER	on ground/ max depth
PS77 226-5	26.02.2011	16:37	64° 56.47'S	60° 35.72'W	320.0	LANDER	on deck
PS77 226-6	26.02.2011	16:59	64° 55.62'S	60° 36.55'W	269.5	MG	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 226-6	26.02.2011	17:14	64° 55.68'S	60° 36.84'W	262.5	MG	on ground
PS77 226-6	26.02.2011	17:29	64° 55.62'S	60° 37.08'W	275.7	MG	off ground
PS77 226-6	26.02.2011	17:44	64° 55.58'S	60° 37.34'W	277.7	MG	on deck
PS77 226-7	26.02.2011	18:36	64° 54.89'S	60° 37.75'W	182.5	AGT	action
PS77 226-7	26.02.2011	18:41	64° 54.87'S	60° 37.26'W	226.2	AGT	on ground
PS77 226-7	26.02.2011	18:55	64° 54.84'S	60° 36.63'W	214.2	AGT	profile start
PS77 226-7	26.02.2011	19:05	64° 54.81'S	60° 36.20'W	219.5	AGT	profile end
PS77 226-7	26.02.2011	19:17	64° 54.81'S	60° 36.10'W	231.0	AGT	off ground
PS77 226-7	26.02.2011	19:30	64° 54.83'S	60° 36.32'W	233.0	AGT	on deck
PS77 226-8	26.02.2011	20:04	64° 55.69'S	60° 37.07'W	267.2	MUC	in the water
PS77 226-8	26.02.2011	20:12	64° 55.68'S	60° 37.17'W	285.7	MUC	on ground
PS77 226-8	26.02.2011	20:12	64° 55.68'S	60° 37.17'W	285.7	MUC	lowering
PS77 226-8	26.02.2011	20:24	64° 55.67'S	60° 37.11'W	276.0	MUC	at surface
PS77 226-8	26.02.2011	20:28	64° 55.68'S	60° 37.11'W	269.0	MUC	on deck
PS77 226-8	26.02.2011	20:31	64° 55.68'S	60° 37.10'W	268.7	MUC	action
PS77 226-8	26.02.2011	20:34	64° 55.67'S	60° 37.12'W	269.7	MUC	in the water
PS77 226-8	26.02.2011	20:39	64° 55.66'S	60° 37.11'W	270.7	MUC	on ground
PS77 226-8	26.02.2011	20:41	64° 55.66'S	60° 37.12'W	273.7	MUC	lowering
PS77 226-8	26.02.2011	20:50	64° 55.67'S	60° 37.10'W	269.5	MUC	on deck
PS77 226-9	26.02.2011	21:10	64° 56.00'S	60° 38.68'W	244.2	MUC	in the water
PS77 226-9	26.02.2011	21:18	64° 56.00'S	60° 38.63'W	242.7	MUC	on ground
PS77 226-9	26.02.2011	21:19	64° 56.00'S	60° 38.62'W	242.7	MUC	lowering
PS77 226-9	26.02.2011	21:27	64° 56.00'S	60° 38.59'W	245.0	MUC	at surface

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 226-9	26.02.2011	21:27	64° 56.00'S	60° 38.59'W	245.0	MUC	on deck
PS77 226-10	26.02.2011	22:03	64° 56.00'S	60° 38.65'W	240.7	MUC	in the water
PS77 226-10	26.02.2011	22:11	64° 56.01'S	60° 38.61'W	242.0	MUC	on ground
PS77 226-10	26.02.2011	22:11	64° 56.01'S	60° 38.61'W	244.7	MUC	hoisting
PS77 226-10	26.02.2011	22:22	64° 56.00'S	60° 38.59'W	250.5	MUC	on deck
PS77 227-1	26.02.2011	22:26	64° 56.03'S	60° 38.56'W	249.0	HS_PS	profile start
PS77 227-1	27.02.2011	00:28	64° 56.58'S	60° 27.12'W	297.2	HS_PS	alter course
PS77 227-1	27.02.2011	01:08	64° 54.77'S	60° 37.43'W	190.7	HS_PS	alter course
PS77 227-1	27.02.2011	01:56	64° 55.92'S	60° 28.21'W	310.0	HS_PS	alter course
PS77 227-1	27.02.2011	02:48	64° 54.57'S	60° 35.13'W	246.0	HS_PS	alter course
PS77 227-1	27.02.2011	03:30	64° 55.56'S	60° 27.21'W	304.0	HS_PS	alter course
PS77 227-1	27.02.2011	04:14	64° 53.92'S	60° 35.23'W	189.2	HS_PS	alter course
PS77 227-1	27.02.2011	04:55	64° 54.73'S	60° 27.68'W	305.0	HS_PS	alter course
PS77 227-1	27.02.2011	05:32	64° 53.07'S	60° 36.19'W	190.0	HS_PS	alter course
PS77 227-1	27.02.2011	06:22	64° 54.15'S	60° 27.14'W	400.0	HS_PS	alter course
PS77 227-1	27.02.2011	07:01	64° 53.30'S	60° 36.88'W	333.0	HS_PS	alter course
PS77 227-1	27.02.2011	07:13	64° 54.58'S	60° 35.57'W	223.7	HS_PS	alter course
PS77 227-1	27.02.2011	07:21	64° 55.37'S	60° 36.88'W	284.5	HS_PS	alter course
PS77 227-1	27.02.2011	07:26	64° 55.97'S	60° 36.92'W	247.5	HS_PS	profile end
PS77 228-1	27.02.2011	08:18	64° 56.39'S	60° 36.07'W	310.0	MOORST	in the water
PS77 228-1	27.02.2011	08:27	64° 56.38'S	60° 36.09'W	308.7	MOORST	in the water
PS77 228-1	27.02.2011	08:42	64° 56.38'S	60° 36.07'W	323.7	MOORST	in the water
PS77 228-1	27.02.2011	08:51	64° 56.31'S	60° 36.20'W	290.7	MOORST	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 228-1	27.02.2011	08:57	64° 56.30'S	60° 36.20'W	292.7	MOORST	in the water
PS77 228-1	27.02.2011	09:07	64° 56.31'S	60° 36.18'W	290.0	MOORST	in the water
PS77 228-1	27.02.2011	09:13	64° 56.31'S	60° 36.17'W	290.7	MOORST	in the water
PS77 228-1	27.02.2011	09:14	64° 56.30'S	60° 36.17'W	289.7	MOORST	in the water
PS77 228-1	27.02.2011	09:18	64° 56.30'S	60° 36.16'W	296.5	MOORST	in the water
PS77 228-1	27.02.2011	09:22	64° 56.30'S	60° 36.14'W	290.2	MOORST	in the water
PS77 228-1	27.02.2011	09:25	64° 56.29'S	60° 36.13'W	290.7	MOORST	in the water
PS77 228-1	27.02.2011	09:28	64° 56.30'S	60° 36.14'W	290.2	MOORST	in the water
PS77 228-1	27.02.2011	09:34	64° 56.28'S	60° 36.16'W	288.2	MOORST	in the water
PS77 228-1	27.02.2011	09:40	64° 56.30'S	60° 36.13'W	291.0	MOORST	in the water
PS77 228-1	27.02.2011	09:46	64° 56.32'S	60° 36.04'W	303.0	MOORST	on ground/ max depth
PS77 228-1	27.02.2011	09:46	64° 56.32'S	60° 36.04'W	303.0	MOORST	action
PS77 228-1	27.02.2011	09:47	64° 56.32'S	60° 36.02'W	305.5	MOORST	action
PS77 228-2	27.02.2011	10:30	64° 54.63'S	60° 39.56'W	334.7	ROV	in the water
PS77 228-2	27.02.2011	10:32	64° 54.63'S	60° 39.58'W	337.0	ROV	information
PS77 228-2	27.02.2011	10:33	64° 54.63'S	60° 39.59'W	350.0	ROV	in the water
PS77 228-2	27.02.2011	11:01	64° 54.60'S	60° 39.65'W	345.5	ROV	profile start
PS77 228-2	27.02.2011	11:02	64° 54.61'S	60° 39.65'W	353.7	ROV	on ground/ max depth
PS77 228-2	27.02.2011	11:14	64° 54.63'S	60° 39.64'W	353.0	ROV	alter course
PS77 228-2	27.02.2011	12:45	64° 54.53'S	60° 39.72'W	364.7	ROV	alter course
PS77 228-2	27.02.2011	14:15	64° 54.38'S	60° 39.70'W	164.5	ROV	profile end
PS77 228-2	27.02.2011	14:17	64° 54.37'S	60° 39.70'W	165.0	ROV	hoisting
PS77 228-2	27.02.2011	14:29	64° 54.38'S	60° 39.69'W	164.7	ROV	at surface

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 228-2	27.02.2011	14:40	64° 54.36‘S	60° 39.61‘W	165.7	ROV	on deck
PS77 228-3	27.02.2011	15:57	64° 56.13‘S	60° 35.11‘W	316.5	BT	in the water
PS77 228-3	27.02.2011	16:04	64° 55.85‘S	60° 34.33‘W	311.2	BT	action
PS77 228-3	27.02.2011	16:17	64° 55.05‘S	60° 32.23‘W	279.7	BT	on ground
PS77 228-3	27.02.2011	16:19	64° 54.96‘S	60° 31.97‘W	276.5	BT	profile start
PS77 228-3	27.02.2011	16:31	64° 54.43‘S	60° 30.44‘W	308.5	BT	profile end
PS77 228-3	27.02.2011	16:31	64° 54.43‘S	60° 30.44‘W	308.5	BT	hoisting
PS77 228-3	27.02.2011	16:36	64° 54.28‘S	60° 30.04‘W	315.5	BT	off ground
PS77 228-3	27.02.2011	16:47	64° 54.11‘S	60° 29.25‘W	332.2	BT	action
PS77 228-3	27.02.2011	16:56	64° 53.87‘S	60° 28.16‘W	360.7	BT	on deck
PS77 228-4	27.02.2011	18:10	64° 55.86‘S	60° 34.18‘W	322.7	AGT	in the water
PS77 228-4	27.02.2011	18:14	64° 55.74‘S	60° 33.92‘W	315.7	AGT	on ground
PS77 228-4	27.02.2011	18:28	64° 55.58‘S	60° 33.37‘W	323.5	AGT	profile start
PS77 228-4	27.02.2011	18:38	64° 55.47‘S	60° 33.06‘W	323.7	AGT	profile end
PS77 228-4	27.02.2011	18:55	64° 55.41‘S	60° 33.05‘W	311.5	AGT	off ground
PS77 228-4	27.02.2011	19:13	64° 55.28‘S	60° 33.15‘W	286.0	AGT	on deck
PS77 229-1	27.02.2011	20:17	64° 52.95‘S	60° 36.15‘W	357.5	HS_PS	profile start
PS77 229-1	28.02.2011	00:16	64° 52.34‘S	60° 22.27‘W	0.0	HS_PS	alter course
PS77 229-1	28.02.2011	00:43	64° 52.08‘S	60° 28.80‘W	0.0	HS_PS	alter course
PS77 229-1	28.02.2011	01:08	64° 51.90‘S	60° 21.70‘W	0.0	HS_PS	profile end
PS77 230-1	28.02.2011	01:16	64° 52.17‘S	60° 21.27‘W	333.7	CTD/RO	in the water
PS77 230-1	28.02.2011	01:31	64° 52.32‘S	60° 21.40‘W	439.7	CTD/RO	max depth
PS77 230-1	28.02.2011	01:33	64° 52.33‘S	60° 21.41‘W	440.2	CTD/RO	hoisting

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 230-1	28.02.2011	01:46	64° 52.45'S	60° 21.55'W	440.5	CTD/RO	on deck
PS77 230-2	28.02.2011	01:57	64° 52.58'S	60° 21.81'W	442.7	MN	in the water
PS77 230-2	28.02.2011	02:15	64° 52.70'S	60° 21.95'W	443.2	MN	max depth
PS77 230-2	28.02.2011	02:36	64° 52.83'S	60° 22.20'W	442.7	MN	on deck
PS77 230-3	28.02.2011	02:46	64° 52.92'S	60° 22.50'W	442.0	BONGO	in the water
PS77 230-3	28.02.2011	03:13	64° 53.02'S	60° 22.70'W	437.7	BONGO	max depth
PS77 230-3	28.02.2011	03:13	64° 53.02'S	60° 22.70'W	437.7	BONGO	hoisting
PS77 230-3	28.02.2011	03:29	64° 53.05'S	60° 22.85'W	437.7	BONGO	on deck
PS77 230-4	28.02.2011	03:31	64° 53.05'S	60° 22.88'W	438.5	BONGO	in the water
PS77 230-4	28.02.2011	03:54	64° 53.09'S	60° 23.00'W	438.2	BONGO	max depth
PS77 230-4	28.02.2011	03:54	64° 53.09'S	60° 23.00'W	438.2	BONGO	hoisting
PS77 230-4	28.02.2011	04:11	64° 53.10'S	60° 23.14'W	439.5	BONGO	on deck
PS77 230-5	28.02.2011	04:14	64° 53.11'S	60° 23.15'W	439.2	BONGO	in the water
PS77 230-5	28.02.2011	04:32	64° 53.17'S	60° 23.13'W	434.2	BONGO	max depth
PS77 230-5	28.02.2011	04:43	64° 53.18'S	60° 23.05'W	433.7	BONGO	on deck
PS77 231-1	28.02.2011	05:57	64° 56.37'S	60° 36.59'W	298.5	CTD/RO	in the water
PS77 231-1	28.02.2011	06:12	64° 56.31'S	60° 36.77'W	305.2	CTD/RO	max depth
PS77 231-1	28.02.2011	06:25	64° 56.24'S	60° 37.06'W	283.7	CTD/RO	on deck
PS77 231-2	28.02.2011	06:50	64° 56.31'S	60° 37.30'W	280.5	BWS	in the water
PS77 231-2	28.02.2011	07:07	64° 56.31'S	60° 37.36'W	276.5	BWS	on ground/ max depth
PS77 231-2	28.02.2011	07:13	64° 56.32'S	60° 37.35'W	278.0	BWS	hoisting
PS77 231-2	28.02.2011	07:23	64° 56.29'S	60° 37.59'W	259.0	BWS	on deck
PS77 231-3	28.02.2011	08:08	64° 55.93'S	60° 33.83'W	336.7	BT	action

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 231-3	28.02.2011	08:11	64° 55.85'S	60° 33.68'W	339.0	BT	in the water
PS77 231-3	28.02.2011	08:18	64° 55.59'S	60° 33.03'W	334.0	BT	action
PS77 231-3	28.02.2011	08:19	64° 55.54'S	60° 32.89'W	331.7	BT	action
PS77 231-3	28.02.2011	08:32	64° 54.83'S	60° 30.91'W	314.2	BT	on ground
PS77 231-3	28.02.2011	08:33	64° 54.79'S	60° 30.80'W	315.5	BT	profile start
PS77 231-3	28.02.2011	08:53	64° 53.80'S	60° 28.46'W	347.0	BT	hoisting
PS77 231-3	28.02.2011	08:59	64° 53.63'S	60° 28.10'W	354.5	BT	off ground
PS77 231-3	28.02.2011	08:59	64° 53.63'S	60° 28.10'W	354.5	BT	profile end
PS77 231-3	28.02.2011	09:08	64° 53.46'S	60° 27.69'W	363.0	BT	action
PS77 231-3	28.02.2011	09:17	64° 53.31'S	60° 27.20'W	368.0	BT	on deck
PS77 231-4	28.02.2011	10:23	64° 56.09'S	60° 38.99'W	242.2	MUC	in the water
PS77 231-4	28.02.2011	10:31	64° 56.06'S	60° 39.03'W	238.0	MUC	on ground
PS77 231-4	28.02.2011	10:32	64° 56.05'S	60° 39.04'W	233.7	MUC	hoisting
PS77 231-4	28.02.2011	10:40	64° 56.03'S	60° 39.06'W	224.2	MUC	at surface
PS77 231-4	28.02.2011	10:42	64° 56.02'S	60° 39.06'W	223.5	MUC	on deck
PS77 231-5	28.02.2011	11:05	64° 56.15'S	60° 38.66'W	247.5	MUC	in the water
PS77 231-5	28.02.2011	11:09	64° 56.16'S	60° 38.67'W	247.2	MUC	action
PS77 231-5	28.02.2011	11:09	64° 56.16'S	60° 38.67'W	247.2	MUC	lowering
PS77 231-5	28.02.2011	11:11	64° 56.16'S	60° 38.66'W	246.7	MUC	on ground
PS77 231-5	28.02.2011	11:12	64° 56.17'S	60° 38.66'W	246.5	MUC	hoisting
PS77 231-5	28.02.2011	11:13	64° 56.17'S	60° 38.65'W	246.5	MUC	off ground
PS77 231-5	28.02.2011	11:21	64° 56.18'S	60° 38.62'W	244.0	MUC	at surface
PS77 231-5	28.02.2011	11:23	64° 56.19'S	60° 38.60'W	243.7	MUC	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 231-6	28.02.2011	12:11	64° 55.02‘S	60° 30.41‘W	354.2	MUC	in the water
PS77 231-6	28.02.2011	12:18	64° 55.12‘S	60° 30.37‘W	360.5	MUC	on ground
PS77 231-6	28.02.2011	12:19	64° 55.12‘S	60° 30.38‘W	360.7	MUC	hoisting
PS77 231-6	28.02.2011	12:28	64° 55.13‘S	60° 30.51‘W	358.5	MUC	at surface
PS77 231-6	28.02.2011	12:29	64° 55.13‘S	60° 30.52‘W	359.2	MUC	lowering
PS77 231-6	28.02.2011	12:40	64° 55.22‘S	60° 30.55‘W	358.5	MUC	on ground
PS77 231-6	28.02.2011	12:41	64° 55.22‘S	60° 30.55‘W	358.5	MUC	hoisting
PS77 231-6	28.02.2011	12:51	64° 55.29‘S	60° 30.48‘W	354.2	MUC	on deck
PS77 231-7	28.02.2011	12:56	64° 55.33‘S	60° 30.44‘W	351.0	MG	in the water
PS77 231-7	28.02.2011	13:15	64° 55.35‘S	60° 30.60‘W	351.5	MG	on ground
PS77 231-7	28.02.2011	13:38	64° 55.36‘S	60° 30.60‘W	351.2	MG	action
PS77 231-7	28.02.2011	13:39	64° 55.35‘S	60° 30.59‘W	351.0	MG	hoisting
PS77 231-7	28.02.2011	13:56	64° 55.36‘S	60° 30.69‘W	352.0	MG	on deck
PS77 231-8	28.02.2011	14:22	64° 56.51‘S	60° 35.48‘W	314.5	LANDER	action
PS77 231-8	28.02.2011	14:22	64° 56.51‘S	60° 35.48‘W	314.5	LANDER	on ground/ max depth
PS77 231-8	28.02.2011	14:25	64° 56.53‘S	60° 35.44‘W	309.5	LANDER	at surface
PS77 231-8	28.02.2011	14:42	64° 56.41‘S	60° 35.77‘W	314.0	LANDER	action
PS77 231-8	28.02.2011	14:49	64° 56.45‘S	60° 35.75‘W	314.2	LANDER	on deck
PS77 232-1	28.02.2011	18:58	64° 57.90‘S	60° 7.32‘W	204.0	ROV	in the water
PS77 232-1	28.02.2011	19:30	64° 57.68‘S	60° 6.29‘W	201.7	ROV	on ground/ max depth
PS77 232-1	28.02.2011	19:30	64° 57.68‘S	60° 6.29‘W	201.7	ROV	profile start
PS77 232-1	28.02.2011	19:55	64° 57.68‘S	60° 6.22‘W	198.7	ROV	profile end
PS77 232-1	28.02.2011	20:16	64° 57.57‘S	60° 5.99‘W	213.2	ROV	at surface

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 232-1	28.02.2011	20:19	64° 57.53‘S	60° 5.80‘W	218.5	ROV	on deck
PS77 233-1	01.03.2011	17:05	65° 33.11‘S	61° 37.38‘W	276.0	CTD/RO	in the water
PS77 233-1	01.03.2011	17:20	65° 33.12‘S	61° 37.17‘W	275.7	CTD/RO	max depth
PS77 233-1	01.03.2011	17:30	65° 33.13‘S	61° 37.09‘W	275.7	CTD/RO	on deck
PS77 233-2	01.03.2011	18:09	65° 30.46‘S	61° 41.92‘W	364.0	MG	in the water
PS77 233-2	01.03.2011	18:24	65° 30.46‘S	61° 41.95‘W	364.2	MG	on ground
PS77 233-2	01.03.2011	18:42	65° 30.47‘S	61° 42.00‘W	364.2	MG	on ground
PS77 233-2	01.03.2011	19:01	65° 30.45‘S	61° 42.02‘W	365.5	MG	on deck
PS77 233-3	01.03.2011	20:18	65° 33.69‘S	61° 37.40‘W	323.2	AGTs	in the water
PS77 233-3	01.03.2011	20:25	65° 33.46‘S	61° 37.29‘W	324.2	AGTs	on ground
PS77 233-3	01.03.2011	20:25	65° 33.46‘S	61° 37.29‘W	324.2	AGTs	profile start
PS77 233-3	01.03.2011	20:34	65° 33.30‘S	61° 37.23‘W	296.7	AGTs	action
PS77 233-3	01.03.2011	20:44	65° 33.09‘S	61° 37.17‘W	277.2	AGTs	hoisting
PS77 233-3	01.03.2011	20:55	65° 32.88‘S	61° 37.10‘W	304.0	AGTs	off ground
PS77 233-3	01.03.2011	20:55	65° 32.88‘S	61° 37.10‘W	304.0	AGTs	profile end
PS77 233-3	01.03.2011	21:06	65° 32.68‘S	61° 36.87‘W	297.0	AGTs	at surface
PS77 233-3	01.03.2011	21:11	65° 32.57‘S	61° 36.73‘W	290.5	AGTs	on deck
PS77 233-4	01.03.2011	21:51	65° 32.99‘S	61° 36.91‘W	291.5	MUC	in the water
PS77 233-4	01.03.2011	21:56	65° 32.99‘S	61° 36.93‘W	292.2	MUC	action
PS77 233-4	01.03.2011	21:57	65° 32.99‘S	61° 36.93‘W	292.2	MUC	lowering
PS77 233-4	01.03.2011	21:59	65° 32.99‘S	61° 36.94‘W	294.2	MUC	on ground
PS77 233-4	01.03.2011	21:59	65° 32.99‘S	61° 36.94‘W	294.2	MUC	hoisting
PS77 233-4	01.03.2011	22:10	65° 32.98‘S	61° 36.92‘W	291.0	MUC	at surface

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 233-4	01.03.2011	22:13	65° 32.97'S	61° 36.92'W	290.2	MUC	on deck
PS77 233-5	01.03.2011	22:33	65° 32.98'S	61° 36.93'W	290.7	MUC	in the water
PS77 233-5	01.03.2011	22:41	65° 32.97'S	61° 36.94'W	291.0	MUC	on ground
PS77 233-5	01.03.2011	22:41	65° 32.97'S	61° 36.94'W	291.0	MUC	hoisting
PS77 233-5	01.03.2011	22:42	65° 32.97'S	61° 36.94'W	292.5	MUC	off ground
PS77 233-5	01.03.2011	22:49	65° 32.98'S	61° 36.95'W	292.7	MUC	at surface
PS77 233-5	01.03.2011	22:50	65° 32.98'S	61° 36.95'W	293.5	MUC	on deck
PS77 233-6	01.03.2011	23:08	65° 32.99'S	61° 37.16'W	297.0	MUC	in the water
PS77 233-6	01.03.2011	23:13	65° 33.00'S	61° 37.16'W	295.7	MUC	on ground
PS77 233-6	01.03.2011	23:14	65° 33.00'S	61° 37.16'W	296.0	MUC	hoisting
PS77 233-6	01.03.2011	23:16	65° 32.99'S	61° 37.17'W	296.5	MUC	off ground
PS77 233-6	01.03.2011	23:23	65° 32.99'S	61° 37.15'W	297.7	MUC	at surface
PS77 233-6	01.03.2011	23:26	65° 32.99'S	61° 37.14'W	296.7	MUC	on deck
PS77 234-1	02.03.2011	00:55	65° 25.99'S	61° 30.09'W	854.0	CTD/RO	in the water
PS77 234-1	02.03.2011	01:18	65° 26.00'S	61° 30.03'W	851.7	CTD/RO	max depth
PS77 234-1	02.03.2011	01:20	65° 26.00'S	61° 30.03'W	851.0	CTD/RO	hoisting
PS77 234-1	02.03.2011	01:41	65° 26.00'S	61° 30.02'W	851.0	CTD/RO	on deck
PS77 234-2	02.03.2011	01:48	65° 25.99'S	61° 30.05'W	850.7	MN	in the water
PS77 234-2	02.03.2011	02:26	65° 25.99'S	61° 30.01'W	850.2	MN	max depth
PS77 234-2	02.03.2011	02:26	65° 25.99'S	61° 30.01'W	850.2	MN	hoisting
PS77 234-2	02.03.2011	02:54	65° 26.00'S	61° 29.97'W	848.0	MN	on deck
PS77 234-3	02.03.2011	03:05	65° 26.02'S	61° 29.98'W	848.0	MN	in the water
PS77 234-3	02.03.2011	03:34	65° 25.93'S	61° 30.02'W	845.5	MN	max depth

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 234-3	02.03.2011	03:34	65° 25.93'S	61° 30.02'W	845.5	MN	hoisting
PS77 234-3	02.03.2011	04:02	65° 25.85'S	61° 30.23'W	845.5	MN	on deck
PS77 234-4	02.03.2011	04:13	65° 25.85'S	61° 30.29'W	847.2	BONGO	in the water
PS77 234-4	02.03.2011	04:28	65° 25.84'S	61° 30.41'W	849.7	BONGO	max depth
PS77 234-4	02.03.2011	04:40	65° 25.83'S	61° 30.53'W	850.5	BONGO	on deck
PS77 235-1	02.03.2011	06:55	65° 33.67'S	61° 37.85'W	336.5	LANDER	in the water
PS77 235-1	02.03.2011	06:58	65° 33.66'S	61° 37.83'W	335.5	LANDER	in the water
PS77 235-1	02.03.2011	07:14	65° 33.65'S	61° 37.87'W	335.0	LANDER	on ground/ max depth
PS77 235-1	02.03.2011	07:21	65° 33.65'S	61° 37.89'W	335.2	LANDER	on deck
PS77 235-2	02.03.2011	07:30	65° 33.55'S	61° 37.70'W	333.5	BWS	in the water
PS77 235-2	02.03.2011	07:53	65° 33.55'S	61° 37.65'W	336.5	BWS	on ground/ max depth
PS77 235-2	02.03.2011	07:58	65° 33.55'S	61° 37.68'W	334.0	BWS	hoisting
PS77 235-2	02.03.2011	08:07	65° 33.56'S	61° 37.71'W	334.5	BWS	at surface
PS77 235-2	02.03.2011	08:15	65° 33.54'S	61° 37.67'W	345.0	BWS	action
PS77 235-2	02.03.2011	08:18	65° 33.55'S	61° 37.67'W	345.5	BWS	in the water
PS77 235-2	02.03.2011	08:33	65° 33.55'S	61° 37.65'W	345.0	BWS	on ground/ max depth
PS77 235-2	02.03.2011	08:37	65° 33.55'S	61° 37.64'W	345.5	BWS	hoisting
PS77 235-2	02.03.2011	08:39	65° 33.55'S	61° 37.64'W	345.5	BWS	off ground
PS77 235-2	02.03.2011	08:49	65° 33.55'S	61° 37.62'W	345.0	BWS	at surface
PS77 235-2	02.03.2011	08:51	65° 33.54'S	61° 37.62'W	345.0	BWS	on deck
PS77 235-3	02.03.2011	09:18	65° 32.73'S	61° 37.74'W	290.0	AGTs	in the water
PS77 235-3	02.03.2011	09:28	65° 32.83'S	61° 37.29'W	300.0	AGTs	on ground
PS77 235-3	02.03.2011	09:40	65° 32.91'S	61° 36.69'W	310.0	AGTs	profile start

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 235-3	02.03.2011	09:51	65° 32.92‵S	61° 36.28‵W	271.0	AGTs	profile end
PS77 235-3	02.03.2011	09:51	65° 32.92‵S	61° 36.28‵W	271.0	AGTs	lowering
PS77 235-3	02.03.2011	10:04	65° 32.90‵S	61° 35.90‵W	290.0	AGTs	off ground
PS77 235-3	02.03.2011	10:20	65° 32.88‵S	61° 35.84‵W	298.5	AGTs	at surface
PS77 235-3	02.03.2011	10:22	65° 32.87‵S	61° 35.81‵W	299.7	AGTs	on deck
PS77 235-4	02.03.2011	10:47	65° 32.96‵S	61° 36.90‵W	286.7	MUC	in the water
PS77 235-4	02.03.2011	10:58	65° 32.96‵S	61° 36.88‵W	286.0	MUC	on ground
PS77 235-4	02.03.2011	10:59	65° 32.96‵S	61° 36.87‵W	283.7	MUC	hoisting
PS77 235-4	02.03.2011	11:08	65° 32.96‵S	61° 36.86‵W	283.2	MUC	at surface
PS77 235-4	02.03.2011	11:10	65° 32.96‵S	61° 36.86‵W	282.5	MUC	on deck
PS77 235-5	02.03.2011	11:29	65° 33.01‵S	61° 36.98‵W	295.0	MUC	in the water
PS77 235-5	02.03.2011	11:38	65° 33.01‵S	61° 36.96‵W	293.7	MUC	on ground
PS77 235-5	02.03.2011	11:39	65° 33.01‵S	61° 36.96‵W	294.5	MUC	hoisting
PS77 235-5	02.03.2011	11:50	65° 33.01‵S	61° 37.00‵W	295.7	MUC	on deck
PS77 235-6	02.03.2011	12:09	65° 33.02‵S	61° 37.02‵W	296.5	MUC	in the water
PS77 235-6	02.03.2011	12:18	65° 33.01‵S	61° 37.00‵W	295.7	MUC	on ground
PS77 235-6	02.03.2011	12:19	65° 33.02‵S	61° 37.00‵W	295.5	MUC	hoisting
PS77 235-6	02.03.2011	12:20	65° 33.02‵S	61° 37.01‵W	296.5	MUC	off ground
PS77 235-6	02.03.2011	12:30	65° 33.01‵S	61° 37.03‵W	296.7	MUC	on deck
PS77 235-7	02.03.2011	12:50	65° 33.04‵S	61° 37.03‵W	298.7	MG	in the water
PS77 235-7	02.03.2011	13:05	65° 33.06‵S	61° 37.04‵W	295.2	MG	information
PS77 235-7	02.03.2011	13:11	65° 33.07‵S	61° 37.03‵W	295.0	MG	information
PS77 235-7	02.03.2011	13:34	65° 33.09‵S	61° 37.05‵W	277.2	MG	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 235-7	02.03.2011	13:51	65° 33.06‘S	61° 37.04‘W	295.2	MG	in the water
PS77 235-7	02.03.2011	14:00	65° 33.07‘S	61° 37.04‘W	295.0	MG	on ground
PS77 235-7	02.03.2011	14:11	65° 33.08‘S	61° 37.03‘W	290.7	MG	off ground
PS77 235-7	02.03.2011	14:11	65° 33.08‘S	61° 37.03‘W	290.7	MG	hoisting
PS77 235-7	02.03.2011	14:26	65° 33.12‘S	61° 37.08‘W	273.5	MG	on deck
PS77 235-8	02.03.2011	16:14	65° 29.47‘S	61° 37.55‘W	492.2	BT	in the water
PS77 235-8	02.03.2011	16:18	65° 29.73‘S	61° 37.45‘W	488.2	BT	action
PS77 235-8	02.03.2011	16:32	65° 30.53‘S	61° 36.48‘W	462.7	BT	alter course
PS77 235-8	02.03.2011	16:37	65° 30.82‘S	61° 36.09‘W	440.7	BT	lowering
PS77 235-8	02.03.2011	16:55	65° 31.68‘S	61° 33.13‘W	448.7	BT	on ground
PS77 235-8	02.03.2011	16:56	65° 31.71‘S	61° 33.00‘W	449.5	BT	profile start
PS77 235-8	02.03.2011	17:16	65° 32.41‘S	61° 30.29‘W	450.5	BT	profile end
PS77 235-8	02.03.2011	17:16	65° 32.41‘S	61° 30.29‘W	450.5	BT	hoisting
PS77 235-8	02.03.2011	17:23	65° 32.55‘S	61° 29.63‘W	447.2	BT	off ground
PS77 235-8	02.03.2011	17:34	65° 32.69‘S	61° 28.85‘W	438.7	BT	action
PS77 235-8	02.03.2011	17:42	65° 32.82‘S	61° 28.15‘W	439.7	BT	on deck
PS77 235-9	02.03.2011	18:41	65° 33.70‘S	61° 38.22‘W	308.5	BWS	in the water
PS77 235-9	02.03.2011	18:59	65° 33.74‘S	61° 38.09‘W	329.2	BWS	on ground/ max depth
PS77 235-9	02.03.2011	19:01	65° 33.74‘S	61° 38.09‘W	330.5	BWS	on ground/ max depth
PS77 235-9	02.03.2011	19:04	65° 33.74‘S	61° 38.10‘W	329.0	BWS	hoisting
PS77 235-9	02.03.2011	19:23	65° 33.75‘S	61° 38.12‘W	329.0	BWS	on deck
PS77 235-10	02.03.2011	19:27	65° 33.75‘S	61° 38.04‘W	332.7	LANDER	on ground/ max depth
PS77 235-10	02.03.2011	19:32	65° 33.75‘S	61° 38.00‘W	333.2	LANDER	at surface

Station PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 235-10	02.03.2011	19:54	65° 33.59'S	61° 37.74'W	338.2	LANDER	on deck
PS77 235-11	02.03.2011	20:28	65° 32.61'S	61° 37.80'W	278.0	ROV	in the water
PS77 235-11	02.03.2011	21:07	65° 32.57'S	61° 37.80'W	276.2	ROV	on ground/ max depth
PS77 235-11	02.03.2011	21:07	65° 32.57'S	61° 37.80'W	276.2	ROV	profile start
PS77 235-11	03.03.2011	00:05	65° 32.54'S	61° 38.45'W	219.2	ROV	hoisting
PS77 235-11	03.03.2011	00:15	65° 32.50'S	61° 38.51'W	213.5	ROV	profile end
PS77 235-11	03.03.2011	00:30	65° 32.46'S	61° 38.56'W	209.5	ROV	at surface
PS77 235-11	03.03.2011	00:44	65° 32.46'S	61° 38.56'W	208.5	ROV	on deck
PS77 237-1	03.03.2011	10:47	66° 15.69'S	60° 6.16'W	400.0	CTD	in the water
PS77 237-1	03.03.2011	11:04	66° 15.70'S	60° 6.14'W	390.0	CTD	max depth
PS77 237-1	03.03.2011	11:06	66° 15.70'S	60° 6.15'W	390.0	CTD	hoisting
PS77 237-1	03.03.2011	11:12	66° 15.70'S	60° 6.16'W	409.0	CTD	at surface
PS77 237-1	03.03.2011	11:13	66° 15.70'S	60° 6.16'W	408.7	CTD	on deck
PS77 237-2	03.03.2011	12:53	66° 14.28'S	60° 11.49'W	394.5	BT	in the water
PS77 237-2	03.03.2011	13:00	66° 13.87'S	60° 11.02'W	390.5	BT	information
PS77 237-2	03.03.2011	13:17	66° 12.53'S	60° 9.72'W	382.7	BT	on ground
PS77 237-2	03.03.2011	13:18	66° 12.48'S	60° 9.68'W	381.0	BT	profile start
PS77 237-2	03.03.2011	13:38	66° 11.27'S	60° 8.61'W	361.0	BT	profile end
PS77 237-2	03.03.2011	13:38	66° 11.27'S	60° 8.61'W	361.0	BT	hoisting
PS77 237-2	03.03.2011	13:43	66° 11.10'S	60° 8.55'W	358.0	BT	off ground
PS77 237-2	03.03.2011	14:03	66° 10.59'S	60° 8.59'W	351.2	BT	on deck
PS77 237-3	03.03.2011	14:30	66° 9.75'S	60° 7.14'W	358.5	BT	in the water
PS77 237-3	03.03.2011	14:38	66° 10.27'S	60° 7.31'W	365.7	BT	information

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 237-3	03.03.2011	14:52	66° 11.40‘S	60° 7.99‘W	377.2	BT	on ground
PS77 237-3	03.03.2011	14:54	66° 11.53‘S	60° 8.10‘W	382.0	BT	profile start
PS77 237-3	03.03.2011	14:56	66° 11.66‘S	60° 8.20‘W	380.2	BT	lowering
PS77 237-3	03.03.2011	15:07	66° 12.38‘S	60° 8.76‘W	388.2	BT	lowering
PS77 237-3	03.03.2011	15:14	66° 12.81‘S	60° 9.05‘W	397.2	BT	profile end
PS77 237-3	03.03.2011	15:14	66° 12.81‘S	60° 9.05‘W	397.2	BT	hoisting
PS77 237-3	03.03.2011	15:18	66° 12.98‘S	60° 9.16‘W	399.2	BT	off ground
PS77 237-3	03.03.2011	15:38	66° 13.61‘S	60° 9.55‘W	412.7	BT	on deck
PS77 237-4	03.03.2011	16:24	66° 9.87‘S	60° 7.19‘W	360.7	LANDER	in the water
PS77 237-4	03.03.2011	16:31	66° 9.85‘S	60° 7.30‘W	358.0	LANDER	in the water
PS77 237-4	03.03.2011	16:44	66° 9.84‘S	60° 7.37‘W	357.2	LANDER	action
PS77 237-4	03.03.2011	16:45	66° 9.84‘S	60° 7.38‘W	357.0	LANDER	on ground/ max depth
PS77 237-4	03.03.2011	17:02	66° 9.80‘S	60° 7.47‘W	355.7	LANDER	on deck
PS77 237-5	03.03.2011	17:21	66° 10.30‘S	60° 7.26‘W	366.5	ATC	in the water
PS77 237-5	03.03.2011	17:21	66° 10.30‘S	60° 7.26‘W	366.5	ATC	on ground/ max depth
PS77 237-6	03.03.2011	17:56	66° 9.97‘S	60° 13.92‘W	380.0	MG	in the water
PS77 237-6	03.03.2011	18:11	66° 9.94‘S	60° 13.61‘W	377.2	MG	on ground
PS77 237-6	03.03.2011	18:33	66° 9.89‘S	60° 13.49‘W	376.2	MG	on ground
PS77 237-6	03.03.2011	18:36	66° 9.88‘S	60° 13.47‘W	376.5	MG	information
PS77 237-6	03.03.2011	18:50	66° 9.85‘S	60° 13.43‘W	376.5	MG	on deck
PS77 237-7	03.03.2011	19:00	66° 9.82‘S	60° 13.38‘W	376.5	MUC	in the water
PS77 237-7	03.03.2011	19:11	66° 9.80‘S	60° 13.30‘W	373.0	MUC	on ground
PS77 237-7	03.03.2011	19:25	66° 9.78‘S	60° 13.26‘W	373.5	MUC	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 237-8	03.03.2011	19:33	66° 9.77‘S	60° 13.25‘W	374.0	MUC	action
PS77 237-8	03.03.2011	19:45	66° 9.75‘S	60° 13.20‘W	372.5	MUC	on ground
PS77 237-8	03.03.2011	20:00	66° 9.73‘S	60° 13.11‘W	371.7	MUC	on deck
PS77 237-9	03.03.2011	20:19	66° 9.66‘S	60° 13.09‘W	371.7	MUC	in the water
PS77 237-9	03.03.2011	20:28	66° 9.66‘S	60° 13.05‘W	370.5	MUC	on ground
PS77 237-9	03.03.2011	20:42	66° 9.64‘S	60° 12.99‘W	370.5	MUC	at surface
PS77 237-9	03.03.2011	20:45	66° 9.64‘S	60° 13.00‘W	370.7	MUC	on deck
PS77 237-10	03.03.2011	20:56	66° 9.58‘S	60° 12.72‘W	366.5	HS_PS	profile start
PS77 237-10	04.03.2011	00:31	66° 15.05‘S	60° 10.02‘W	422.0	HS_PS	alter course
PS77 237-10	04.03.2011	01:14	66° 14.68‘S	60° 18.27‘W	388.2	HS_PS	alter course
PS77 237-10	04.03.2011	01:38	66° 13.95‘S	60° 13.05‘W	409.0	HS_PS	alter course
PS77 237-10	04.03.2011	02:10	66° 13.39‘S	60° 19.38‘W	382.2	HS_PS	alter course
PS77 237-10	04.03.2011	02:39	66° 12.78‘S	60° 12.54‘W	396.5	HS_PS	alter course
PS77 237-10	04.03.2011	03:06	66° 12.45‘S	60° 18.55‘W	381.2	HS_PS	alter course
PS77 237-10	04.03.2011	03:35	66° 11.65‘S	60° 11.78‘W	391.2	HS_PS	alter course
PS77 237-10	04.03.2011	04:01	66° 11.23‘S	60° 19.13‘W	369.0	HS_PS	alter course
PS77 237-10	04.03.2011	04:37	66° 10.59‘S	60° 10.56‘W	375.7	HS_PS	alter course
PS77 237-10	04.03.2011	05:16	66° 10.22‘S	60° 18.06‘W	374.7	HS_PS	alter course
PS77 237-10	04.03.2011	05:45	66° 10.21‘S	60° 8.99‘W	348.7	HS_PS	profile end
PS77 239-1	04.03.2011	06:07	66° 9.92‘S	60° 6.82‘W	364.7	CTD/RO	in the water
PS77 239-1	04.03.2011	06:23	66° 9.93‘S	60° 6.88‘W	364.5	CTD/RO	max depth
PS77 239-1	04.03.2011	06:37	66° 9.92‘S	60° 6.87‘W	363.7	CTD/RO	on deck
PS77 239-2	04.03.2011	06:46	66° 9.93‘S	60° 6.86‘W	363.5	BWS	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 239-2	04.03.2011	07:02	66° 9.93'S	60° 6.84'W	363.7	BWS	on ground/ max depth
PS77 239-2	04.03.2011	07:04	66° 9.93'S	60° 6.84'W	0.0	BWS	on ground/ max depth
PS77 239-2	04.03.2011	07:07	66° 9.93'S	60° 6.85'W	0.0	BWS	hoisting
PS77 239-2	04.03.2011	07:20	66° 9.94'S	60° 6.88'W	364.0	BWS	on deck
PS77 239-3	04.03.2011	07:53	66° 11.56'S	60° 8.42'W	371.0	AGT	in the water
PS77 239-3	04.03.2011	08:01	66° 11.69'S	60° 8.93'W	362.0	AGT	on ground
PS77 239-3	04.03.2011	08:16	66° 11.89'S	60° 9.75'W	356.0	AGT	profile start
PS77 239-3	04.03.2011	08:26	66° 12.01'S	60° 10.26'W	360.0	AGT	profile end
PS77 239-3	04.03.2011	08:27	66° 12.03'S	60° 10.32'W	360.0	AGT	hoisting
PS77 239-3	04.03.2011	08:41	66° 12.07'S	60° 10.37'W	360.0	AGT	off ground
PS77 239-3	04.03.2011	08:53	66° 12.12'S	60° 10.41'W	353.0	AGT	at surface
PS77 239-3	04.03.2011	08:57	66° 12.14'S	60° 10.45'W	355.0	AGT	on deck
PS77 239-4	04.03.2011	09:51	66° 11.60'S	60° 7.71'W	373.0	RMT	in the water
PS77 239-4	04.03.2011	09:54	66° 11.66'S	60° 7.86'W	373.0	RMT	max depth
PS77 239-4	04.03.2011	09:54	66° 11.66'S	60° 7.86'W	373.0	RMT	profile start
PS77 239-4	04.03.2011	10:01	66° 11.74'S	60° 8.14'W	370.0	RMT	lowering
PS77 239-4	04.03.2011	10:17	66° 12.06'S	60° 9.10'W	362.0	RMT	profile end
PS77 239-4	04.03.2011	10:17	66° 12.06'S	60° 9.10'W	362.0	RMT	hoisting
PS77 239-4	04.03.2011	10:23	66° 12.15'S	60° 9.39'W	362.0	RMT	at surface
PS77 239-4	04.03.2011	10:26	66° 12.18'S	60° 9.45'W	362.0	RMT	on deck
PS77 239-5	04.03.2011	11:00	66° 11.91'S	60° 7.83'W	378.0	RMT	in the water
PS77 239-5	04.03.2011	11:02	66° 11.97'S	60° 8.00'W	376.0	RMT	lowering
PS77 239-5	04.03.2011	11:07	66° 12.11'S	60° 8.44'W	373.0	RMT	max depth

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 239-5	04.03.2011	11:07	66° 12.11‘S	60° 8.44‘W	373.0	RMT	profile start
PS77 239-5	04.03.2011	11:17	66° 12.31‘S	60° 9.03‘W	371.0	RMT	hoisting
PS77 239-5	04.03.2011	11:19	66° 12.36‘S	60° 9.18‘W	368.0	RMT	max depth
PS77 239-5	04.03.2011	11:23	66° 12.44‘S	60° 9.45‘W	367.0	RMT	hoisting
PS77 239-5	04.03.2011	11:23	66° 12.44‘S	60° 9.45‘W	367.0	RMT	profile end
PS77 239-5	04.03.2011	11:28	66° 12.50‘S	60° 9.66‘W	370.0	RMT	at surface
PS77 239-5	04.03.2011	11:31	66° 12.53‘S	60° 9.77‘W	363.0	RMT	on deck
PS77 239-6	04.03.2011	12:42	66° 16.55‘S	60° 15.49‘W	407.0	MG	in the water
PS77 239-6	04.03.2011	13:00	66° 16.57‘S	60° 15.48‘W	406.0	MG	information
PS77 239-6	04.03.2011	13:17	66° 16.59‘S	60° 15.54‘W	406.0	MG	on ground
PS77 239-6	04.03.2011	13:17	66° 16.59‘S	60° 15.54‘W	406.0	MG	hoisting
PS77 239-6	04.03.2011	13:37	66° 16.62‘S	60° 15.48‘W	406.0	MG	on deck
PS77 239-7	04.03.2011	13:54	66° 16.63‘S	60° 15.50‘W	405.0	MUC	in the water
PS77 239-7	04.03.2011	14:08	66° 16.63‘S	60° 15.52‘W	404.0	MUC	on ground
PS77 239-7	04.03.2011	14:08	66° 16.63‘S	60° 15.52‘W	404.0	MUC	hoisting
PS77 239-7	04.03.2011	14:26	66° 16.61‘S	60° 15.52‘W	405.0	MUC	on deck
PS77 239-7	04.03.2011	14:49	66° 16.61‘S	60° 15.52‘W	405.0	MUC	in the water
PS77 239-7	04.03.2011	14:59	66° 16.63‘S	60° 15.51‘W	404.0	MUC	on ground
PS77 239-7	04.03.2011	15:00	66° 16.63‘S	60° 15.51‘W	404.0	MUC	hoisting
PS77 239-7	04.03.2011	15:12	66° 16.63‘S	60° 15.51‘W	404.0	MUC	on deck
PS77 239-8	04.03.2011	15:20	66° 16.63‘S	60° 15.51‘W	404.0	MUC	in the water
PS77 239-8	04.03.2011	15:33	66° 16.62‘S	60° 15.51‘W	404.0	MUC	on ground
PS77 239-8	04.03.2011	15:33	66° 16.62‘S	60° 15.51‘W	404.0	MUC	hoisting

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 239-8	04.03.2011	15:47	66° 16.63'S	60° 15.51'W	405.0	MUC	on deck
PS77 239-9	04.03.2011	15:59	66° 16.63'S	60° 15.49'W	405.0	MUC	in the water
PS77 239-9	04.03.2011	16:11	66° 16.65'S	60° 15.51'W	405.0	MUC	on ground
PS77 239-9	04.03.2011	16:25	66° 16.68'S	60° 15.53'W	407.0	MUC	on deck
PS77 240-1	04.03.2011	17:41	66° 16.69'S	60° 15.87'W	407.0	RMT	in the water
PS77 240-1	04.03.2011	17:48	66° 16.84'S	60° 16.44'W	410.0	RMT	max depth 200m
PS77 240-1	04.03.2011	17:55	66° 16.96'S	60° 16.96'W	413.0	RMT	hoisting
PS77 240-1	04.03.2011	18:00	66° 17.06'S	60° 17.32'W	406.0	RMT	max depth 100m
PS77 240-1	04.03.2011	18:08	66° 17.19'S	60° 17.81'W	406.0	RMT	hoisting
PS77 240-1	04.03.2011	18:17	66° 17.29'S	60° 18.15'W	404.0	RMT	profile start
PS77 240-1	04.03.2011	18:18	66° 17.30'S	60° 18.17'W	404.0	RMT	profile end
PS77 240-1	04.03.2011	18:18	66° 17.30'S	60° 18.17'W	404.0	RMT	on deck
PS77 241-1	04.03.2011	19:30	66° 9.73'S	60° 28.26'W	305.0	ROV	in the water
PS77 241-1	04.03.2011	19:49	66° 9.72'S	60° 28.34'W	305.0	ROV	information
PS77 241-1	04.03.2011	19:51	66° 9.72'S	60° 28.34'W	305.0	ROV	lowering
PS77 241-1	04.03.2011	20:24	66° 9.74'S	60° 28.28'W	305.0	ROV	on ground/ max depth
PS77 241-1	04.03.2011	20:24	66° 9.74'S	60° 28.28'W	305.0	ROV	profile start
PS77 241-1	05.03.2011	00:25	66° 9.80'S	60° 28.68'W	296.0	ROV	hoisting
PS77 241-1	05.03.2011	00:26	66° 9.80'S	60° 28.68'W	296.0	ROV	profile end
PS77 241-1	05.03.2011	00:40	66° 9.80'S	60° 28.70'W	295.0	ROV	at surface
PS77 241-1	05.03.2011	00:44	66° 9.80'S	60° 28.70'W	294.0	ROV	action
PS77 241-1	05.03.2011	00:53	66° 9.77'S	60° 28.69'W	295.0	ROV	on deck
PS77 242-1	05.03.2011	02:12	66° 17.00'S	60° 16.83'W	414.0	CTD/RO	in the water

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 242-1	05.03.2011	02:31	66° 17.01'S	60° 16.85'W	414.0	CTD/RO	max depth
PS77 242-1	05.03.2011	02:33	66° 17.01'S	60° 16.83'W	414.0	CTD/RO	hoisting
PS77 242-1	05.03.2011	02:46	66° 17.04'S	60° 16.86'W	413.0	CTD/RO	on deck
PS77 242-2	05.03.2011	02:55	66° 17.04'S	60° 16.84'W	414.0	MN	in the water
PS77 242-2	05.03.2011	03:09	66° 17.07'S	60° 16.79'W	413.0	MN	max depth
PS77 242-2	05.03.2011	03:10	66° 17.07'S	60° 16.79'W	413.0	MN	hoisting
PS77 242-2	05.03.2011	03:30	66° 17.11'S	60° 16.61'W	414.0	MN	on deck
PS77 242-3	05.03.2011	03:38	66° 17.12'S	60° 16.52'W	416.0	BONGO	in the water
PS77 242-3	05.03.2011	03:56	66° 17.18'S	60° 16.35'W	416.0	BONGO	max depth
PS77 242-3	05.03.2011	04:11	66° 17.21'S	60° 16.15'W	417.0	BONGO	on deck
PS77 242-4	05.03.2011	04:14	66° 17.22'S	60° 16.12'W	417.0	BONGO	in the water
PS77 242-4	05.03.2011	04:30	66° 17.24'S	60° 15.90'W	416.0	BONGO	max depth
PS77 242-4	05.03.2011	04:38	66° 17.26'S	60° 15.80'W	413.0	BONGO	on deck
PS77 243-1	05.03.2011	08:28	66° 16.73'S	60° 17.03'W	410.0	CTD	in the water
PS77 243-1	05.03.2011	08:47	66° 16.73'S	60° 17.00'W	410.0	CTD	max depth
PS77 243-1	05.03.2011	08:48	66° 16.73'S	60° 16.99'W	410.0	CTD	hoisting
PS77 243-1	05.03.2011	08:55	66° 16.70'S	60° 16.95'W	409.0	CTD	at surface
PS77 243-1	05.03.2011	08:56	66° 16.70'S	60° 16.95'W	409.0	CTD	on deck
PS77 243-2	05.03.2011	10:26	66° 16.74'S	60° 16.02'W	412.0	BPT	in the water
PS77 243-2	05.03.2011	10:32	66° 16.44'S	60° 15.97'W	410.0	BPT	interrupted
PS77 243-2	05.03.2011	10:57	66° 15.45'S	60° 15.96'W	407.0	BPT	lowering
PS77 243-2	05.03.2011	11:05	66° 14.89'S	60° 15.97'W	402.0	BPT	lowering
PS77 243-2	05.03.2011	11:06	66° 14.81'S	60° 15.97'W	402.0	BPT	max depth

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 243-2	05.03.2011	11:07	66° 14.76‘S	60° 15.97‘W	401.0	BPT	profile start
PS77 243-2	05.03.2011	11:27	66° 13.51‘S	60° 16.03‘W	367.0	BPT	profile end
PS77 243-2	05.03.2011	11:27	66° 13.51‘S	60° 16.03‘W	367.0	BPT	hoisting
PS77 243-2	05.03.2011	11:50	66° 12.81‘S	60° 16.50‘W	370.0	BPT	on deck
PS77 243-3	05.03.2011	13:07	66° 17.26‘S	60° 17.01‘W	410.0	BPT	in the water
PS77 243-3	05.03.2011	13:28	66° 16.50‘S	60° 15.20‘W	405.0	BPT	in the water
PS77 243-3	05.03.2011	13:35	66° 16.12‘S	60° 14.31‘W	401.0	BPT	profile start
PS77 243-3	05.03.2011	13:35	66° 16.12‘S	60° 14.31‘W	401.0	BPT	max depth
PS77 243-3	05.03.2011	13:56	66° 15.09‘S	60° 12.36‘W	386.0	BPT	profile end
PS77 243-3	05.03.2011	13:56	66° 15.09‘S	60° 12.36‘W	386.0	BPT	hoisting
PS77 243-3	05.03.2011	14:17	66° 14.54‘S	60° 12.11‘W	386.0	BPT	on deck
PS77 243-4	05.03.2011	14:46	66° 15.74‘S	60° 14.71‘W	397.0	MUC	in the water
PS77 243-4	05.03.2011	15:01	66° 15.79‘S	60° 14.69‘W	397.0	MUC	on ground
PS77 243-4	05.03.2011	15:01	66° 15.79‘S	60° 14.69‘W	397.0	MUC	hoisting
PS77 243-4	05.03.2011	15:14	66° 15.79‘S	60° 14.73‘W	397.0	MUC	on deck
PS77 243-5	05.03.2011	16:07	66° 9.95‘S	60° 7.73‘W	336.0	LANDER	on ground/ max depth
PS77 243-5	05.03.2011	16:13	66° 9.96‘S	60° 7.57‘W	341.0	LANDER	at surface
PS77 243-5	05.03.2011	16:28	66° 9.88‘S	60° 7.55‘W	338.0	LANDER	hoisting
PS77 243-5	05.03.2011	16:47	66° 9.98‘S	60° 7.63‘W	342.0	LANDER	on deck
PS77 243-6	05.03.2011	18:24	66° 10.11‘S	60° 7.43‘W	349.0	ATC	hydrophone in the water
PS77 243-6	05.03.2011	18:25	66° 10.10‘S	60° 7.44‘W	348.0	ATC	released
PS77 243-6	05.03.2011	18:34	66° 10.12‘S	60° 7.48‘W	347.0	ATC	at surface
PS77 243-6	05.03.2011	18:51	66° 10.37‘S	60° 7.68‘W	348.0	ATC	on ground/ max depth

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 243-6	05.03.2011	18:52	66° 10.37‘S	60° 7.71‘W	346.0	ATC	on deck
PS77 244-1	05.03.2011	20:20	65° 57.53‘S	60° 19.27‘W	429.0	HS_PS	profile start
PS77 244-1	06.03.2011	00:31	66° 0.34‘S	60° 20.27‘W	413.0	HS_PS	alter course
PS77 244-1	06.03.2011	00:38	66° 0.30‘S	60° 22.43‘W	394.0	HS_PS	alter course
PS77 244-1	06.03.2011	01:27	66° 1.89‘S	60° 30.00‘W	273.0	HS_PS	alter course
PS77 244-1	06.03.2011	02:10	66° 1.12‘S	60° 21.15‘W	406.0	HS_PS	alter course
PS77 244-1	06.03.2011	02:54	66° 2.75‘S	60° 32.57‘W	175.0	HS_PS	alter course
PS77 244-1	06.03.2011	03:45	66° 1.83‘S	60° 19.86‘W	396.0	HS_PS	alter course
PS77 244-1	06.03.2011	04:35	66° 3.26‘S	60° 33.63‘W	187.0	HS_PS	alter course
PS77 244-1	06.03.2011	05:25	66° 2.02‘S	60° 18.97‘W	396.0	HS_PS	alter course
PS77 244-1	06.03.2011	06:11	65° 58.66‘S	60° 18.01‘W	413.0	HS_PS	alter course
PS77 244-1	06.03.2011	06:48	66° 1.91‘S	60° 16.68‘W	393.0	HS_PS	alter course
PS77 244-1	06.03.2011	07:38	65° 57.43‘S	60° 15.60‘W	400.0	HS_PS	alter course
PS77 244-1	06.03.2011	08:17	66° 2.04‘S	60° 15.59‘W	400.0	HS_PS	alter course
PS77 244-1	06.03.2011	08:49	65° 59.04‘S	60° 14.75‘W	396.0	HS_PS	profile end
PS77 245-1	06.03.2011	10:16	66° 0.33‘S	60° 30.45‘W	176.0	ROV	in the water
PS77 245-1	06.03.2011	10:47	66° 0.33‘S	60° 30.38‘W	182.0	ROV	on ground/ max depth
PS77 245-1	06.03.2011	10:47	66° 0.33‘S	60° 30.38‘W	182.0	ROV	profile start
PS77 245-1	06.03.2011	14:09	66° 0.39‘S	60° 30.93‘W	0.0	ROV	profile end
PS77 245-1	06.03.2011	14:09	66° 0.39‘S	60° 30.93‘W	0.0	ROV	hoisting
PS77 245-1	06.03.2011	14:09	66° 0.39‘S	60° 30.93‘W	0.0	ROV	information
PS77 245-1	06.03.2011	14:17	66° 0.38‘S	60° 30.95‘W	0.0	ROV	at surface
PS77 245-1	06.03.2011	14:23	66° 0.40‘S	60° 30.93‘W	0.0	ROV	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 245-1	06.03.2011	14:28	66° 0.42'S	60° 30.90'W	162.7	ROV	on deck
PS77 246-1	06.03.2011	15:45	65° 56.31'S	60° 24.91'W	370.2	CTD/RO	in the water
PS77 246-1	06.03.2011	16:02	65° 56.32'S	60° 24.72'W	364.0	CTD/RO	max depth
PS77 246-1	06.03.2011	16:11	65° 56.31'S	60° 24.54'W	370.7	CTD/RO	on deck
PS77 246-2	06.03.2011	16:57	65° 55.03'S	60° 20.35'W	432.7	MUC	in the water
PS77 246-2	06.03.2011	17:20	65° 55.09'S	60° 20.11'W	433.0	MUC	on ground
PS77 246-2	06.03.2011	17:38	65° 55.04'S	60° 19.95'W	433.5	MUC	on deck
PS77 246-3	06.03.2011	18:15	65° 54.96'S	60° 20.60'W	429.5	MUC	in the water
PS77 246-3	06.03.2011	18:29	65° 54.95'S	60° 20.43'W	432.2	MUC	on ground
PS77 246-3	06.03.2011	18:44	65° 54.90'S	60° 20.35'W	433.5	MUC	on deck
PS77 246-4	06.03.2011	19:04	65° 54.95'S	60° 21.51'W	402.5	MUC	action
PS77 246-4	06.03.2011	19:14	65° 54.95'S	60° 21.49'W	403.0	MUC	on ground
PS77 246-4	06.03.2011	19:28	65° 54.82'S	60° 21.50'W	402.7	MUC	on deck
PS77 246-5	06.03.2011	19:46	65° 55.05'S	60° 20.82'W	422.7	MUC	in the water
PS77 246-5	06.03.2011	19:58	65° 54.99'S	60° 20.70'W	427.7	MUC	on ground
PS77 246-5	06.03.2011	20:08	65° 54.89'S	60° 20.71'W	428.5	MUC	at surface
PS77 246-5	06.03.2011	20:10	65° 54.86'S	60° 20.71'W	429.0	MUC	on deck
PS77 247-1	07.03.2011	06:03	65° 55.10'S	60° 19.90'W	434.0	CTD/RO	in the water
PS77 247-1	07.03.2011	06:19	65° 55.11'S	60° 19.77'W	434.5	CTD/RO	max depth
PS77 247-1	07.03.2011	06:29	65° 55.13'S	60° 19.71'W	435.0	CTD/RO	on deck
PS77 247-2	07.03.2011	06:43	65° 55.09'S	60° 20.09'W	433.5	BWS	in the water
PS77 247-2	07.03.2011	07:03	65° 55.08'S	60° 20.10'W	434.0	BWS	on ground/ max depth
PS77 247-2	07.03.2011	07:08	65° 55.08'S	60° 20.11'W	434.2	BWS	hoisting

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 247-2	07.03.2011	07:22	65° 55.05'S	60° 20.14'W	434.0	BWS	on deck
PS77 247-3	07.03.2011	07:46	65° 55.12'S	60° 19.91'W	434.7	MUC	in the water
PS77 247-3	07.03.2011	08:03	65° 55.12'S	60° 19.83'W	435.2	MUC	on ground
PS77 247-3	07.03.2011	08:03	65° 55.12'S	60° 19.83'W	435.2	MUC	hoisting
PS77 247-3	07.03.2011	08:18	65° 55.15'S	60° 19.84'W	436.0	MUC	at surface
PS77 247-3	07.03.2011	08:22	65° 55.15'S	60° 19.86'W	435.7	MUC	on deck
PS77 247-4	07.03.2011	08:42	65° 55.16'S	60° 19.95'W	435.5	MUC	in the water
PS77 247-4	07.03.2011	08:54	65° 55.15'S	60° 20.01'W	436.0	MUC	on ground
PS77 247-4	07.03.2011	08:54	65° 55.15'S	60° 20.01'W	436.0	MUC	hoisting
PS77 247-4	07.03.2011	09:06	65° 55.15'S	60° 20.12'W	436.0	MUC	at surface
PS77 247-4	07.03.2011	09:10	65° 55.16'S	60° 20.14'W	435.7	MUC	on deck
PS77 247-5	07.03.2011	09:58	65° 55.04'S	60° 19.94'W	437.2	MG	in the water
PS77 247-5	07.03.2011	10:22	65° 55.09'S	60° 19.89'W	436.2	MG	on ground
PS77 247-5	07.03.2011	10:42	65° 55.07'S	60° 19.92'W	436.2	MG	on ground
PS77 247-5	07.03.2011	10:42	65° 55.07'S	60° 19.92'W	436.2	MG	hoisting
PS77 247-5	07.03.2011	10:59	65° 55.08'S	60° 19.94'W	436.0	MG	at surface
PS77 247-5	07.03.2011	11:03	65° 55.09'S	60° 19.95'W	435.7	MG	on deck
PS77 248-1	07.03.2011	11:40	65° 56.26'S	60° 25.20'W	367.7	MG	in the water
PS77 248-1	07.03.2011	11:56	65° 56.21'S	60° 25.38'W	357.2	MG	on ground
PS77 248-1	07.03.2011	12:19	65° 56.20'S	60° 25.39'W	355.5	MG	on ground
PS77 248-1	07.03.2011	12:19	65° 56.20'S	60° 25.39'W	355.5	MG	hoisting
PS77 248-1	07.03.2011	12:39	65° 56.13'S	60° 25.55'W	349.7	MG	on deck
PS77 248-2	07.03.2011	13:24	65° 56.85'S	60° 27.68'W	246.2	AGT	in the water

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 248-2	07.03.2011	13:39	65° 57.27'S	60° 27.98'W	212.0	AGT	on ground
PS77 248-2	07.03.2011	13:48	65° 57.51'S	60° 28.15'W	201.5	AGT	profile start
PS77 248-2	07.03.2011	13:59	65° 57.69'S	60° 28.30'W	195.5	AGT	profile end
PS77 248-2	07.03.2011	13:59	65° 57.69'S	60° 28.30'W	195.5	AGT	hoisting
PS77 248-2	07.03.2011	14:08	65° 57.73'S	60° 28.30'W	198.5	AGT	off ground
PS77 248-2	07.03.2011	14:33	65° 57.57'S	60° 28.26'W	197.5	AGT	on deck
PS77 248-3	07.03.2011	15:23	65° 55.12'S	60° 19.67'W	434.5	AGT	in the water
PS77 248-3	07.03.2011	15:34	65° 55.45'S	60° 19.93'W	433.0	AGT	on ground
PS77 248-3	07.03.2011	15:47	65° 55.69'S	60° 20.07'W	429.0	AGT	profile start
PS77 248-3	07.03.2011	15:57	65° 55.86'S	60° 20.18'W	424.5	AGT	profile end
PS77 248-3	07.03.2011	15:57	65° 55.86'S	60° 20.18'W	424.5	AGT	hoisting
PS77 248-3	07.03.2011	16:14	65° 55.88'S	60° 20.15'W	424.7	AGT	off ground
PS77 248-3	07.03.2011	16:36	65° 55.86'S	60° 19.97'W	428.5	AGT	on deck
PS77 249-1	07.03.2011	17:51	65° 56.52'S	60° 31.72'W	211.5	ROV	in the water
PS77 249-1	07.03.2011	18:06	65° 56.55'S	60° 31.69'W	207.7	ROV	action
PS77 249-1	07.03.2011	18:25	65° 56.55'S	60° 31.68'W	209.2	ROV	on ground/ max depth
PS77 249-1	07.03.2011	18:25	65° 56.55'S	60° 31.68'W	209.2	ROV	profile start
PS77 249-1	07.03.2011	23:23	65° 56.89'S	60° 31.99'W	130.2	ROV	profile end
PS77 249-1	07.03.2011	23:36	65° 56.88'S	60° 32.05'W	126.5	ROV	at surface
PS77 249-1	07.03.2011	23:41	65° 56.89'S	60° 32.10'W	125.2	ROV	action
PS77 249-1	07.03.2011	23:47	65° 56.88'S	60° 32.14'W	123.5	ROV	on deck
PS77 250-1	08.03.2011	07:07	65° 26.09'S	61° 26.72'W	837.7	CTD/RO	in the water
PS77 250-1	08.03.2011	07:31	65° 26.07'S	61° 26.81'W	840.5	CTD/RO	max depth

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 250-1	08.03.2011	07:48	65° 26.04'S	61° 26.78'W	844.0	CTD/RO	on deck
PS77 250-2	08.03.2011	08:09	65° 26.00'S	61° 26.72'W	842.7	MUC	action
PS77 250-2	08.03.2011	08:33	65° 25.94'S	61° 26.53'W	835.7	MUC	in the water
PS77 250-2	08.03.2011	08:50	65° 25.90'S	61° 26.44'W	834.0	MUC	on ground
PS77 250-2	08.03.2011	09:15	65° 25.84'S	61° 26.29'W	833.0	MUC	at surface
PS77 250-2	08.03.2011	09:18	65° 25.83'S	61° 26.27'W	832.0	MUC	on deck
PS77 250-3	08.03.2011	09:37	65° 25.76'S	61° 26.16'W	825.7	MUC	in the water
PS77 250-3	08.03.2011	10:00	65° 25.66'S	61° 26.03'W	815.2	MUC	on ground
PS77 250-3	08.03.2011	10:19	65° 25.56'S	61° 25.92'W	809.2	MUC	at surface
PS77 250-3	08.03.2011	10:22	65° 25.55'S	61° 25.91'W	807.5	MUC	on deck
PS77 250-4	08.03.2011	10:41	65° 25.43'S	61° 25.80'W	801.5	MUC	in the water
PS77 250-4	08.03.2011	10:59	65° 25.32'S	61° 25.70'W	789.0	MUC	on ground
PS77 250-4	08.03.2011	10:59	65° 25.32'S	61° 25.70'W	789.0	MUC	hoisting
PS77 250-4	08.03.2011	11:17	65° 25.18'S	61° 25.61'W	778.2	MUC	at surface
PS77 250-4	08.03.2011	11:21	65° 25.15'S	61° 25.59'W	774.7	MUC	on deck
PS77 250-5	08.03.2011	11:51	65° 25.65'S	61° 25.40'W	812.0	MG	in the water
PS77 250-5	08.03.2011	12:21	65° 25.45'S	61° 25.37'W	801.5	MG	on ground
PS77 250-5	08.03.2011	12:52	65° 25.33'S	61° 25.37'W	792.2	MG	on ground/
PS77 250-5	08.03.2011	13:27	65° 25.29'S	61° 25.60'W	794.7	MG	on deck
PS77 250-6	08.03.2011	14:13	65° 23.60'S	61° 32.59'W	699.2	AGT	in the water
PS77 250-6	08.03.2011	14:27	65° 23.01'S	61° 32.87'W	566.7	AGT	on ground
PS77 250-6	08.03.2011	14:44	65° 22.67'S	61° 33.10'W	583.5	AGT	profile start
PS77 250-6	08.03.2011	14:54	65° 22.51'S	61° 33.24'W	612.5	AGT	profile end

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 250-6	08.03.2011	14:54	65° 22.51'S	61° 33.24'W	612.5	AGT	hoisting
PS77 250-6	08.03.2011	15:15	65° 22.38'S	61° 33.46'W	579.0	AGT	off ground
PS77 250-6	08.03.2011	15:49	65° 21.97'S	61° 34.06'W	587.0	AGT	on deck
PS77 250-7	08.03.2011	16:29	65° 21.80'S	61° 35.18'W	558.7	RMT	in the water
PS77 250-7	08.03.2011	16:43	65° 21.91'S	61° 36.57'W	587.7	RMT	profile start
PS77 250-7	08.03.2011	16:57	65° 22.03'S	61° 37.96'W	574.5	RMT	information
PS77 250-7	08.03.2011	17:03	65° 22.09'S	61° 38.50'W	570.5	RMT	profile end
PS77 250-7	08.03.2011	17:28	65° 22.31'S	61° 40.48'W	652.0	RMT	on deck
PS77 250-8	08.03.2011	18:08	65° 22.54'S	61° 42.45'W	713.5	BPT	in the water
PS77 250-8	08.03.2011	18:24	65° 22.81'S	61° 44.30'W	721.5	BPT	in the water
PS77 250-8	08.03.2011	18:31	65° 22.99'S	61° 45.44'W	828.0	BPT	max depth
PS77 250-8	08.03.2011	18:31	65° 22.99'S	61° 45.44'W	828.0	BPT	profile start
PS77 250-8	08.03.2011	18:51	65° 23.51'S	61° 48.70'W	678.5	BPT	profile end
PS77 250-8	08.03.2011	18:51	65° 23.51'S	61° 48.70'W	678.5	BPT	hoisting
PS77 250-8	08.03.2011	18:59	65° 23.58'S	61° 49.46'W	658.2	BPT	action
PS77 250-8	08.03.2011	19:09	65° 23.59'S	61° 50.21'W	635.7	BPT	on deck
PS77 251-1	08.03.2011	20:47	65° 26.36'S	61° 33.39'W	808.2	CTD	in the water
PS77 251-1	08.03.2011	21:10	65° 26.28'S	61° 33.50'W	817.0	CTD	max depth
PS77 251-1	08.03.2011	21:11	65° 26.27'S	61° 33.51'W	816.7	CTD	hoisting
PS77 251-1	08.03.2011	21:33	65° 26.19'S	61° 33.62'W	817.0	CTD	on deck
PS77 251-2	08.03.2011	21:41	65° 26.16'S	61° 33.65'W	812.0	MN	in the water
PS77 251-2	08.03.2011	22:13	65° 26.03'S	61° 33.84'W	793.5	MN	max depth
PS77 251-2	08.03.2011	22:46	65° 25.88'S	61° 34.06'W	790.5	MN	at surface

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 251-2	08.03.2011	22:49	65° 25.86'S	61° 34.08'W	801.7	MN	on deck
PS77 251-3	08.03.2011	23:01	65° 25.82'S	61° 34.16'W	818.2	BONGO	in the water
PS77 251-3	08.03.2011	23:03	65° 25.81'S	61° 34.17'W	818.7	BONGO	max depth
PS77 251-3	08.03.2011	23:07	65° 25.79'S	61° 34.19'W	818.2	BONGO	at surface
PS77 251-4	08.03.2011	23:10	65° 25.78'S	61° 34.21'W	816.2	BONGO	in the water
PS77 251-3	08.03.2011	23:10	65° 25.78'S	61° 34.21'W	816.2	BONGO	on deck
PS77 251-4	08.03.2011	23:17	65° 25.75'S	61° 34.26'W	815.2	BONGO	max depth
PS77 251-4	08.03.2011	23:23	65° 25.74'S	61° 34.28'W	814.5	BONGO	at surface
PS77 251-4	08.03.2011	23:27	65° 25.73'S	61° 34.28'W	812.7	BONGO	in the water
PS77 251-4	08.03.2011	23:27	65° 25.73'S	61° 34.28'W	812.7	BONGO	on deck
PS77 251-4	08.03.2011	23:45	65° 25.65'S	61° 34.39'W	804.0	BONGO	max depth
PS77 251-4	09.03.2011	00:05	65° 25.58'S	61° 34.50'W	800.5	BONGO	on deck
PS77 252-1	10.03.2011	08:06	64° 41.41'S	60° 32.04'W	271.5	CTD	in the water
PS77 252-1	10.03.2011	08:21	64° 41.45'S	60° 32.04'W	282.0	CTD	max depth
PS77 252-1	10.03.2011	08:30	64° 41.47'S	60° 32.06'W	282.7	CTD	at surface
PS77 252-1	10.03.2011	08:32	64° 41.48'S	60° 32.05'W	287.2	CTD	on deck
PS77 252-2	10.03.2011	08:46	64° 41.60'S	60° 32.00'W	307.5	BWS	in the water
PS77 252-2	10.03.2011	09:01	64° 41.58'S	60° 31.95'W	295.5	BWS	on ground/ max depth
PS77 252-2	10.03.2011	09:05	64° 41.58'S	60° 31.95'W	295.7	BWS	hoisting
PS77 252-2	10.03.2011	09:15	64° 41.58'S	60° 31.80'W	298.5	BWS	at surface
PS77 252-2	10.03.2011	09:16	64° 41.58'S	60° 31.78'W	302.2	BWS	on deck
PS77 252-3	10.03.2011	09:50	64° 41.57'S	60° 30.68'W	300.2	AGT	in the water
PS77 252-3	10.03.2011	09:58	64° 41.65'S	60° 31.07'W	316.0	AGT	on ground

Station PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 252-3	10.03.2011	10:07	64° 41.80'S	60° 31.37'W	311.5	AGT	profile start
PS77 252-3	10.03.2011	10:15	64° 41.88'S	60° 31.57'W	340.2	AGT	action
PS77 252-3	10.03.2011	10:15	64° 41.88'S	60° 31.57'W	340.2	AGT	profile end
PS77 252-3	10.03.2011	10:50	64° 41.78'S	60° 31.28'W	309.5	AGT	off ground
PS77 252-3	10.03.2011	11:05	64° 41.79'S	60° 31.26'W	310.7	AGT	at surface
PS77 252-3	10.03.2011	11:09	64° 41.79'S	60° 31.25'W	310.5	AGT	on deck
PS77 252-4	10.03.2011	11:28	64° 41.83'S	60° 31.26'W	337.0	MN	in the water
PS77 252-4	10.03.2011	11:48	64° 41.86'S	60° 31.26'W	336.0	MN	max depth
PS77 252-4	10.03.2011	11:49	64° 41.86'S	60° 31.25'W	334.5	MN	hoisting
PS77 252-4	10.03.2011	12:07	64° 41.88'S	60° 31.25'W	335.0	MN	on deck
PS77 252-5	10.03.2011	12:12	64° 41.88'S	60° 31.24'W	334.5	BONGO	in the water
PS77 252-5	10.03.2011	12:27	64° 41.90'S	60° 31.25'W	334.0	BONGO	max depth
PS77 252-5	10.03.2011	12:27	64° 41.90'S	60° 31.25'W	334.0	BONGO	hoisting
PS77 252-5	10.03.2011	12:37	64° 41.89'S	60° 31.23'W	333.5	BONGO	on deck
PS77 252-6	10.03.2011	13:33	64° 41.14'S	60° 32.54'W	209.5	MUC	in the water
PS77 252-6	10.03.2011	13:39	64° 41.14'S	60° 32.51'W	212.0	MUC	on ground
PS77 252-6	10.03.2011	13:40	64° 41.14'S	60° 32.51'W	212.5	MUC	hoisting
PS77 252-6	10.03.2011	13:51	64° 41.12'S	60° 32.43'W	209.7	MUC	on deck
PS77 252-7	10.03.2011	14:43	64° 41.64'S	60° 30.57'W	299.5	AGTs	in the water
PS77 252-7	10.03.2011	14:50	64° 41.83'S	60° 30.92'W	327.0	AGTs	on ground
PS77 252-7	10.03.2011	15:09	64° 42.12'S	60° 31.53'W	339.7	AGTs	profile start
PS77 252-7	10.03.2011	15:18	64° 42.21'S	60° 31.77'W	343.0	AGTs	profile end
PS77 252-7	10.03.2011	15:18	64° 42.21'S	60° 31.77'W	343.0	AGTs	hoisting

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 252-7	10.03.2011	15:37	64° 42.27'S	60° 31.76'W	338.7	AGTs	off ground
PS77 252-7	10.03.2011	15:56	64° 42.29'S	60° 31.66'W	336.2	AGTs	on deck
PS77 252-8	10.03.2011	18:36	64° 41.14'S	60° 32.67'W	202.0	MG	in the water
PS77 252-8	10.03.2011	18:45	64° 41.14'S	60° 32.68'W	202.7	MG	on ground
PS77 252-8	10.03.2011	19:08	64° 41.21'S	60° 32.74'W	226.2	MG	hoisting
PS77 252-8	10.03.2011	19:21	64° 41.22'S	60° 32.71'W	229.7	MG	on deck
PS77 253-1	11.03.2011	10:01	64° 54.81'S	60° 39.04'W	140.0	ROV	in the water
PS77 253-1	11.03.2011	10:26	64° 54.82'S	60° 39.06'W	140.0	ROV	on ground/ max depth
PS77 253-1	11.03.2011	10:26	64° 54.82'S	60° 39.06'W	140.0	ROV	profile start
PS77 253-1	11.03.2011	14:15	64° 54.67'S	60° 39.60'W	0.0	ROV	profile end
PS77 253-1	11.03.2011	14:17	64° 54.67'S	60° 39.59'W	0.0	ROV	hoisting
PS77 253-1	11.03.2011	14:26	64° 54.67'S	60° 39.60'W	0.0	ROV	at surface
PS77 253-1	11.03.2011	14:31	64° 54.66'S	60° 39.60'W	0.0	ROV	on deck
PS77 253-1	11.03.2011	14:35	64° 54.61'S	60° 39.62'W	0.0	ROV	on deck
PS77 253-2	11.03.2011	14:45	64° 54.59'S	60° 39.69'W	0.0	CTD/RO	in the water
PS77 253-2	11.03.2011	14:55	64° 54.57'S	60° 39.63'W	0.0	CTD/RO	max depth
PS77 253-2	11.03.2011	14:58	64° 54.57'S	60° 39.63'W	184.7	CTD/RO	hoisting
PS77 253-2	11.03.2011	15:09	64° 54.58'S	60° 39.66'W	186.0	CTD/RO	on deck
PS77 254-1	11.03.2011	18:56	65° 0.54'S	59° 25.56'W	302.5	MG	in the water
PS77 254-1	11.03.2011	19:11	65° 0.49'S	59° 25.57'W	302.0	MG	on ground
PS77 254-1	11.03.2011	19:32	65° 0.39'S	59° 25.72'W	303.5	MG	hoisting
PS77 254-1	11.03.2011	19:48	65° 0.31'S	59° 25.79'W	304.0	MG	on deck
PS77 254-2	11.03.2011	20:13	65° 0.29'S	59° 25.75'W	304.7	MUC	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 254-2	11.03.2011	20:23	65° 0.25'S	59° 25.70'W	304.7	MUC	on ground
PS77 254-2	11.03.2011	20:34	65° 0.24'S	59° 25.73'W	303.5	MUC	at surface
PS77 254-2	11.03.2011	20:38	65° 0.23'S	59° 25.71'W	306.2	MUC	on deck
PS77 254-3	11.03.2011	20:49	65° 0.20'S	59° 25.71'W	306.0	MUC	in the water
PS77 254-3	11.03.2011	20:56	65° 0.20'S	59° 25.79'W	306.0	MUC	on ground
PS77 254-3	11.03.2011	21:05	65° 0.20'S	59° 25.65'W	305.0	MUC	at surface
PS77 254-3	11.03.2011	21:08	65° 0.18'S	59° 25.61'W	305.0	MUC	on deck
PS77 254-4	11.03.2011	21:21	65° 0.15'S	59° 25.68'W	305.2	MUC	in the water
PS77 254-4	11.03.2011	21:35	65° 0.19'S	59° 25.83'W	306.2	MUC	on ground
PS77 254-4	11.03.2011	21:43	65° 0.19'S	59° 25.88'W	306.5	MUC	at surface
PS77 254-4	11.03.2011	21:46	65° 0.18'S	59° 25.89'W	306.2	MUC	on deck
PS77 254-5	11.03.2011	22:04	65° 0.10'S	59° 25.84'W	307.0	MUC	in the water
PS77 254-5	11.03.2011	22:17	65° 0.08'S	59° 25.91'W	307.2	MUC	on ground
PS77 254-5	11.03.2011	22:25	65° 0.11'S	59° 26.00'W	307.7	MUC	at surface
PS77 254-5	11.03.2011	22:30	65° 0.14'S	59° 26.07'W	307.5	MUC	on deck
PS77 255-1	12.03.2011	02:17	64° 49.19'S	60° 34.92'W	714.7	CTD/RO	in the water
PS77 255-1	12.03.2011	02:40	64° 49.17'S	60° 35.07'W	720.2	CTD/RO	max depth
PS77 255-1	12.03.2011	02:41	64° 49.17'S	60° 35.07'W	720.5	CTD/RO	hoisting
PS77 255-1	12.03.2011	03:05	64° 49.19'S	60° 35.11'W	719.7	CTD/RO	on deck
PS77 255-2	12.03.2011	03:12	64° 49.21'S	60° 35.12'W	716.2	MN	in the water
PS77 255-2	12.03.2011	03:46	64° 49.36'S	60° 35.07'W	689.7	MN	max depth
PS77 255-2	12.03.2011	03:46	64° 49.36'S	60° 35.07'W	689.7	MN	hoisting
PS77 255-2	12.03.2011	04:25	64° 49.46'S	60° 35.33'W	684.7	MN	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 255-3	12.03.2011	04:35	64° 49.49'S	60° 35.45'W	681.7	BONGO	in the water
PS77 255-3	12.03.2011	05:01	64° 49.57'S	60° 35.48'W	671.2	BONGO	max depth
PS77 255-3	12.03.2011	05:01	64° 49.57'S	60° 35.48'W	671.2	BONGO	hoisting
PS77 255-3	12.03.2011	05:01	64° 49.57'S	60° 35.48'W	671.2	BONGO	off ground
PS77 255-3	12.03.2011	05:19	64° 49.66'S	60° 35.54'W	662.2	BONGO	on deck
PS77 256-1	12.03.2011	06:21	64° 54.06'S	60° 23.77'W	355.7	CTD	in the water
PS77 256-1	12.03.2011	06:34	64° 54.11'S	60° 23.86'W	352.2	CTD	max depth
PS77 256-1	12.03.2011	06:36	64° 54.12'S	60° 23.88'W	352.0	CTD	hoisting
PS77 256-1	12.03.2011	06:36	64° 54.12'S	60° 23.88'W	352.0	CTD	off ground
PS77 256-1	12.03.2011	06:43	64° 54.17'S	60° 23.98'W	348.0	CTD	on deck
PS77 256-2	12.03.2011	08:10	64° 53.83'S	60° 24.31'W	441.0	FLS	profile start
PS77 256-3	12.03.2011	10:15	64° 45.84'S	60° 23.41'W	845.0	BPT	in the water
PS77 256-3	12.03.2011	10:35	64° 46.70'S	60° 24.01'W	890.0	BPT	in the water
PS77 256-3	12.03.2011	10:39	64° 47.00'S	60° 23.65'W	890.0	BPT	profile start
PS77 256-3	12.03.2011	10:49	64° 47.60'S	60° 22.97'W	863.0	BPT	lowering
PS77 256-3	12.03.2011	10:59	64° 48.17'S	60° 22.44'W	815.0	BPT	profile end
PS77 256-3	12.03.2011	10:59	64° 48.17'S	60° 22.44'W	815.0	BPT	hoisting
PS77 256-3	12.03.2011	11:07	64° 48.36'S	60° 22.00'W	781.0	BPT	action
PS77 256-3	12.03.2011	11:22	64° 48.52'S	60° 20.52'W	748.0	BPT	on deck
PS77 256-2	12.03.2011	12:32	64° 52.86'S	60° 18.10'W	0.0	FLS	alter course
PS77 256-2	12.03.2011	12:54	64° 51.80'S	60° 13.03'W	0.0	FLS	information
PS77 256-4	12.03.2011	13:07	64° 51.35'S	60° 12.33'W	0.0	BPT	in the water
PS77 256-4	12.03.2011	13:31	64° 51.72'S	60° 14.59'W	0.0	BPT	action

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 256-4	12.03.2011	13:36	64° 51.34'S	60° 14.97'W	436.0	BPT	profile start
PS77 256-4	12.03.2011	13:51	64° 50.27'S	60° 15.60'W	489.0	BPT	profile end
PS77 256-4	12.03.2011	13:51	64° 50.27'S	60° 15.60'W	0.0	BPT	hoisting
PS77 256-4	12.03.2011	13:55	64° 50.09'S	60° 15.69'W	0.0	BPT	information
PS77 256-4	12.03.2011	14:07	64° 49.71'S	60° 15.64'W	0.0	BPT	on deck
PS77 256-2	12.03.2011	14:13	64° 49.39'S	60° 15.71'W	0.0	FLS	information
PS77 256-2	12.03.2011	15:00	64° 44.78'S	60° 19.47'W	0.0	FLS	alter course
PS77 256-2	12.03.2011	15:22	64° 43.88'S	60° 14.50'W	0.0	FLS	information
PS77 256-5	12.03.2011	15:35	64° 43.16'S	60° 13.12'W	910.0	BPT	in the water
PS77 256-5	12.03.2011	15:56	64° 44.26'S	60° 13.71'W	0.0	BPT	lowering
PS77 256-5	12.03.2011	16:08	64° 45.21'S	60° 12.94'W	0.0	BPT	max depth
PS77 256-5	12.03.2011	16:09	64° 45.28'S	60° 12.89'W	805.0	BPT	profile start
PS77 256-5	12.03.2011	16:24	64° 46.23'S	60° 12.00'W	791.0	BPT	profile end
PS77 256-5	12.03.2011	16:24	64° 46.23'S	60° 12.00'W	0.0	BPT	hoisting
PS77 256-5	12.03.2011	16:35	64° 46.62'S	60° 11.53'W	0.0	BPT	information
PS77 256-5	12.03.2011	16:48	64° 46.78'S	60° 10.70'W	735.0	BPT	on deck
PS77 256-2	12.03.2011	17:35	64° 50.72'S	60° 7.82'W	440.0	FLS	profile end
PS77 256-6	12.03.2011	17:56	64° 50.87'S	60° 7.69'W	444.0	CTD	in the water
PS77 256-6	12.03.2011	18:13	64° 50.92'S	60° 7.69'W	442.0	CTD	max depth
PS77 256-6	12.03.2011	18:15	64° 50.93'S	60° 7.68'W	0.0	CTD	hoisting
PS77 256-6	12.03.2011	18:16	64° 50.93'S	60° 7.68'W	0.0	CTD	off ground
PS77 256-6	12.03.2011	18:24	64° 50.95'S	60° 7.67'W	440.0	CTD	on deck
PS77 257-1	13.03.2011	08:47	64° 56.34'S	60° 35.95'W	322.5	MOORST	on ground/ max depth

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 257-1	13.03.2011	09:03	64° 56.32‘S	60° 35.88‘W	321.2	MOORST	action
PS77 257-1	13.03.2011	09:08	64° 56.32‘S	60° 35.84‘W	321.7	MOORST	at surface
PS77 257-1	13.03.2011	09:37	64° 56.42‘S	60° 35.99‘W	318.5	MOORST	on deck
PS77 257-1	13.03.2011	09:39	64° 56.43‘S	60° 35.99‘W	316.7	MOORST	on deck
PS77 257-1	13.03.2011	09:40	64° 56.43‘S	60° 35.98‘W	316.7	MOORST	on deck
PS77 257-1	13.03.2011	09:43	64° 56.43‘S	60° 35.97‘W	315.5	MOORST	on deck
PS77 257-1	13.03.2011	09:45	64° 56.43‘S	60° 35.96‘W	315.7	MOORST	on deck
PS77 257-1	13.03.2011	09:46	64° 56.43‘S	60° 35.97‘W	316.5	MOORST	on deck
PS77 257-1	13.03.2011	09:47	64° 56.43‘S	60° 35.96‘W	316.5	MOORST	on deck
PS77 257-1	13.03.2011	09:52	64° 56.42‘S	60° 35.95‘W	316.0	MOORST	on deck
PS77 257-1	13.03.2011	09:56	64° 56.40‘S	60° 35.89‘W	317.5	MOORST	on deck
PS77 257-1	13.03.2011	09:59	64° 56.38‘S	60° 35.87‘W	318.5	MOORST	on deck
PS77 257-1	13.03.2011	10:05	64° 56.40‘S	60° 35.87‘W	318.2	MOORST	on deck
PS77 257-2	13.03.2011	10:38	64° 54.85‘S	60° 38.67‘W	149.0	AGTs	in the water
PS77 257-2	13.03.2011	10:45	64° 54.80‘S	60° 38.85‘W	152.5	AGTs	on ground
PS77 257-2	13.03.2011	10:49	64° 54.75‘S	60° 39.01‘W	158.5	AGTs	action
PS77 257-2	13.03.2011	10:49	64° 54.75‘S	60° 39.01‘W	158.5	AGTs	profile start
PS77 257-2	13.03.2011	10:59	64° 54.62‘S	60° 39.50‘W	168.5	AGTs	profile end
PS77 257-2	13.03.2011	10:59	64° 54.62‘S	60° 39.50‘W	168.5	AGTs	hoisting
PS77 257-2	13.03.2011	11:04	64° 54.56‘S	60° 39.71‘W	190.5	AGTs	off ground
PS77 257-2	13.03.2011	11:14	64° 54.44‘S	60° 40.12‘W	198.2	AGTs	at surface
PS77 257-2	13.03.2011	11:19	64° 54.37‘S	60° 40.35‘W	271.0	AGTs	on deck
PS77 258-1	16.03.2011	08:10	64° 22.05‘S	47° 14.21‘W	4279.7	CTD	in the water

Station PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 258-1	16.03.2011	09:26	64° 22.12'S	47° 13.84'W	4277.0	CTD	max depth
PS77 258-1	16.03.2011	10:33	64° 22.21'S	47° 14.12'W	4276.0	CTD	at surface
PS77 258-1	16.03.2011	10:35	64° 22.22'S	47° 14.13'W	4276.0	CTD	on deck
PS77 258-2	16.03.2011	11:00	64° 22.28'S	47° 13.93'W	4276.7	MN	in the water
PS77 258-2	16.03.2011	12:27	64° 22.41'S	47° 13.80'W	4279.7	MN	max depth
PS77 258-2	16.03.2011	12:28	64° 22.41'S	47° 13.79'W	4277.2	MN	hoisting
PS77 258-2	16.03.2011	13:38	64° 22.74'S	47° 13.24'W	4280.7	MN	on deck
PS77 258-3	16.03.2011	13:58	64° 23.13'S	47° 10.99'W	4290.0	BONGO	in the water
PS77 258-3	16.03.2011	14:22	64° 23.20'S	47° 10.86'W	4290.5	BONGO	max depth
PS77 258-3	16.03.2011	14:22	64° 23.20'S	47° 10.86'W	4290.5	BONGO	hoisting
PS77 258-3	16.03.2011	14:42	64° 23.27'S	47° 10.85'W	4291.5	BONGO	on deck
PS77 258-4	16.03.2011	14:59	64° 23.18'S	47° 11.54'W	4287.5	BONGO	in the water
PS77 258-4	16.03.2011	15:23	64° 23.30'S	47° 11.48'W	4290.5	BONGO	max depth
PS77 258-4	16.03.2011	15:24	64° 23.31'S	47° 11.48'W	4289.0	BONGO	hoisting
PS77 258-4	16.03.2011	15:44	64° 23.40'S	47° 11.56'W	4288.5	BONGO	on deck
PS77 259-1	20.03.2011	11:53	70° 46.16'S	11° 15.65'W	1407.0	TRAPST	in the water
PS77 259-1	20.03.2011	11:56	70° 46.16'S	11° 15.68'W	0.0	TRAPST	on ground/ max depth
PS77 260-1	20.03.2011	13:27	70° 48.32'S	10° 45.87'W	496.7	CTD/RO	in the water
PS77 260-1	20.03.2011	13:46	70° 48.26'S	10° 45.75'W	497.2	CTD/RO	max depth
PS77 260-1	20.03.2011	13:46	70° 48.26'S	10° 45.75'W	497.2	CTD/RO	hoisting
PS77 260-1	20.03.2011	14:07	70° 48.30'S	10° 45.43'W	490.2	CTD/RO	on deck
PS77 260-2	20.03.2011	14:19	70° 48.16'S	10° 45.73'W	508.0	MN	in the water
PS77 260-2	20.03.2011	14:47	70° 48.05'S	10° 45.81'W	513.7	MN	max depth

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 260-2	20.03.2011	14:48	70° 48.05‘S	10° 45.82‘W	514.7	MN	hoisting
PS77 260-2	20.03.2011	15:11	70° 47.94‘S	10° 46.05‘W	521.5	MN	on deck
PS77 260-3	20.03.2011	15:28	70° 48.72‘S	10° 45.58‘W	470.2	MOORST	in the water
PS77 260-3	20.03.2011	15:31	70° 48.72‘S	10° 45.56‘W	470.2	MOORST	in the water
PS77 260-3	20.03.2011	15:40	70° 48.70‘S	10° 45.64‘W	473.7	MOORST	in the water
PS77 260-3	20.03.2011	15:48	70° 48.68‘S	10° 45.71‘W	474.7	MOORST	in the water
PS77 260-3	20.03.2011	15:54	70° 48.66‘S	10° 45.79‘W	475.5	MOORST	in the water
PS77 260-3	20.03.2011	15:56	70° 48.65‘S	10° 45.82‘W	477.0	MOORST	in the water
PS77 260-3	20.03.2011	16:12	70° 48.60‘S	10° 46.08‘W	480.2	MOORST	on ground/ max depth
PS77 260-3	20.03.2011	16:13	70° 48.60‘S	10° 46.10‘W	480.5	MOORST	information
PS77 260-3	20.03.2011	16:18	70° 48.58‘S	10° 46.19‘W	479.5	MOORST	on deck
PS77 260-4	20.03.2011	16:44	70° 48.81‘S	10° 46.26‘W	463.5	MUC	in the water
PS77 260-4	20.03.2011	16:56	70° 48.81‘S	10° 46.46‘W	462.2	MUC	on ground
PS77 260-4	20.03.2011	17:09	70° 48.82‘S	10° 46.67‘W	460.7	MUC	on deck
PS77 260-5	20.03.2011	17:30	70° 48.86‘S	10° 47.08‘W	465.0	MUC	in the water
PS77 260-5	20.03.2011	17:39	70° 48.86‘S	10° 47.18‘W	466.2	MUC	on ground
PS77 260-5	20.03.2011	17:50	70° 48.86‘S	10° 47.31‘W	471.2	MUC	on deck
PS77 260-6	20.03.2011	18:39	70° 50.24‘S	10° 35.65‘W	270.5	AGT	in the water
PS77 260-6	20.03.2011	18:44	70° 50.39‘S	10° 35.81‘W	259.5	AGT	on ground
PS77 260-6	20.03.2011	18:55	70° 50.56‘S	10° 36.20‘W	252.5	AGT	profile start
PS77 260-6	20.03.2011	19:05	70° 50.71‘S	10° 36.56‘W	250.5	AGT	profile end
PS77 260-6	20.03.2011	19:34	70° 50.65‘S	10° 36.86‘W	255.7	AGT	on deck
PS77 261-1	20.03.2011	20:46	70° 56.39‘S	10° 28.75‘W	212.5	MOORST	action

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 261-1	20.03.2011	20:47	70° 56.39'S	10° 28.74'W	213.2	MOORST	in the water
PS77 261-1	20.03.2011	20:48	70° 56.39'S	10° 28.73'W	213.5	MOORST	lowering
PS77 261-1	20.03.2011	21:04	70° 56.33'S	10° 28.74'W	208.2	MOORST	on ground/ max depth
PS77 261-1	20.03.2011	21:10	70° 56.32'S	10° 28.72'W	208.5	MOORST	on deck
PS77 261-2	20.03.2011	21:17	70° 56.37'S	10° 28.80'W	210.0	MOORST	in the water
PS77 261-2	20.03.2011	21:17	70° 56.37'S	10° 28.80'W	210.0	MOORST	lowering
PS77 261-2	20.03.2011	21:50	70° 56.37'S	10° 28.79'W	210.2	MOORST	action
PS77 261-2	20.03.2011	21:51	70° 56.38'S	10° 28.80'W	210.0	MOORST	on ground/ max depth
PS77 261-3	20.03.2011	22:05	70° 56.40'S	10° 28.83'W	211.0	BWS	in the water
PS77 261-3	20.03.2011	22:21	70° 56.39'S	10° 28.79'W	210.7	BWS	on ground/ max depth
PS77 261-3	20.03.2011	22:24	70° 56.38'S	10° 28.80'W	210.5	BWS	hoisting
PS77 261-3	20.03.2011	22:32	70° 56.37'S	10° 28.82'W	209.5	BWS	at surface
PS77 261-3	20.03.2011	22:34	70° 56.37'S	10° 28.82'W	209.5	BWS	on deck
PS77 262-1	21.03.2011	01:02	70° 45.66'S	11° 16.42'W	1438.7	CTD/RO	in the water
PS77 262-1	21.03.2011	01:37	70° 45.58'S	11° 16.90'W	1450.5	CTD/RO	max depth
PS77 262-1	21.03.2011	01:39	70° 45.57'S	11° 16.89'W	1450.7	CTD/RO	hoisting
PS77 262-1	21.03.2011	02:13	70° 45.51'S	11° 17.07'W	1458.0	CTD/RO	on deck
PS77 262-2	21.03.2011	02:18	70° 45.48'S	11° 17.14'W	1460.7	MN	in the water
PS77 262-2	21.03.2011	03:15	70° 45.67'S	11° 17.51'W	1455.7	MN	max depth
PS77 262-2	21.03.2011	03:15	70° 45.67'S	11° 17.51'W	1455.7	MN	hoisting
PS77 262-2	21.03.2011	04:00	70° 45.85'S	11° 18.25'W	1464.0	MN	on deck
PS77 262-3	21.03.2011	04:09	70° 45.85'S	11° 18.48'W	1468.5	BONGO	in the water
PS77 262-3	21.03.2011	04:23	70° 45.89'S	11° 18.69'W	1472.5	BONGO	max depth

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 262-3	21.03.2011	04:30	70° 45.90'S	11° 18.74'W	1473.5	BONGO	on deck
PS77 263-1	21.03.2011	06:53	70° 39.90'S	10° 30.23'W	874.7	CTD	in the water
PS77 263-1	21.03.2011	07:17	70° 40.09'S	10° 30.80'W	884.5	CTD	max depth
PS77 263-1	21.03.2011	07:34	70° 40.23'S	10° 31.07'W	879.5	CTD	on deck
PS77 263-2	21.03.2011	07:40	70° 40.43'S	10° 31.27'W	867.7	FLS	action
PS77 263-2	21.03.2011	09:19	70° 49.31'S	10° 16.10'W	344.0	FLS	alter course
PS77 263-2	21.03.2011	10:04	70° 47.44'S	10° 3.47'W	404.0	FLS	alter course
PS77 263-3	21.03.2011	10:06	70° 47.24'S	10° 3.75'W	404.0	BPT	in the water
PS77 263-3	21.03.2011	10:21	70° 46.33'S	10° 5.18'W	393.0	BPT	lowering
PS77 263-3	21.03.2011	10:32	70° 45.43'S	10° 6.47'W	395.0	BPT	max depth
PS77 263-3	21.03.2011	10:33	70° 45.37'S	10° 6.56'W	395.0	BPT	profile start
PS77 263-3	21.03.2011	10:37	70° 45.10'S	10° 6.93'W	388.0	BPT	action
PS77 263-3	21.03.2011	10:48	70° 44.38'S	10° 7.85'W	379.0	BPT	profile end
PS77 263-3	21.03.2011	10:48	70° 44.38'S	10° 7.85'W	379.0	BPT	hoisting
PS77 263-3	21.03.2011	11:11	70° 43.57'S	10° 9.09'W	367.0	BPT	on deck
PS77 263-2	21.03.2011	12:10	70° 38.84'S	10° 15.71'W	0.0	FLS	alter course
PS77 263-2	21.03.2011	12:41	70° 38.89'S	10° 23.79'W	0.0	FLS	information
PS77 263-4	21.03.2011	12:46	70° 39.11'S	10° 24.34'W	0.0	BPT	in the water
PS77 263-4	21.03.2011	13:16	70° 41.28'S	10° 21.10'W	0.0	BPT	information
PS77 263-4	21.03.2011	13:22	70° 41.70'S	10° 20.52'W	288.0	BPT	profile start
PS77 263-4	21.03.2011	13:23	70° 41.75'S	10° 20.45'W	0.0	BPT	information
PS77 263-4	21.03.2011	13:37	70° 42.55'S	10° 19.36'W	296.0	BPT	profile end
PS77 263-4	21.03.2011	13:38	70° 42.60'S	10° 19.28'W	0.0	BPT	hoisting

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 263-4	21.03.2011	13:45	70° 42.83'S	10° 18.91'W	0.0	BPT	surface
PS77 263-4	21.03.2011	13:57	70° 43.13'S	10° 18.25'W	0.0	BPT	on deck
PS77 263-2	21.03.2011	13:58	70° 43.14'S	10° 18.16'W	0.0	FLS	information
PS77 263-2	21.03.2011	14:20	70° 45.01'S	10° 15.70'W	0.0	FLS	alter course
PS77 263-2	21.03.2011	14:32	70° 45.31'S	10° 18.78'W	0.0	FLS	information
PS77 263-5	21.03.2011	14:33	70° 45.25'S	10° 18.85'W	318.0	BPT	in the water
PS77 263-5	21.03.2011	14:47	70° 44.30'S	10° 20.20'W	312.0	BPT	information
PS77 263-5	21.03.2011	15:08	70° 42.79'S	10° 22.60'W	287.0	BPT	profile start
PS77 263-5	21.03.2011	15:38	70° 41.01'S	10° 24.91'W	359.0	BPT	profile end
PS77 263-5	21.03.2011	15:51	70° 40.79'S	10° 24.96'W	0.0	BPT	surface
PS77 263-5	21.03.2011	16:06	70° 40.47'S	10° 24.64'W	380.0	BPT	on deck
PS77 263-2	21.03.2011	16:12	70° 40.24'S	10° 24.63'W	0.0	FLS	information
PS77 263-6	21.03.2011	16:40	70° 38.16'S	10° 25.13'W	0.0	BPT	in the water
PS77 263-6	21.03.2011	16:52	70° 38.44'S	10° 26.94'W	0.0	BPT	in the water
PS77 263-6	21.03.2011	16:53	70° 38.46'S	10° 27.07'W	0.0	BPT	lowering
PS77 263-6	21.03.2011	16:58	70° 38.66'S	10° 28.16'W	0.0	BPT	max depth
PS77 263-6	21.03.2011	16:58	70° 38.66'S	10° 28.16'W	0.0	BPT	profile start
PS77 263-6	21.03.2011	17:24	70° 39.50'S	10° 32.91'W	0.0	BPT	profile end
PS77 263-6	21.03.2011	17:24	70° 39.50'S	10° 32.91'W	0.0	BPT	hoisting
PS77 263-6	21.03.2011	17:30	70° 39.63'S	10° 33.67'W	0.0	BPT	on deck
PS77 263-2	21.03.2011	17:37	70° 39.73'S	10° 34.41'W	1090.0	FLS	profile start
PS77 263-2	21.03.2011	17:39	70° 39.77'S	10° 34.61'W	1090.0	FLS	profile end
PS77 263-6	21.03.2011	17:47	70° 39.77'S	10° 35.64'W	1120.0	BPT	on deck

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 264-1	21.03.2011	21:27	70° 56.73'S	10° 31.31'W	282.0	ROV	in the water
PS77 264-1	21.03.2011	21:58	70° 56.70'S	10° 31.39'W	261.0	ROV	on ground/ max depth
PS77 264-1	21.03.2011	21:58	70° 56.70'S	10° 31.39'W	0.0	ROV	profile start
PS77 264-1	22.03.2011	03:32	70° 56.05'S	10° 32.39'W	0.0	ROV	profile end
PS77 264-1	22.03.2011	03:33	70° 56.05'S	10° 32.39'W	0.0	ROV	hoisting
PS77 264-1	22.03.2011	03:52	70° 56.02'S	10° 32.32'W	0.0	ROV	on deck
PS77 264-1	22.03.2011	03:59	70° 55.97'S	10° 32.25'W	0.0	ROV	on deck
PS77 265-1	22.03.2011	06:09	70° 47.98'S	10° 40.00'W	0.0	CTD/RO	in the water
PS77 265-1	22.03.2011	06:24	70° 47.94'S	10° 40.08'W	0.0	CTD/RO	max depth
PS77 265-1	22.03.2011	06:34	70° 47.90'S	10° 40.24'W	0.0	CTD/RO	on deck
PS77 265-2	22.03.2011	06:57	70° 47.83'S	10° 40.08'W	0.0	AGT	in the water
PS77 265-2	22.03.2011	07:06	70° 47.62'S	10° 40.21'W	0.0	AGT	on ground
PS77 265-2	22.03.2011	07:23	70° 47.34'S	10° 40.39'W	0.0	AGT	profile start
PS77 265-2	22.03.2011	07:35	70° 47.13'S	10° 40.54'W	0.0	AGT	profile end
PS77 265-2	22.03.2011	07:46	70° 47.01'S	10° 40.57'W	0.0	AGT	off ground
PS77 265-2	22.03.2011	08:08	70° 46.88'S	10° 40.89'W	633.5	AGT	at surface
PS77 265-2	22.03.2011	08:09	70° 46.87'S	10° 40.91'W	637.0	AGT	on deck
PS77 265-3	22.03.2011	08:51	70° 48.42'S	10° 39.59'W	445.5	MUC	in the water
PS77 265-3	22.03.2011	09:06	70° 48.38'S	10° 39.72'W	450.7	MUC	on ground
PS77 265-3	22.03.2011	09:06	70° 48.38'S	10° 39.72'W	450.7	MUC	hoisting
PS77 265-3	22.03.2011	09:18	70° 48.36'S	10° 39.84'W	457.5	MUC	at surface
PS77 265-3	22.03.2011	09:22	70° 48.36'S	10° 39.89'W	456.2	MUC	on deck
PS77 266-1	22.03.2011	12:25	70° 45.46'S	11° 17.25'W	0.0	CTD/RO	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 266-1	22.03.2011	13:01	70° 45.54'S	11° 18.11'W	1471.5	CTD/RO	max depth
PS77 266-1	22.03.2011	13:03	70° 45.55'S	11° 18.16'W	1472.0	CTD/RO	hoisting
PS77 266-1	22.03.2011	13:30	70° 45.63'S	11° 18.77'W	1481.5	CTD/RO	on deck
PS77 266-2	22.03.2011	13:53	70° 45.66'S	11° 19.19'W	1488.0	MN	in the water
PS77 266-2	22.03.2011	14:07	70° 45.67'S	11° 19.50'W	1492.5	MN	max depth
PS77 266-2	22.03.2011	14:07	70° 45.67'S	11° 19.50'W	1492.5	MN	hoisting
PS77 266-2	22.03.2011	14:24	70° 45.70'S	11° 19.89'W	1500.2	MN	on deck
PS77 266-3	22.03.2011	14:33	70° 45.69'S	11° 20.01'W	1501.7	MN	in the water
PS77 266-3	22.03.2011	15:19	70° 45.73'S	11° 20.84'W	1519.5	MN	max depth
PS77 266-3	22.03.2011	15:19	70° 45.73'S	11° 20.84'W	1519.5	MN	hoisting
PS77 266-3	22.03.2011	15:57	70° 45.71'S	11° 21.58'W	1534.2	MN	on deck
PS77 266-4	22.03.2011	16:06	70° 45.71'S	11° 21.73'W	1537.5	BONGO	in the water
PS77 266-4	22.03.2011	16:20	70° 45.73'S	11° 22.07'W	1540.2	BONGO	max depth
PS77 266-4	22.03.2011	16:28	70° 45.74'S	11° 22.26'W	1541.7	BONGO	on deck
PS77 266-5	22.03.2011	16:32	70° 45.74'S	11° 22.35'W	1542.7	BONGO	in the water
PS77 266-5	22.03.2011	16:43	70° 45.76'S	11° 22.61'W	1544.5	BONGO	max depth
PS77 266-5	22.03.2011	16:50	70° 45.77'S	11° 22.74'W	1545.2	BONGO	on deck
PS77 267-1	22.03.2011	18:15	70° 51.54'S	11° 2.24'W	409.5	CTD	in the water
PS77 267-1	22.03.2011	18:33	70° 51.59'S	11° 2.21'W	405.7	CTD	max depth
PS77 267-1	22.03.2011	18:47	70° 51.65'S	11° 2.05'W	399.0	CTD	on deck
PS77 267-2	22.03.2011	19:31	70° 55.17'S	10° 49.83'W	0.0	FLS	profile start
PS77 267-3	22.03.2011	19:32	70° 55.12'S	10° 49.96'W	0.0	BPT	in the water
PS77 267-3	22.03.2011	19:45	70° 54.44'S	10° 50.82'W	0.0	BPT	in the water

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 267-3	22.03.2011	19:47	70° 54.34‘S	10° 50.96‘W	0.0	BPT	lowering
PS77 267-3	22.03.2011	20:00	70° 53.39‘S	10° 52.20‘W	0.0	BPT	profile start
PS77 267-3	22.03.2011	20:00	70° 53.39‘S	10° 52.20‘W	0.0	BPT	max depth
PS77 267-3	22.03.2011	20:30	70° 51.59‘S	10° 54.64‘W	0.0	BPT	profile end
PS77 267-3	22.03.2011	20:30	70° 51.59‘S	10° 54.64‘W	0.0	BPT	hoisting
PS77 267-3	22.03.2011	20:52	70° 51.04‘S	10° 55.85‘W	0.0	BPT	on deck
PS77 267-2	22.03.2011	21:33	70° 47.11‘S	11° 0.76‘W	0.0	FLS	alter course
PS77 267-2	22.03.2011	22:18	70° 49.14‘S	11° 10.78‘W	0.0	FLS	alter course
PS77 267-4	22.03.2011	22:18	70° 49.14‘S	11° 10.78‘W	0.0	BPT	in the water
PS77 267-4	22.03.2011	22:36	70° 50.21‘S	11° 9.42‘W	848.0	BPT	profile start
PS77 267-4	22.03.2011	22:36	70° 50.21‘S	11° 9.42‘W	0.0	BPT	max depth
PS77 267-4	22.03.2011	22:51	70° 51.09‘S	11° 8.18‘W	0.0	BPT	profile end
PS77 267-4	22.03.2011	22:51	70° 51.09‘S	11° 8.18‘W	0.0	BPT	hoisting
PS77 267-4	22.03.2011	23:09	70° 51.74‘S	11° 8.04‘W	0.0	BPT	on deck
PS77 267-5	22.03.2011	23:35	70° 52.27‘S	11° 7.91‘W	0.0	BPT	in the water
PS77 267-5	22.03.2011	23:53	70° 53.15‘S	11° 5.65‘W	319.0	BPT	max depth
PS77 267-5	22.03.2011	23:54	70° 53.20‘S	11° 5.54‘W	0.0	BPT	profile start
PS77 267-5	23.03.2011	01:00	70° 57.28‘S	10° 59.87‘W	337.0	BPT	profile end
PS77 267-5	23.03.2011	01:00	70° 57.28‘S	10° 59.87‘W	0.0	BPT	hoisting
PS77 267-5	23.03.2011	01:08	70° 57.53‘S	10° 59.65‘W	0.0	BPT	information
PS77 267-2	23.03.2011	01:21	70° 57.98‘S	10° 59.52‘W	0.0	FLS	information
PS77 267-5	23.03.2011	01:21	70° 57.98‘S	10° 59.52‘W	0.0	BPT	on deck
PS77 267-2	23.03.2011	01:57	70° 59.55‘S	11° 8.47‘W	0.0	FLS	alter course

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 267-2	23.03.2011	01:57	70° 59.55'S	11° 8.47'W	0.0	FLS	information
PS77 267-6	23.03.2011	01:58	70° 59.50'S	11° 8.63'W	0.0	BPT	in the water
PS77 267-6	23.03.2011	02:14	70° 58.71'S	11° 9.75'W	0.0	BPT	information
PS77 267-6	23.03.2011	02:24	70° 58.08'S	11° 10.79'W	371.0	BPT	profile start
PS77 267-6	23.03.2011	02:30	70° 57.79'S	11° 11.36'W	0.0	BPT	lowering
PS77 267-6	23.03.2011	03:03	70° 56.13'S	11° 14.05'W	329.0	BPT	profile end
PS77 267-6	23.03.2011	03:03	70° 56.13'S	11° 14.05'W	0.0	BPT	hoisting
PS77 267-6	23.03.2011	03:18	70° 55.79'S	11° 14.79'W	0.0	BPT	information
PS77 267-2	23.03.2011	03:28	70° 55.55'S	11° 15.48'W	0.0	FLS	information
PS77 267-6	23.03.2011	03:28	70° 55.55'S	11° 15.48'W	0.0	BPT	on deck
PS77 267-2	23.03.2011	04:10	70° 51.67'S	11° 20.27'W	0.0	FLS	information
PS77 267-7	23.03.2011	04:20	70° 51.41'S	11° 22.84'W	0.0	BPT	in the water
PS77 267-7	23.03.2011	04:32	70° 51.88'S	11° 24.70'W	0.0	BPT	in the water
PS77 267-7	23.03.2011	04:33	70° 51.92'S	11° 24.85'W	0.0	BPT	lowering
PS77 267-7	23.03.2011	04:37	70° 52.13'S	11° 25.67'W	1270.0	BPT	max depth
PS77 267-7	23.03.2011	04:43	70° 52.39'S	11° 26.72'W	1260.0	BPT	profile start
PS77 267-7	23.03.2011	04:58	70° 53.02'S	11° 29.25'W	1210.0	BPT	profile end
PS77 267-7	23.03.2011	04:58	70° 53.02'S	11° 29.25'W	0.0	BPT	hoisting
PS77 267-7	23.03.2011	05:04	70° 53.17'S	11° 29.86'W	0.0	BPT	surface
PS77 267-2	23.03.2011	05:16	70° 53.38'S	11° 30.76'W	0.0	FLS	alter course
PS77 267-7	23.03.2011	05:16	70° 53.38'S	11° 30.76'W	1170.0	BPT	on deck
PS77 267-2	23.03.2011	06:47	71° 2.09'S	11° 18.99'W	500.0	FLS	profile end
PS77 268-1	23.03.2011	08:52	70° 46.26'S	11° 18.29'W	1464.7	CTD	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 268-1	23.03.2011	09:28	70° 46.32'S	11° 19.34'W	1476.7	CTD	max depth
PS77 268-1	23.03.2011	09:30	70° 46.33'S	11° 19.41'W	1477.5	CTD	hoisting
PS77 268-1	23.03.2011	09:57	70° 46.47'S	11° 20.48'W	1492.0	CTD	at surface
PS77 268-1	23.03.2011	09:58	70° 46.48'S	11° 20.52'W	1492.2	CTD	on deck
PS77 268-2	23.03.2011	10:11	70° 46.58'S	11° 21.03'W	1497.7	MN	in the water
PS77 268-2	23.03.2011	10:54	70° 46.81'S	11° 22.40'W	1516.7	MN	max depth
PS77 268-2	23.03.2011	11:36	70° 46.94'S	11° 23.14'W	1529.7	MN	at surface
PS77 268-2	23.03.2011	11:38	70° 46.95'S	11° 23.23'W	1533.2	MN	on deck
PS77 268-3	23.03.2011	11:42	70° 46.98'S	11° 23.42'W	1540.7	MN	in the water
PS77 268-3	23.03.2011	11:44	70° 46.98'S	11° 23.50'W	1540.7	MN	at surface
PS77 268-3	23.03.2011	11:50	70° 47.02'S	11° 23.85'W	1538.0	MN	in the water
PS77 268-3	23.03.2011	11:54	70° 47.04'S	11° 23.96'W	1538.0	MN	max depth
PS77 268-3	23.03.2011	11:59	70° 47.06'S	11° 24.05'W	1538.2	MN	at surface
PS77 268-3	23.03.2011	12:01	70° 47.07'S	11° 24.16'W	1539.5	MN	on deck
PS77 269-1	23.03.2011	18:05	71° 25.65'S	12° 37.76'W	0.0	CTD	in the water
PS77 269-1	23.03.2011	18:23	71° 25.66'S	12° 38.23'W	510.0	CTD	max depth
PS77 269-1	23.03.2011	18:34	71° 25.69'S	12° 38.46'W	0.0	CTD	on deck
PS77 269-2	23.03.2011	18:38	71° 25.72'S	12° 38.59'W	0.0	FLS	profile start
PS77 269-3	23.03.2011	18:43	71° 25.44'S	12° 38.71'W	0.0	BPT	in the water
PS77 269-3	23.03.2011	18:52	71° 24.91'S	12° 39.02'W	0.0	BPT	in the water
PS77 269-3	23.03.2011	18:52	71° 24.91'S	12° 39.02'W	0.0	BPT	lowering
PS77 269-3	23.03.2011	19:02	71° 24.12'S	12° 39.43'W	0.0	BPT	max depth
PS77 269-3	23.03.2011	19:04	71° 24.01'S	12° 39.47'W	488.0	BPT	profile start

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 269-3	23.03.2011	19:31	71° 22.38'S	12° 40.24'W	461.0	BPT	profile end
PS77 269-3	23.03.2011	19:31	71° 22.38'S	12° 40.24'W	0.0	BPT	hoisting
PS77 269-3	23.03.2011	19:43	71° 22.13'S	12° 41.18'W	0.0	BPT	surface
PS77 269-3	23.03.2011	19:54	71° 22.10'S	12° 42.49'W	426.0	BPT	on deck
PS77 269-4	23.03.2011	20:24	71° 21.38'S	12° 42.02'W	0.0	BPT	in the water
PS77 269-4	23.03.2011	20:26	71° 21.30'S	12° 41.87'W	0.0	BPT	lowering
PS77 269-4	23.03.2011	20:39	71° 20.49'S	12° 40.16'W	448.0	BPT	max depth
PS77 269-4	23.03.2011	20:40	71° 20.45'S	12° 40.10'W	448.0	BPT	profile start
PS77 269-4	23.03.2011	21:17	71° 18.37'S	12° 38.67'W	451.0	BPT	profile end
PS77 269-4	23.03.2011	21:18	71° 18.31'S	12° 38.67'W	0.0	BPT	hoisting
PS77 269-4	23.03.2011	21:50	71° 18.04'S	12° 41.34'W	0.0	BPT	on deck
PS77 269-5	23.03.2011	22:31	71° 17.14'S	12° 48.21'W	0.0	BPT	action
PS77 269-5	23.03.2011	22:41	71° 17.00'S	12° 46.78'W	0.0	BPT	in the water
PS77 269-5	23.03.2011	22:55	71° 17.33'S	12° 45.40'W	0.0	BPT	lowering
PS77 269-5	23.03.2011	23:14	71° 18.88'S	12° 44.35'W	400.0	BPT	max depth
PS77 269-5	23.03.2011	23:22	71° 19.41'S	12° 44.09'W	0.0	BPT	profile start
PS77 269-5	23.03.2011	23:42	71° 20.55'S	12° 43.46'W	0.0	BPT	profile end
PS77 269-5	23.03.2011	23:42	71° 20.55'S	12° 43.46'W	0.0	BPT	hoisting
PS77 269-5	24.03.2011	00:14	71° 21.58'S	12° 45.06'W	0.0	BPT	on deck
PS77 269-6	24.03.2011	01:40	71° 26.52'S	12° 35.49'W	562.0	BPT	in the water
PS77 269-6	24.03.2011	02:00	71° 25.48'S	12° 33.74'W	0.0	BPT	information
PS77 269-6	24.03.2011	02:08	71° 24.77'S	12° 33.82'W	509.0	BPT	max depth
PS77 269-6	24.03.2011	02:08	71° 24.77'S	12° 33.82'W	0.0	BPT	profile start

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 269-6	24.03.2011	02:19	71° 24.05‘S	12° 34.00‘W	0.0	BPT	lowering
PS77 269-6	24.03.2011	02:25	71° 23.65‘S	12° 34.02‘W	490.0	BPT	lowering
PS77 269-6	24.03.2011	02:35	71° 23.02‘S	12° 34.16‘W	480.0	BPT	profile end
PS77 269-6	24.03.2011	02:35	71° 23.02‘S	12° 34.16‘W	0.0	BPT	hoisting
PS77 269-6	24.03.2011	02:52	71° 22.76‘S	12° 35.43‘W	0.0	BPT	surface
PS77 269-6	24.03.2011	03:06	71° 22.79‘S	12° 37.15‘W	0.0	BPT	on deck
PS77 269-2	24.03.2011	03:09	71° 22.68‘S	12° 37.30‘W	0.0	FLS	profile end
PS77 PS77 270-1	24.03.2011	11:32	71° 25.94‘S	12° 35.45‘W	526.0	MN	in the water
PS77 270-1	24.03.2011	11:54	71° 25.71‘S	12° 35.86‘W	528.0	MN	max depth
PS77 270-1	24.03.2011	11:55	71° 25.70‘S	12° 35.89‘W	0.0	MN	hoisting
PS77 270-1	24.03.2011	12:14	71° 25.57‘S	12° 36.49‘W	0.0	MN	on deck
PS77 271-1	24.03.2011	13:21	71° 18.39‘S	12° 44.87‘W	360.0	MN	in the water
PS77 271-1	24.03.2011	13:35	71° 18.43‘S	12° 45.24‘W	355.7	MN	max depth
PS77 271-1	24.03.2011	13:35	71° 18.43‘S	12° 45.24‘W	0.0	MN	hoisting
PS77 271-1	24.03.2011	13:50	71° 18.48‘S	12° 45.62‘W	353.2	MN	on deck
PS77 272-1	24.03.2011	18:06	71° 7.45‘S	11° 28.29‘W	106.2	ROV	in the water
PS77 272-1	24.03.2011	18:08	71° 7.46‘S	11° 28.35‘W	109.5	ROV	action
PS77 272-1	24.03.2011	18:19	71° 7.50‘S	11° 28.48‘W	115.0	ROV	action
PS77 272-1	24.03.2011	18:19	71° 7.50‘S	11° 28.48‘W	115.0	ROV	profile start
PS77 272-1	25.03.2011	00:20	71° 7.32‘S	11° 27.43‘W	118.2	ROV	information
PS77 272-1	25.03.2011	00:20	71° 7.32‘S	11° 27.43‘W	118.2	ROV	profile end
PS77 272-1	25.03.2011	00:42	71° 7.34‘S	11° 27.24‘W	132.0	ROV	at surface
PS77 272-1	25.03.2011	00:50	71° 7.37‘S	11° 27.25‘W	125.0	ROV	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 272-2	25.03.2011	01:20	71° 7.49‘S	11° 28.51‘W	114.5	BWS	in the water
PS77 272-2	25.03.2011	01:28	71° 7.49‘S	11° 28.49‘W	114.5	BWS	on ground/ max depth
PS77 272-2	25.03.2011	01:33	71° 7.49‘S	11° 28.48‘W	114.5	BWS	hoisting
PS77 272-2	25.03.2011	01:40	71° 7.49‘S	11° 28.53‘W	115.2	BWS	on deck
PS77 272-3	25.03.2011	01:54	71° 7.49‘S	11° 28.51‘W	114.7	BWS	in the water
PS77 272-3	25.03.2011	02:01	71° 7.50‘S	11° 28.51‘W	114.7	BWS	on ground/ max depth
PS77 272-3	25.03.2011	02:06	71° 7.50‘S	11° 28.50‘W	114.5	BWS	hoisting
PS77 272-3	25.03.2011	02:13	71° 7.50‘S	11° 28.50‘W	114.2	BWS	on deck
PS77 273-1	25.03.2011	06:12	70° 46.23‘S	11° 15.81‘W	1406.7	TRAPF	hydrophone into the water
PS77 273-1	25.03.2011	06:15	70° 46.25‘S	11° 15.88‘W	1407.7	TRAPF	released
PS77 273-1	25.03.2011	07:06	70° 46.22‘S	11° 16.11‘W	1412.7	TRAPF	hydrophone into the water
PS77 273-1	25.03.2011	08:28	70° 46.70‘S	11° 18.62‘W	1449.2	TRAPF	Released
PS77 273-1	25.03.2011	08:28	70° 46.70‘S	11° 18.62‘W	1449.2	TRAPF	trab recovery failed
PS77 274-1	25.03.2011	11:51	70° 56.23‘S	10° 33.00‘W	312.2	CTD	in the water
PS77 274-1	25.03.2011	12:06	70° 56.23‘S	10° 33.31‘W	318.0	CTD	max depth
PS77 274-1	25.03.2011	12:14	70° 56.26‘S	10° 33.52‘W	322.7	CTD	on deck
PS77 274-2	25.03.2011	12:16	70° 56.27‘S	10° 33.61‘W	322.7	MUC	in the water
PS77 274-2	25.03.2011	12:32	70° 56.35‘S	10° 34.00‘W	331.2	MUC	on ground
PS77 274-2	25.03.2011	12:42	70° 56.39‘S	10° 34.18‘W	330.5	MUC	on deck
PS77 274-3	25.03.2011	12:56	70° 56.49‘S	10° 34.52‘W	332.2	MG	in the water
PS77 274-3	25.03.2011	13:08	70° 56.54‘S	10° 34.42‘W	332.0	MG	information
PS77 274-3	25.03.2011	13:24	70° 56.57‘S	10° 34.27‘W	332.5	MG	on ground
PS77 274-3	25.03.2011	13:24	70° 56.57‘S	10° 34.27‘W	332.5	MG	hoisting

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 274-3	25.03.2011	13:42	70° 56.61'S	10° 34.28'W	333.7	MG	on deck
PS77 275-1	25.03.2011	14:06	70° 56.54'S	10° 32.08'W	303.5	MG	in the water
PS77 275-1	25.03.2011	14:45	70° 56.42'S	10° 31.62'W	284.7	MG	on ground
PS77 275-1	25.03.2011	14:45	70° 56.42'S	10° 31.62'W	284.7	MG	hoisting
PS77 275-1	25.03.2011	15:01	70° 56.36'S	10° 31.62'W	284.5	MG	on deck
PS77 275-2	25.03.2011	15:22	70° 56.37'S	10° 29.09'W	216.7	LANDER	action
PS77 275-2	25.03.2011	15:36	70° 56.29'S	10° 29.37'W	1528.0	LANDER	information
PS77 275-2	25.03.2011	15:40	70° 56.31'S	10° 29.41'W	1225.7	LANDER	in the water
PS77 275-2	25.03.2011	15:42	70° 56.32'S	10° 29.41'W	1468.7	LANDER	action
PS77 275-2	25.03.2011	15:43	70° 56.32'S	10° 29.42'W	1573.0	LANDER	information
PS77 275-2	25.03.2011	16:05	70° 56.41'S	10° 29.35'W	226.5	LANDER	information
PS77 275-2	25.03.2011	16:15	70° 56.39'S	10° 29.62'W	235.7	LANDER	on deck
PS77 275-2	25.03.2011	16:16	70° 56.39'S	10° 29.66'W	235.7	LANDER	information
PS77 275-2	25.03.2011	16:21	70° 56.39'S	10° 29.76'W	243.0	LANDER	information
PS77 275-2	25.03.2011	16:24	70° 56.39'S	10° 29.80'W	243.0	LANDER	action
PS77 275-2	25.03.2011	16:42	70° 56.40'S	10° 29.24'W	223.2	LANDER	information
PS77 275-2	25.03.2011	16:47	70° 56.44'S	10° 29.38'W	225.5	LANDER	on ground/ max depth
PS77 275-2	25.03.2011	16:48	70° 56.45'S	10° 29.41'W	227.5	LANDER	on deck
PS77 275-3	25.03.2011	17:12	70° 56.05'S	10° 30.05'W	243.5	AGT	in the water
PS77 275-3	25.03.2011	17:15	70° 56.04'S	10° 29.79'W	238.2	AGT	on ground
PS77 275-3	25.03.2011	17:23	70° 56.01'S	10° 29.28'W	225.5	AGT	profile start
PS77 275-3	25.03.2011	17:33	70° 56.01'S	10° 28.72'W	218.7	AGT	profile end
PS77 275-3	25.03.2011	17:42	70° 56.04'S	10° 28.62'W	212.5	AGT	off ground

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 275-3	25.03.2011	17:55	70° 56.10'S	10° 28.67'W	211.7	AGT	on deck
PS77 275-4	25.03.2011	18:45	70° 56.13'S	10° 29.63'W	235.0	ROV	in the water
PS77 275-4	25.03.2011	18:47	70° 56.14'S	10° 29.62'W	235.0	ROV	information
PS77 275-4	25.03.2011	18:55	70° 56.16'S	10° 29.58'W	234.0	ROV	information
PS77 275-4	25.03.2011	19:16	70° 56.13'S	10° 29.62'W	234.7	ROV	on ground/ max depth
PS77 275-4	25.03.2011	19:16	70° 56.13'S	10° 29.62'W	234.7	ROV	profile start
PS77 275-4	25.03.2011	23:45	70° 55.88'S	10° 28.80'W	218.7	ROV	hoisting
PS77 275-4	25.03.2011	23:45	70° 55.88'S	10° 28.80'W	218.7	ROV	profile end
PS77 275-4	25.03.2011	23:56	70° 55.90'S	10° 28.76'W	219.0	ROV	at surface
PS77 275-4	26.03.2011	00:02	70° 55.87'S	10° 28.69'W	217.7	ROV	on deck
PS77 275-4	26.03.2011	00:05	70° 55.86'S	10° 28.67'W	217.7	ROV	on deck
PS77 276-1	27.03.2011	09:10	70° 56.51'S	10° 31.45'W	277.2	CTD	in the water
PS77 276-1	27.03.2011	09:24	70° 56.52'S	10° 31.45'W	277.5	CTD	max depth
PS77 276-1	27.03.2011	09:27	70° 56.51'S	10° 31.40'W	278.0	CTD	hoisting
PS77 276-1	27.03.2011	09:37	70° 56.52'S	10° 31.26'W	279.5	CTD	at surface
PS77 276-1	27.03.2011	09:38	70° 56.52'S	10° 31.24'W	279.5	CTD	on deck
PS77 276-2	27.03.2011	09:50	70° 56.49'S	10° 31.04'W	275.7	MN	in the water
PS77 276-2	27.03.2011	10:01	70° 56.50'S	10° 30.99'W	274.2	MN	max depth
PS77 276-2	27.03.2011	10:01	70° 56.50'S	10° 30.99'W	274.2	MN	hoisting
PS77 276-2	27.03.2011	10:13	70° 56.47'S	10° 30.89'W	267.5	MN	at surface
PS77 276-2	27.03.2011	10:15	70° 56.46'S	10° 30.87'W	267.7	MN	on deck
PS77 276-3	27.03.2011	10:33	70° 56.60'S	10° 32.17'W	308.5	MUC	in the water
PS77 276-3	27.03.2011	10:45	70° 56.60'S	10° 32.07'W	297.0	MUC	on ground

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 276-3	27.03.2011	10:46	70° 56.60'S	10° 32.06'W	304.2	MUC	hoisting
PS77 276-3	27.03.2011	10:54	70° 56.58'S	10° 32.04'W	302.5	MUC	at surface
PS77 276-3	27.03.2011	10:56	70° 56.57'S	10° 32.02'W	302.5	MUC	on deck
PS77 276-4	27.03.2011	11:25	70° 56.61'S	10° 32.17'W	308.5	MUC	in the water
PS77 276-4	27.03.2011	11:36	70° 56.60'S	10° 32.06'W	303.7	MUC	on ground
PS77 276-4	27.03.2011	11:36	70° 56.60'S	10° 32.06'W	303.7	MUC	hoisting
PS77 276-4	27.03.2011	11:47	70° 56.56'S	10° 32.11'W	304.2	MUC	at surface
PS77 276-4	27.03.2011	11:50	70° 56.56'S	10° 32.11'W	305.0	MUC	on deck
PS77 276-5	27.03.2011	12:14	70° 56.58'S	10° 32.03'W	304.0	MUC	in the water
PS77 276-5	27.03.2011	12:24	70° 56.59'S	10° 32.00'W	302.7	MUC	on ground
PS77 276-5	27.03.2011	12:24	70° 56.59'S	10° 32.00'W	302.7	MUC	hoisting
PS77 276-5	27.03.2011	12:38	70° 56.58'S	10° 31.94'W	300.5	MUC	on deck
PS77 277-1	27.03.2011	14:49	70° 46.06'S	11° 16.88'W	0.0	CTD/RO	in the water
PS77 277-1	27.03.2011	15:22	70° 46.16'S	11° 17.99'W	1454.7	CTD/RO	max depth
PS77 277-1	27.03.2011	15:23	70° 46.16'S	11° 18.02'W	1455.0	CTD/RO	hoisting
PS77 277-1	27.03.2011	15:52	70° 46.22'S	11° 18.91'W	1475.7	CTD/RO	on deck
PS77 277-2	27.03.2011	16:07	70° 46.29'S	11° 19.38'W	1478.5	MN	in the water
PS77 277-2	27.03.2011	16:48	70° 46.46'S	11° 20.84'W	1497.7	MN	max depth
PS77 277-2	27.03.2011	17:38	70° 46.71'S	11° 22.39'W	1518.2	MN	on deck
PS77 277-3	27.03.2011	17:57	70° 46.82'S	11° 22.87'W	1522.5	BONGO	in the water
PS77 277-3	27.03.2011	18:52	70° 47.15'S	11° 24.44'W	1541.2	BONGO	max depth
PS77 277-3	27.03.2011	19:29	70° 47.36'S	11° 25.38'W	1557.5	BONGO	on deck
PS77 277-4	27.03.2011	19:33	70° 47.38'S	11° 25.50'W	1560.5	BONGO	action

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 277-4	27.03.2011	19:54	70° 47.49‘S	11° 26.03‘W	1566.5	BONGO	max depth
PS77 277-4	27.03.2011	19:54	70° 47.49‘S	11° 26.03‘W	1566.5	BONGO	hoisting
PS77 277-4	27.03.2011	20:07	70° 47.55‘S	11° 26.26‘W	1565.0	BONGO	on deck
PS77 277-5	27.03.2011	20:10	70° 47.57‘S	11° 26.30‘W	1564.7	BONGO	in the water
PS77 277-5	27.03.2011	20:22	70° 47.63‘S	11° 26.54‘W	1565.2	BONGO	max depth
PS77 277-5	27.03.2011	20:23	70° 47.63‘S	11° 26.57‘W	1565.5	BONGO	hoisting
PS77 277-5	27.03.2011	20:31	70° 47.68‘S	11° 26.82‘W	1567.2	BONGO	on deck
PS77 278-1	28.03.2011	00:08	70° 54.61‘S	10° 19.47‘W	220.0	ROV	in the water
PS77 278-1	28.03.2011	00:14	70° 54.60‘S	10° 19.46‘W	220.2	ROV	in the water
PS77 278-1	28.03.2011	00:20	70° 54.59‘S	10° 19.39‘W	220.0	ROV	action
PS77 278-1	28.03.2011	00:37	70° 54.59‘S	10° 19.32‘W	220.2	ROV	on ground/ max depth
PS77 278-1	28.03.2011	00:38	70° 54.59‘S	10° 19.32‘W	220.0	ROV	profile start
PS77 278-1	28.03.2011	04:23	70° 54.98‘S	10° 18.83‘W	191.7	ROV	hoisting
PS77 278-1	28.03.2011	04:24	70° 54.98‘S	10° 18.83‘W	191.5	ROV	profile end
PS77 278-1	28.03.2011	04:44	70° 55.00‘S	10° 18.65‘W	189.5	ROV	on deck
PS77 278-2	28.03.2011	04:59	70° 55.00‘S	10° 18.64‘W	189.2	BWS	in the water
PS77 278-2	28.03.2011	05:11	70° 55.00‘S	10° 18.64‘W	189.2	BWS	on ground/ max depth
PS77 278-2	28.03.2011	05:14	70° 55.01‘S	10° 18.64‘W	188.7	BWS	hoisting
PS77 278-2	28.03.2011	05:23	70° 55.01‘S	10° 18.63‘W	0.0	BWS	on deck
PS77 278-3	28.03.2011	05:30	70° 54.98‘S	10° 18.64‘W	0.0	HS_PS	profile start
PS77 278-3	28.03.2011	05:53	70° 56.23‘S	10° 17.89‘W	178.0	HS_PS	alter course
PS77 278-3	28.03.2011	06:45	70° 58.94‘S	10° 26.28‘W	137.0	HS_PS	action
PS77 278-3	28.03.2011	07:20	70° 59.23‘S	10° 26.82‘W	154.7	HS_PS	alter course

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 278-3	28.03.2011	07:49	70° 56.44'S	10° 29.97'W	246.2	HS_PS	profile end
PS77 279-1	28.03.2011	08:03	70° 56.25'S	10° 30.24'W	248.5	CTD	in the water
PS77 279-1	28.03.2011	08:15	70° 56.24'S	10° 30.10'W	246.2	CTD	max depth
PS77 279-1	28.03.2011	08:17	70° 56.24'S	10° 30.08'W	246.0	CTD	hoisting
PS77 279-1	28.03.2011	08:26	70° 56.22'S	10° 29.98'W	243.7	CTD	at surface
PS77 279-1	28.03.2011	08:27	70° 56.21'S	10° 29.97'W	241.7	CTD	on deck
PS77 279-2	28.03.2011	08:42	70° 56.18'S	10° 29.86'W	238.2	MN	in the water
PS77 279-2	28.03.2011	08:52	70° 56.16'S	10° 29.80'W	236.5	MN	max depth
PS77 279-2	28.03.2011	09:00	70° 56.15'S	10° 29.78'W	237.5	MN	at surface
PS77 279-2	28.03.2011	09:01	70° 56.15'S	10° 29.78'W	237.0	MN	on deck
PS77 279-3	28.03.2011	09:21	70° 56.11'S	10° 29.78'W	238.0	MG	in the water
PS77 279-3	28.03.2011	09:24	70° 56.10'S	10° 29.79'W	238.7	MG	action
PS77 279-3	28.03.2011	09:37	70° 56.27'S	10° 30.31'W	250.0	MG	in the water
PS77 279-3	28.03.2011	09:41	70° 56.26'S	10° 30.32'W	249.7	MG	lowering
PS77 279-3	28.03.2011	09:50	70° 56.24'S	10° 30.32'W	249.0	MG	on ground
PS77 279-3	28.03.2011	10:08	70° 56.22'S	10° 30.33'W	248.5	MG	on ground
PS77 279-3	28.03.2011	10:09	70° 56.22'S	10° 30.33'W	248.7	MG	off ground
PS77 279-3	28.03.2011	10:19	70° 56.18'S	10° 30.40'W	250.5	MG	at surface
PS77 279-3	28.03.2011	10:24	70° 56.18'S	10° 30.37'W	251.5	MG	on deck
PS77 279-4	28.03.2011	10:50	70° 56.23'S	10° 30.20'W	248.0	MUC	in the water
PS77 279-4	28.03.2011	10:58	70° 56.23'S	10° 30.18'W	248.5	MUC	on ground
PS77 279-4	28.03.2011	10:58	70° 56.23'S	10° 30.18'W	248.5	MUC	off ground
PS77 279-4	28.03.2011	11:05	70° 56.25'S	10° 30.18'W	248.5	MUC	at surface

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 279-4	28.03.2011	11:08	70° 56.24'S	10° 30.16'W	247.7	MUC	on deck
PS77 280-1	28.03.2011	12:00	70° 56.49'S	10° 31.80'W	291.2	MG	in the water
PS77 280-1	28.03.2011	12:14	70° 56.56'S	10° 31.93'W	298.2	MG	on ground
PS77 280-1	28.03.2011	12:39	70° 56.63'S	10° 32.08'W	306.7	MG	on ground
PS77 280-1	28.03.2011	12:39	70° 56.63'S	10° 32.08'W	306.7	MG	hoisting
PS77 280-1	28.03.2011	12:53	70° 56.62'S	10° 31.98'W	301.2	MG	at surface
PS77 280-1	28.03.2011	12:57	70° 56.57'S	10° 32.02'W	303.7	MG	on deck
PS77 280-2	28.03.2011	13:16	70° 56.13'S	10° 33.12'W	312.7	RD	in the water
PS77 280-2	28.03.2011	13:30	70° 56.23'S	10° 32.92'W	312.5	RD	on ground
PS77 280-2	28.03.2011	13:35	70° 56.28'S	10° 32.81'W	312.7	RD	profile start
PS77 280-2	28.03.2011	13:45	70° 56.35'S	10° 32.63'W	310.5	RD	profile end
PS77 280-2	28.03.2011	13:46	70° 56.35'S	10° 32.62'W	311.0	RD	hoisting
PS77 280-2	28.03.2011	13:52	70° 56.36'S	10° 32.62'W	311.0	RD	information
PS77 280-2	28.03.2011	14:02	70° 56.36'S	10° 32.66'W	310.7	RD	on deck
PS77 281-1	28.03.2011	15:50	70° 47.54'S	10° 29.56'W	274.2	BT	in the water
PS77 281-1	28.03.2011	15:56	70° 47.85'S	10° 30.29'W	272.5	BT	in the water
PS77 281-1	28.03.2011	16:10	70° 48.83'S	10° 32.52'W	280.2	BT	on ground
PS77 281-1	28.03.2011	16:12	70° 48.93'S	10° 32.69'W	282.7	BT	profile start
PS77 281-1	28.03.2011	16:22	70° 49.46'S	10° 33.66'W	283.2	BT	profile end
PS77 281-1	28.03.2011	16:23	70° 49.52'S	10° 33.75'W	285.7	BT	hoisting
PS77 281-1	28.03.2011	16:26	70° 49.61'S	10° 33.90'W	288.5	BT	off ground
PS77 281-1	28.03.2011	16:39	70° 50.05'S	10° 34.52'W	278.7	BT	surface
PS77 281-1	28.03.2011	16:45	70° 50.25'S	10° 34.68'W	274.2	BT	on deck

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 282-1	28.03.2011	19:23	70° 58.80‘S	10° 27.78‘W	190.7	LANDER	in the water
PS77 282-1	28.03.2011	19:27	70° 58.80‘S	10° 27.79‘W	190.7	LANDER	lowering
PS77 282-1	28.03.2011	19:35	70° 58.79‘S	10° 27.83‘W	192.2	LANDER	on ground/ max depth
PS77 282-1	28.03.2011	19:35	70° 58.79‘S	10° 27.83‘W	192.2	LANDER	hoisting
PS77 282-1	28.03.2011	19:38	70° 58.80‘S	10° 27.83‘W	190.7	LANDER	on deck
PS77 282-2	28.03.2011	19:48	70° 58.66‘S	10° 27.70‘W	212.2	LANDER	in the water
PS77 282-2	28.03.2011	20:15	70° 58.64‘S	10° 27.66‘W	212.7	LANDER	action
PS77 282-2	28.03.2011	20:16	70° 58.64‘S	10° 27.66‘W	212.7	LANDER	in the water
PS77 282-2	28.03.2011	20:16	70° 58.64‘S	10° 27.66‘W	212.7	LANDER	on ground/ max depth
PS77 282-3	28.03.2011	20:22	70° 58.60‘S	10° 27.57‘W	214.0	HS_PS	profile start
PS77 282-3	28.03.2011	20:48	70° 57.71‘S	10° 28.94‘W	266.7	HS_PS	alter course
PS77 282-3	28.03.2011	21:12	70° 55.91‘S	10° 33.51‘W	314.2	HS_PS	alter course
PS77 282-3	28.03.2011	21:47	70° 58.84‘S	10° 29.16‘W	220.2	HS_PS	alter course
PS77 282-3	28.03.2011	22:06	70° 57.30‘S	10° 31.31‘W	288.0	HS_PS	alter course
PS77 282-3	28.03.2011	22:20	70° 56.11‘S	10° 34.40‘W	324.7	HS_PS	alter course
PS77 282-3	28.03.2011	22:38	70° 57.56‘S	10° 31.49‘W	305.2	HS_PS	alter course
PS77 282-3	28.03.2011	23:08	70° 57.37‘S	10° 33.26‘W	338.7	HS_PS	alter course
PS77 282-3	28.03.2011	23:09	70° 57.40‘S	10° 33.51‘W	345.2	HS_PS	alter course
PS77 282-3	29.03.2011	00:10	70° 55.74‘S	10° 32.82‘W	303.2	HS_PS	profile end
PS77 283-1	29.03.2011	08:05	70° 57.99‘S	10° 30.32‘W	284.7	CTD	in the water
PS77 283-1	29.03.2011	08:19	70° 58.00‘S	10° 30.28‘W	285.7	CTD	max depth
PS77 283-1	29.03.2011	08:21	70° 58.00‘S	10° 30.25‘W	285.7	CTD	hoisting
PS77 283-1	29.03.2011	08:31	70° 58.00‘S	10° 30.21‘W	284.5	CTD	at surface

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 283-1	29.03.2011	08:32	70° 58.00‘S	10° 30.20‘W	284.7	CTD	on deck
PS77 283-2	29.03.2011	08:48	70° 57.99‘S	10° 30.24‘W	285.2	MN	in the water
PS77 283-2	29.03.2011	08:59	70° 58.00‘S	10° 30.17‘W	287.0	MN	max depth
PS77 283-2	29.03.2011	08:59	70° 58.00‘S	10° 30.17‘W	287.0	MN	hoisting
PS77 283-2	29.03.2011	09:08	70° 58.00‘S	10° 30.17‘W	286.2	MN	at surface
PS77 283-2	29.03.2011	09:09	70° 58.00‘S	10° 30.16‘W	286.2	MN	on deck
PS77 283-3	29.03.2011	09:33	70° 57.96‘S	10° 30.29‘W	284.0	MG	in the water
PS77 283-3	29.03.2011	09:58	70° 58.02‘S	10° 30.37‘W	284.5	MG	on ground
PS77 283-3	29.03.2011	09:59	70° 58.02‘S	10° 30.37‘W	284.2	MG	hoisting
PS77 283-3	29.03.2011	10:08	70° 58.02‘S	10° 30.36‘W	284.7	MG	at surface
PS77 283-3	29.03.2011	10:13	70° 58.02‘S	10° 30.36‘W	284.7	MG	on deck
PS77 283-4	29.03.2011	10:27	70° 58.00‘S	10° 30.26‘W	285.7	MUC	in the water
PS77 283-4	29.03.2011	10:34	70° 57.99‘S	10° 30.23‘W	285.2	MUC	on ground
PS77 283-4	29.03.2011	10:34	70° 57.99‘S	10° 30.23‘W	285.2	MUC	hoisting
PS77 283-4	29.03.2011	10:43	70° 58.00‘S	10° 30.19‘W	285.5	MUC	at surface
PS77 283-4	29.03.2011	10:46	70° 57.99‘S	10° 30.19‘W	284.2	MUC	on deck
PS77 283-5	29.03.2011	11:10	70° 57.96‘S	10° 30.27‘W	284.7	MG	in the water
PS77 283-5	29.03.2011	11:38	70° 58.02‘S	10° 30.33‘W	285.2	MG	on ground
PS77 283-5	29.03.2011	11:38	70° 58.02‘S	10° 30.33‘W	285.2	MG	hoisting
PS77 283-5	29.03.2011	11:50	70° 58.01‘S	10° 30.27‘W	286.2	MG	at surface
PS77 283-5	29.03.2011	11:54	70° 58.07‘S	10° 30.68‘W	286.7	MG	on deck
PS77 284-1	29.03.2011	12:19	70° 58.36‘S	10° 31.02‘W	301.7	RD	in the water
PS77 284-1	29.03.2011	12:39	70° 58.35‘S	10° 30.24‘W	289.7	RD	on ground

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 284-1	29.03.2011	12:49	70° 58.34'S	10° 29.99'W	286.7	RD	profile start
PS77 284-1	29.03.2011	12:59	70° 58.33'S	10° 29.77'W	279.5	RD	profile end
PS77 284-1	29.03.2011	12:59	70° 58.33'S	10° 29.77'W	279.5	RD	hoisting
PS77 284-1	29.03.2011	13:09	70° 58.33'S	10° 29.75'W	279.0	RD	information
PS77 284-1	29.03.2011	13:20	70° 58.33'S	10° 29.74'W	278.5	RD	on deck
PS77 285-1	29.03.2011	13:58	70° 56.64'S	10° 32.12'W	308.0	MG	in the water
PS77 285-1	29.03.2011	14:12	70° 56.66'S	10° 32.19'W	310.0	MG	on ground
PS77 285-1	29.03.2011	14:41	70° 56.75'S	10° 32.40'W	315.7	MG	action
PS77 285-1	29.03.2011	14:42	70° 56.75'S	10° 32.41'W	316.2	MG	hoisting
PS77 285-1	29.03.2011	15:00	70° 56.75'S	10° 32.40'W	316.2	MG	on deck
PS77 286-1	29.03.2011	16:51	70° 49.29'S	10° 33.29'W	283.7	BT	in the water
PS77 286-1	29.03.2011	16:57	70° 49.59'S	10° 33.89'W	288.2	BT	in the water
PS77 286-1	29.03.2011	16:58	70° 49.64'S	10° 33.98'W	286.7	BT	lowering
PS77 286-1	29.03.2011	17:13	70° 50.64'S	10° 36.11'W	247.7	BT	on ground
PS77 286-1	29.03.2011	17:13	70° 50.64'S	10° 36.11'W	247.7	BT	profile start
PS77 286-1	29.03.2011	17:22	70° 51.13'S	10° 37.16'W	249.0	BT	hoisting
PS77 286-1	29.03.2011	17:22	70° 51.13'S	10° 37.16'W	249.0	BT	profile end
PS77 286-1	29.03.2011	17:27	70° 51.30'S	10° 37.54'W	249.0	BT	off ground
PS77 286-1	29.03.2011	17:34	70° 51.51'S	10° 37.95'W	246.2	BT	surface
PS77 286-1	29.03.2011	17:45	70° 51.82'S	10° 38.62'W	257.0	BT	on deck
PS77 287-1	29.03.2011	20:12	70° 59.07'S	10° 26.63'W	156.5	ROV	in the water
PS77 287-1	29.03.2011	20:38	70° 59.07'S	10° 26.64'W	156.5	ROV	on ground/ max depth
PS77 287-1	29.03.2011	21:38	70° 59.09'S	10° 26.78'W	159.5	ROV	profile start

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 287-1	29.03.2011	22:20	70° 59.12'S	10° 26.98'W	162.2	ROV	alter course
PS77 287-1	30.03.2011	01:37	70° 59.10'S	10° 27.87'W	196.5	ROV	profile end
PS77 287-1	30.03.2011	01:37	70° 59.10'S	10° 27.87'W	196.5	ROV	hoisting
PS77 287-1	30.03.2011	01:48	70° 59.10'S	10° 27.86'W	196.2	ROV	at surface
PS77 287-1	30.03.2011	01:52	70° 59.10'S	10° 27.86'W	196.0	ROV	on deck
PS77 287-1	30.03.2011	01:58	70° 59.10'S	10° 27.86'W	195.2	ROV	on deck
PS77 287-2	30.03.2011	02:55	70° 58.82'S	10° 27.51'W	182.5	BWS	in the water
PS77 287-2	30.03.2011	03:05	70° 58.82'S	10° 27.47'W	180.0	BWS	on ground/ max depth
PS77 287-2	30.03.2011	03:06	70° 58.82'S	10° 27.46'W	180.0	BWS	lowering
PS77 287-2	30.03.2011	03:11	70° 58.82'S	10° 27.46'W	0.0	BWS	hoisting
PS77 287-2	30.03.2011	03:19	70° 58.82'S	10° 27.46'W	179.7	BWS	on deck
PS77 288-1	30.03.2011	07:59	70° 56.54'S	10° 31.79'W	291.7	CTD	in the water
PS77 288-1	30.03.2011	08:14	70° 56.53'S	10° 31.76'W	291.5	CTD	max depth
PS77 288-1	30.03.2011	08:14	70° 56.53'S	10° 31.76'W	291.5	CTD	hoisting
PS77 288-1	30.03.2011	08:19	70° 56.54'S	10° 31.77'W	291.0	CTD	at surface
PS77 288-1	30.03.2011	08:22	70° 56.54'S	10° 31.76'W	290.5	CTD	on deck
PS77 288-2	30.03.2011	08:40	70° 56.50'S	10° 31.74'W	288.2	MG	in the water
PS77 288-2	30.03.2011	09:26	70° 56.56'S	10° 31.86'W	295.5	MG	on ground
PS77 288-2	30.03.2011	09:26	70° 56.56'S	10° 31.86'W	295.5	MG	hoisting
PS77 288-2	30.03.2011	09:39	70° 56.54'S	10° 31.82'W	294.5	MG	at surface
PS77 288-2	30.03.2011	09:46	70° 56.56'S	10° 32.49'W	315.0	MG	on deck
PS77 288-3	30.03.2011	10:01	70° 56.45'S	10° 32.71'W	314.0	RD	in the water
PS77 288-3	30.03.2011	10:23	70° 56.40'S	10° 32.61'W	310.7	RD	on ground

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 288-3	30.03.2011	10:24	70° 56.40'S	10° 32.60'W	310.5	RD	profile start
PS77 288-3	30.03.2011	10:39	70° 56.42'S	10° 32.25'W	302.5	RD	profile end
PS77 288-3	30.03.2011	10:39	70° 56.42'S	10° 32.25'W	302.5	RD	hoisting
PS77 288-3	30.03.2011	11:01	70° 56.40'S	10° 32.20'W	299.2	RD	at surface
PS77 288-3	30.03.2011	11:01	70° 56.40'S	10° 32.20'W	299.2	RD	on deck
PS77 288-4	30.03.2011	11:22	70° 56.54'S	10° 31.77'W	291.0	MUC	in the water
PS77 288-4	30.03.2011	11:35	70° 56.53'S	10° 31.70'W	287.7	MUC	on ground
PS77 288-4	30.03.2011	11:36	70° 56.53'S	10° 31.70'W	287.7	MUC	hoisting
PS77 288-4	30.03.2011	11:45	70° 56.53'S	10° 31.69'W	287.5	MUC	at surface
PS77 288-4	30.03.2011	11:48	70° 56.53'S	10° 31.68'W	287.5	MUC	on deck
PS77 289-1	30.03.2011	12:11	70° 56.67'S	10° 32.04'W	302.5	MG	in the water
PS77 289-1	30.03.2011	12:22	70° 56.68'S	10° 32.09'W	304.5	MG	on ground
PS77 289-1	30.03.2011	12:52	70° 56.77'S	10° 32.33'W	316.0	MG	on ground
PS77 289-1	30.03.2011	12:52	70° 56.77'S	10° 32.33'W	316.0	MG	hoisting
PS77 289-1	30.03.2011	13:08	70° 56.82'S	10° 32.47'W	319.0	MG	on deck
PS77 290-1	30.03.2011	13:42	70° 58.63'S	10° 27.53'W	214.0	MOORST	in the water
PS77 290-1	30.03.2011	13:42	70° 58.63'S	10° 27.53'W	214.0	MOORST	on ground/ max depth
PS77 290-1	30.03.2011	13:45	70° 58.62'S	10° 27.48'W	212.7	MOORST	action
PS77 290-1	30.03.2011	13:48	70° 58.60'S	10° 27.46'W	214.2	MOORST	at surface
PS77 290-1	30.03.2011	13:48	70° 58.60'S	10° 27.46'W	214.2	MOORST	on deck
PS77 290-1	30.03.2011	14:07	70° 58.75'S	10° 27.69'W	198.5	MOORST	on deck
PS77 290-1	30.03.2011	14:11	70° 58.74'S	10° 27.63'W	202.2	MOORST	in the water
PS77 290-1	30.03.2011	14:14	70° 58.73'S	10° 27.61'W	206.7	MOORST	action

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 290-1	30.03.2011	14:14	70° 58.73'S	10° 27.61'W	206.7	MOORST	at surface
PS77 290-1	30.03.2011	14:15	70° 58.73'S	10° 27.60'W	208.0	MOORST	on deck
PS77 290-1	30.03.2011	14:15	70° 58.73'S	10° 27.60'W	208.0	MOORST	at surface
PS77 290-1	30.03.2011	14:30	70° 58.65'S	10° 27.68'W	212.5	MOORST	information
PS77 290-1	30.03.2011	14:46	70° 58.70'S	10° 27.68'W	209.5	MOORST	on deck
PS77 291-1	30.03.2011	17:17	70° 52.08'S	10° 36.78'W	235.0	BT	in the water
PS77 291-1	30.03.2011	17:24	70° 51.69'S	10° 36.42'W	231.2	BT	in the water
PS77 291-1	30.03.2011	17:24	70° 51.69'S	10° 36.42'W	231.2	BT	lowering
PS77 291-1	30.03.2011	17:39	70° 50.50'S	10° 35.24'W	267.5	BT	on ground
PS77 291-1	30.03.2011	17:39	70° 50.50'S	10° 35.24'W	267.5	BT	profile start
PS77 291-1	30.03.2011	17:50	70° 49.87'S	10° 34.59'W	281.7	BT	hoisting
PS77 291-1	30.03.2011	17:50	70° 49.87'S	10° 34.59'W	281.7	BT	profile end
PS77 291-1	30.03.2011	17:54	70° 49.72'S	10° 34.43'W	282.7	BT	off ground
PS77 291-1	30.03.2011	18:03	70° 49.47'S	10° 34.08'W	284.0	BT	surface
PS77 291-1	30.03.2011	18:10	70° 49.32'S	10° 33.90'W	279.2	BT	on deck
PS77 292-1	31.03.2011	06:06	70° 50.86'S	10° 35.63'W	239.5	CTD/RO	action
PS77 292-1	31.03.2011	06:18	70° 50.83'S	10° 35.65'W	241.2	CTD/RO	max depth
PS77 292-1	31.03.2011	06:24	70° 50.81'S	10° 35.66'W	241.7	CTD/RO	on deck
PS77 292-2	31.03.2011	06:53	70° 52.19'S	10° 37.30'W	230.5	BT	in the water
PS77 292-2	31.03.2011	07:00	70° 51.77'S	10° 36.79'W	234.7	BT	in the water
PS77 292-2	31.03.2011	07:13	70° 50.76'S	10° 35.59'W	243.5	BT	on ground
PS77 292-2	31.03.2011	07:14	70° 50.69'S	10° 35.51'W	252.0	BT	profile start
PS77 292-2	31.03.2011	07:24	70° 50.07'S	10° 34.73'W	276.7	BT	profile end

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 292-2	31.03.2011	07:24	70° 50.07'S	10° 34.73'W	276.7	BT	hoisting
PS77 292-2	31.03.2011	07:28	70° 49.91'S	10° 34.48'W	280.2	BT	off ground
PS77 292-2	31.03.2011	07:37	70° 49.65'S	10° 34.06'W	289.7	BT	surface
PS77 292-2	31.03.2011	07:47	70° 49.41'S	10° 33.80'W	281.2	BT	on deck
PS77 293-1	31.03.2011	09:39	70° 56.44'S	10° 31.64'W	285.5	MG	in the water
PS77 293-1	31.03.2011	09:52	70° 56.45'S	10° 31.65'W	285.7	MG	on ground
PS77 293-1	31.03.2011	10:43	70° 56.57'S	10° 31.91'W	298.2	MG	on ground
PS77 293-1	31.03.2011	10:44	70° 56.57'S	10° 31.91'W	298.2	MG	hoisting
PS77 293-1	31.03.2011	11:00	70° 56.57'S	10° 31.92'W	298.5	MG	at surface
PS77 293-1	31.03.2011	11:04	70° 56.59'S	10° 31.96'W	299.5	MG	on deck
PS77 294-1	31.03.2011	11:20	70° 56.51'S	10° 34.84'W	333.7	RD	in the water
PS77 294-1	31.03.2011	11:37	70° 56.50'S	10° 34.84'W	333.7	RD	on ground
PS77 294-1	31.03.2011	11:41	70° 56.52'S	10° 34.84'W	335.7	RD	profile start
PS77 294-1	31.03.2011	11:53	70° 56.61'S	10° 34.80'W	336.7	RD	profile end
PS77 294-1	31.03.2011	11:53	70° 56.61'S	10° 34.80'W	336.7	RD	hoisting
PS77 294-1	31.03.2011	12:01	70° 56.65'S	10° 34.77'W	337.7	RD	information
PS77 294-1	31.03.2011	12:13	70° 56.67'S	10° 34.71'W	338.5	RD	on deck
PS77 295-1	31.03.2011	12:59	70° 56.55'S	10° 31.80'W	291.7	MG	in the water
PS77 295-1	31.03.2011	13:19	70° 56.57'S	10° 31.87'W	296.0	MG	on ground
PS77 295-1	31.03.2011	13:40	70° 56.63'S	10° 32.01'W	302.7	MG	on ground
PS77 295-1	31.03.2011	13:44	70° 56.63'S	10° 32.01'W	302.7	MG	hoisting
PS77 295-1	31.03.2011	14:04	70° 56.60'S	10° 31.94'W	300.5	MG	on deck
PS77 295-2	31.03.2011	14:27	70° 56.63'S	10° 32.01'W	303.2	MG	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 295-2	31.03.2011	14:38	70° 56.63'S	10° 32.01'W	303.5	MG	on ground
PS77 295-2	31.03.2011	14:38	70° 56.63'S	10° 32.01'W	303.5	MG	on ground
PS77 295-2	31.03.2011	14:55	70° 56.62'S	10° 32.00'W	302.7	MG	on deck
PS77 296-1	31.03.2011	15:07	70° 56.55'S	10° 31.80'W	292.5	BWS	in the water
PS77 296-1	31.03.2011	15:24	70° 56.55'S	10° 31.80'W	294.7	BWS	on ground/ max depth
PS77 296-1	31.03.2011	15:28	70° 56.54'S	10° 31.80'W	292.7	BWS	hoisting
PS77 296-1	31.03.2011	15:29	70° 56.55'S	10° 31.79'W	292.7	BWS	off ground
PS77 296-1	31.03.2011	15:38	70° 56.55'S	10° 31.79'W	292.7	BWS	on deck
PS77 297-1	31.03.2011	16:16	70° 56.45'S	10° 31.29'W	276.5	MG	in the water
PS77 297-1	31.03.2011	16:24	70° 56.48'S	10° 31.35'W	278.2	MG	on ground
PS77 297-1	31.03.2011	16:56	70° 56.60'S	10° 31.62'W	286.5	MG	information
PS77 297-1	31.03.2011	16:57	70° 56.60'S	10° 31.63'W	287.0	MG	off ground
PS77 297-1	31.03.2011	17:14	70° 56.62'S	10° 31.76'W	292.0	MG	on deck
PS77 298-1	31.03.2011	18:49	70° 55.02'S	10° 18.72'W	191.2	LANDER	in the water
PS77 298-1	31.03.2011	18:52	70° 55.00'S	10° 18.67'W	190.5	LANDER	lowering
PS77 298-1	31.03.2011	19:16	70° 55.00'S	10° 18.60'W	190.0	LANDER	in the water
PS77 298-1	31.03.2011	19:17	70° 55.00'S	10° 18.60'W	190.0	LANDER	on ground/ max depth
PS77 298-1	31.03.2011	19:19	70° 55.00'S	10° 18.60'W	190.0	LANDER	information
PS77 298-2	31.03.2011	20:31	70° 54.56'S	10° 19.13'W	221.2	BONGO	in the water
PS77 298-2	31.03.2011	20:42	70° 54.54'S	10° 19.10'W	221.7	BONGO	max depth
PS77 298-2	31.03.2011	20:51	70° 54.54'S	10° 19.13'W	221.7	BONGO	hoisting
PS77 298-2	31.03.2011	21:04	70° 54.54'S	10° 19.09'W	221.5	BONGO	at surface
PS77 298-2	31.03.2011	21:05	70° 54.54'S	10° 19.08'W	221.5	BONGO	on deck

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 298-3	31.03.2011	21:10	70° 54.54‘S	10° 19.10‘W	221.5	BONGO	in the water
PS77 298-3	31.03.2011	21:19	70° 54.54‘S	10° 19.09‘W	221.5	BONGO	max depth
PS77 298-3	31.03.2011	21:31	70° 54.54‘S	10° 19.08‘W	221.2	BONGO	hoisting
PS77 298-3	31.03.2011	21:41	70° 54.54‘S	10° 19.08‘W	221.2	BONGO	at surface
PS77 298-3	31.03.2011	21:42	70° 54.54‘S	10° 19.08‘W	221.2	BONGO	on deck
PS77 298-4	31.03.2011	21:46	70° 54.54‘S	10° 19.08‘W	221.2	BONGO	in the water
PS77 298-4	31.03.2011	21:53	70° 54.54‘S	10° 19.08‘W	221.2	BONGO	max depth
PS77 298-4	31.03.2011	22:11	70° 54.53‘S	10° 19.07‘W	221.2	BONGO	hoisting
PS77 298-4	31.03.2011	22:19	70° 54.53‘S	10° 19.07‘W	221.2	BONGO	at surface
PS77 298-4	31.03.2011	22:20	70° 54.53‘S	10° 19.07‘W	221.2	BONGO	on deck
PS77 298-5	31.03.2011	22:22	70° 54.53‘S	10° 19.07‘W	221.2	BONGO	in the water
PS77 298-5	31.03.2011	22:26	70° 54.53‘S	10° 19.07‘W	221.2	BONGO	max depth
PS77 298-5	31.03.2011	22:34	70° 54.53‘S	10° 19.06‘W	221.5	BONGO	hoisting
PS77 298-5	31.03.2011	22:38	70° 54.53‘S	10° 19.06‘W	221.2	BONGO	at surface
PS77 298-5	31.03.2011	22:39	70° 54.53‘S	10° 19.06‘W	221.2	BONGO	on deck
PS77 298-6	31.03.2011	22:41	70° 54.54‘S	10° 19.05‘W	221.5	BONGO	in the water
PS77 298-6	31.03.2011	22:44	70° 54.54‘S	10° 19.05‘W	221.5	BONGO	max depth
PS77 298-6	31.03.2011	22:56	70° 54.54‘S	10° 19.12‘W	221.0	BONGO	hoisting
PS77 298-6	31.03.2011	22:59	70° 54.54‘S	10° 19.10‘W	221.0	BONGO	at surface
PS77 298-6	31.03.2011	23:00	70° 54.54‘S	10° 19.10‘W	221.0	BONGO	on deck
PS77 299-1	01.04.2011	02:08	70° 56.21‘S	10° 28.94‘W	215.0	ROV	in the water
PS77 299-1	01.04.2011	02:12	70° 56.21‘S	10° 28.94‘W	215.0	ROV	in the water
PS77 299-1	01.04.2011	02:21	70° 56.22‘S	10° 28.98‘W	216.0	ROV	action

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 299-1	01.04.2011	02:41	70° 56.22'S	10° 28.96'W	215.7	ROV	profile start
PS77 299-1	01.04.2011	05:35	70° 56.30'S	10° 28.76'W	207.7	ROV	profile end
PS77 299-1	01.04.2011	05:35	70° 56.30'S	10° 28.76'W	207.7	ROV	hoisting
PS77 299-1	01.04.2011	05:51	70° 56.30'S	10° 28.76'W	207.5	ROV	at surface
PS77 299-1	01.04.2011	05:55	70° 56.29'S	10° 28.77'W	207.7	ROV	information
PS77 299-1	01.04.2011	06:01	70° 56.23'S	10° 28.87'W	214.2	ROV	on deck
PS77 300-1	01.04.2011	07:07	70° 51.96'S	10° 37.30'W	236.2	BT	in the water
PS77 300-1	01.04.2011	07:14	70° 51.52'S	10° 36.72'W	238.0	BT	in the water
PS77 300-1	01.04.2011	07:14	70° 51.52'S	10° 36.72'W	238.0	BT	lowering
PS77 300-1	01.04.2011	07:27	70° 50.55'S	10° 35.36'W	268.2	BT	action
PS77 300-1	01.04.2011	07:28	70° 50.48'S	10° 35.28'W	267.5	BT	profile start
PS77 300-1	01.04.2011	07:38	70° 49.90'S	10° 34.45'W	280.2	BT	profile end
PS77 300-1	01.04.2011	07:38	70° 49.90'S	10° 34.45'W	280.2	BT	hoisting
PS77 300-1	01.04.2011	07:43	70° 49.72'S	10° 34.18'W	284.0	BT	off ground
PS77 300-1	01.04.2011	07:50	70° 49.51'S	10° 33.82'W	285.7	BT	surface
PS77 300-1	01.04.2011	07:58	70° 49.31'S	10° 33.44'W	283.0	BT	on deck
PS77 300-2	01.04.2011	08:34	70° 49.26'S	10° 33.12'W	282.5	CTD	in the water
PS77 300-2	01.04.2011	08:46	70° 49.38'S	10° 33.05'W	282.7	CTD	max depth
PS77 300-2	01.04.2011	08:48	70° 49.39'S	10° 33.06'W	282.7	CTD	hoisting
PS77 300-2	01.04.2011	08:53	70° 49.39'S	10° 33.05'W	282.0	CTD	at surface
PS77 300-2	01.04.2011	08:54	70° 49.39'S	10° 33.05'W	282.2	CTD	on deck
PS77 301-1	01.04.2011	09:58	70° 52.55'S	10° 35.99'W	227.0	BT	action
PS77 301-1	01.04.2011	10:05	70° 52.21'S	10° 35.81'W	225.5	BT	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 301-1	01.04.2011	10:07	70° 52.05'S	10° 35.73'W	225.5	BT	lowering
PS77 301-1	01.04.2011	10:19	70° 51.06'S	10° 35.27'W	225.7	BT	on ground
PS77 301-1	01.04.2011	10:20	70° 50.99'S	10° 35.23'W	226.7	BT	profile start
PS77 301-1	01.04.2011	10:27	70° 50.56'S	10° 35.01'W	249.2	BT	lowering
PS77 301-1	01.04.2011	10:30	70° 50.34'S	10° 34.92'W	265.7	BT	profile end
PS77 301-1	01.04.2011	10:30	70° 50.34'S	10° 34.92'W	265.7	BT	hoisting
PS77 301-1	01.04.2011	10:34	70° 50.16'S	10° 34.84'W	271.5	BT	off ground
PS77 301-1	01.04.2011	10:51	70° 49.67'S	10° 34.60'W	283.7	BT	on deck
PS77 302-1	01.04.2011	14:37	70° 56.69'S	10° 32.14'W	0.0	ROV	in the water
PS77 302-1	01.04.2011	14:39	70° 56.69'S	10° 32.15'W	0.0	ROV	in the water
PS77 302-1	01.04.2011	14:46	70° 56.69'S	10° 32.15'W	0.0	ROV	action
PS77 302-1	01.04.2011	15:00	70° 56.68'S	10° 32.15'W	0.0	ROV	on ground/ max depth
PS77 302-1	01.04.2011	15:00	70° 56.68'S	10° 32.15'W	0.0	ROV	profile start
PS77 302-1	01.04.2011	15:56	70° 56.69'S	10° 32.14'W	0.0	ROV	profile end
PS77 302-1	01.04.2011	15:58	70° 56.69'S	10° 32.14'W	0.0	ROV	hoisting
PS77 302-1	01.04.2011	16:03	70° 56.70'S	10° 32.16'W	0.0	ROV	lowering
PS77 302-1	01.04.2011	16:08	70° 56.69'S	10° 32.17'W	0.0	ROV	hoisting
PS77 302-1	01.04.2011	16:29	70° 56.69'S	10° 32.10'W	0.0	ROV	at surface
PS77 302-1	01.04.2011	16:40	70° 56.70'S	10° 32.13'W	0.0	ROV	on deck
PS77 303-1	03.04.2011	08:09	70° 56.63'S	10° 32.48'W	313.0	MOR	in the water
PS77 303-1	03.04.2011	08:40	70° 56.70'S	10° 32.40'W	313.0	MOR	on ground/ max depth
PS77 303-1	03.04.2011	09:16	70° 56.71'S	10° 32.36'W	313.0	MOR	hoisting
PS77 303-1	03.04.2011	10:14	70° 56.77'S	10° 32.22'W	307.0	MOR	off ground

Sta-tion PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 303-1	03.04.2011	10:56	70° 56.78'S	10° 32.12'W	305.0	MOR	on deck
PS77 304-1	03.04.2011	13:31	70° 54.67'S	10° 16.86'W	0.0	CAL	in the water
PS77 304-1	03.04.2011	13:31	70° 54.67'S	10° 16.86'W	0.0	CAL	profile start
PS77 304-1	03.04.2011	13:40	70° 54.69'S	10° 16.67'W	0.0	CAL	on ground/ max depth
PS77 304-1	03.04.2011	15:19	70° 54.31'S	10° 15.87'W	0.0	CAL	profile end
PS77 304-1	03.04.2011	15:19	70° 54.31'S	10° 15.87'W	0.0	CAL	on deck
PS77 305-1	03.04.2011	16:00	70° 55.01'S	10° 18.78'W	0.0	LANDER	on ground/ max depth
PS77 305-1	03.04.2011	16:48	70° 54.97'S	10° 18.78'W	0.0	LANDER	information
PS77 305-1	03.04.2011	17:11	70° 54.99'S	10° 18.60'W	0.0	LANDER	off ground
PS77 305-1	03.04.2011	17:13	70° 54.99'S	10° 18.60'W	0.0	LANDER	on deck
PS77 306-1	03.04.2011	19:02	70° 54.70'S	10° 16.53'W	0.0	ROV	in the water
PS77 306-1	03.04.2011	19:13	70° 54.64'S	10° 16.45'W	0.0	ROV	information
PS77 306-1	03.04.2011	19:32	70° 54.65'S	10° 16.40'W	0.0	ROV	profile start
PS77 306-1	03.04.2011	23:02	70° 54.59'S	10° 16.44'W	0.0	ROV	profile end
PS77 306-1	03.04.2011	23:03	70° 54.59'S	10° 16.44'W	0.0	ROV	hoisting
PS77 306-1	03.04.2011	23:12	70° 54.59'S	10° 16.43'W	0.0	ROV	at surface
PS77 306-1	03.04.2011	23:20	70° 54.58'S	10° 16.47'W	0.0	ROV	on deck
PS77 307-1	04.04.2011	06:13	70° 54.41'S	10° 16.36'W	0.0	CAL	profile start
PS77 307-1	04.04.2011	06:13	70° 54.41'S	10° 16.36'W	0.0	CAL	on ground/ max depth
PS77 307-1	04.04.2011	13:11	70° 54.47'S	10° 16.51'W	0.0	CAL	action
PS77 307-1	04.04.2011	14:17	70° 54.39'S	10° 16.28'W	0.0	CAL	profile end
PS77 307-1	04.04.2011	14:31	70° 54.39'S	10° 16.27'W	0.0	CAL	on deck
PS77 308-1	04.04.2011	17:26	70° 52.73'S	10° 36.01'W	231.2	BT	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 308-1	04.04.2011	17:32	70° 52.37'S	10° 35.85'W	226.2	BT	in the water
PS77 308-1	04.04.2011	17:33	70° 52.31'S	10° 35.82'W	226.5	BT	lowering
PS77 308-1	04.04.2011	17:45	70° 51.30'S	10° 35.35'W	223.5	BT	on ground
PS77 308-1	04.04.2011	17:45	70° 51.30'S	10° 35.35'W	223.5	BT	profile start
PS77 308-1	04.04.2011	17:56	70° 50.56'S	10° 35.04'W	250.5	BT	profile end
PS77 308-1	04.04.2011	17:56	70° 50.56'S	10° 35.04'W	250.5	BT	hoisting
PS77 308-1	04.04.2011	17:58	70° 50.47'S	10° 34.99'W	266.0	BT	off ground
PS77 308-1	04.04.2011	18:06	70° 50.26'S	10° 34.84'W	274.0	BT	surface
PS77 308-1	04.04.2011	18:14	70° 50.06'S	10° 34.74'W	279.7	BT	on deck
PS77 309-1	04.04.2011	20:42	70° 56.31'S	10° 28.74'W	208.5	BWS	in the water
PS77 309-1	04.04.2011	20:56	70° 56.30'S	10° 28.72'W	207.0	BWS	on ground/ max depth
PS77 309-1	04.04.2011	20:56	70° 56.30'S	10° 28.72'W	207.0	BWS	action
PS77 309-1	04.04.2011	21:01	70° 56.30'S	10° 28.72'W	208.5	BWS	hoisting
PS77 309-1	04.04.2011	21:03	70° 56.30'S	10° 28.72'W	207.0	BWS	off ground
PS77 309-1	04.04.2011	21:09	70° 56.30'S	10° 28.72'W	207.0	BWS	at surface
PS77 309-1	04.04.2011	21:10	70° 56.30'S	10° 28.72'W	206.7	BWS	on deck
PS77 310-1	05.04.2011	06:07	70° 48.27'S	10° 45.72'W	497.7	CTD/RO	in the water
PS77 310-1	05.04.2011	06:23	70° 48.23'S	10° 45.58'W	499.2	CTD/RO	max depth
PS77 310-1	05.04.2011	06:38	70° 48.22'S	10° 45.62'W	501.0	CTD/RO	on deck
PS77 310-2	05.04.2011	07:49	70° 48.57'S	10° 46.07'W	488.2	MOR	on ground/ max depth
PS77 310-2	05.04.2011	07:50	70° 48.57'S	10° 46.08'W	488.7	MOR	information
PS77 310-2	05.04.2011	07:52	70° 48.58'S	10° 46.09'W	488.0	MOR	information
PS77 310-2	05.04.2011	10:37	70° 47.63'S	10° 45.62'W	553.0	MOR	information

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 310-2	05.04.2011	10:48	70° 47.68‘S	10° 45.74‘W	550.5	MOR	at surface
PS77 310-2	05.04.2011	10:56	70° 47.65‘S	10° 45.77‘W	555.0	MOR	on deck
PS77 310-2	05.04.2011	11:00	70° 47.62‘S	10° 45.73‘W	559.5	MOR	on deck
PS77 310-2	05.04.2011	11:35	70° 47.42‘S	10° 45.41‘W	589.2	MOR	on deck
PS77 310-2	05.04.2011	11:39	70° 47.39‘S	10° 45.45‘W	594.5	MOR	on deck
PS77 310-2	05.04.2011	11:43	70° 47.37‘S	10° 45.42‘W	596.7	MOR	on deck
PS77 310-3	05.04.2011	12:35	70° 47.16‘S	10° 44.92‘W	631.0	MG	in the water
PS77 310-3	05.04.2011	13:01	70° 47.20‘S	10° 44.93‘W	617.7	MG	on ground
PS77 310-3	05.04.2011	13:29	70° 47.24‘S	10° 45.10‘W	611.5	MG	on ground
PS77 310-3	05.04.2011	13:31	70° 47.24‘S	10° 45.10‘W	612.7	MG	on ground
PS77 310-3	05.04.2011	13:56	70° 47.24‘S	10° 45.17‘W	613.0	MG	at surface
PS77 310-3	05.04.2011	14:01	70° 47.20‘S	10° 45.16‘W	621.2	MG	on deck
PS77 311-1	06.04.2011	08:09	68° 10.36‘S	7° 55.17‘W	4296.0	CTD	in the water
PS77 311-1	06.04.2011	08:49	68° 10.43‘S	7° 54.95‘W	4291.0	CTD	max depth
PS77 311-1	06.04.2011	08:52	68° 10.44‘S	7° 54.93‘W	4289.0	CTD	hoisting
PS77 311-1	06.04.2011	09:21	68° 10.48‘S	7° 54.94‘W	4288.0	CTD	at surface
PS77 311-1	06.04.2011	09:22	68° 10.48‘S	7° 54.94‘W	4288.0	CTD	on deck
PS77 311-2	06.04.2011	09:30	68° 10.49‘S	7° 54.96‘W	4228.0	MN	in the water
PS77 311-2	06.04.2011	10:32	68° 10.48‘S	7° 55.06‘W	4229.0	MN	max depth
PS77 311-2	06.04.2011	10:32	68° 10.48‘S	7° 55.06‘W	4229.0	MN	hoisting
PS77 311-2	06.04.2011	11:21	68° 10.42‘S	7° 55.46‘W	4300.2	MN	at surface
PS77 311-2	06.04.2011	11:21	68° 10.42‘S	7° 55.46‘W	4300.2	MN	on deck
PS77 311-3	06.04.2011	11:24	68° 10.41‘S	7° 55.46‘W	4302.0	MN	in the water

Station PS77	Date	Time	Position (Lat.)	Position (Lon.)	Depth (m)	Gear	Action
PS77 311-3	06.04.2011	11:37	68° 10.39'S	7° 55.43'W	4301.7	MN	max depth
PS77 311-3	06.04.2011	11:37	68° 10.39'S	7° 55.43'W	4301.7	MN	hoisting
PS77 311-3	06.04.2011	11:49	68° 10.39'S	7° 55.39'W	4300.7	MN	on deck
PS77 311-4	06.04.2011	11:56	68° 10.39'S	7° 55.37'W	4300.0	BONGO	in the water
PS77 311-4	06.04.2011	12:05	68° 10.38'S	7° 55.40'W	4301.5	BONGO	max depth
PS77 311-4	06.04.2011	12:05	68° 10.38'S	7° 55.40'W	4301.5	BONGO	hoisting
PS77 311-4	06.04.2011	12:14	68° 10.35'S	7° 55.49'W	4304.2	BONGO	on deck
PS77 312-1	09.04.2011	14:46	54° 29.90'S	3° 13.36' E	0.0	CTD	in the water
PS77 312-1	09.04.2011	14:57	54° 29.88'S	3° 13.39' E	0.0	CTD	max depth
PS77 312-1	09.04.2011	14:59	54° 29.89'S	3° 13.40' E	0.0	CTD	hoisting
PS77 312-1	09.04.2011	15:06	54° 29.88'S	3° 13.46' E	0.0	CTD	on deck
PS77 312-2	09.04.2011	16:05	54° 27.96'S	3° 10.35' E	0.0	BT	in the water
PS77 312-2	09.04.2011	16:14	54° 27.57'S	3° 9.68' E	0.0	BT	information
PS77 312-2	09.04.2011	16:23	54° 27.36'S	3° 10.30' E	243.7	BT	information
PS77 312-2	09.04.2011	16:24	54° 27.44'S	3° 10.37' E	242.2	BT	in the water
PS77 312-2	09.04.2011	16:24	54° 27.44'S	3° 10.37' E	242.2	BT	lowering
PS77 312-2	09.04.2011	16:35	54° 28.23'S	3° 11.10' E	0.0	BT	on ground
PS77 312-2	09.04.2011	16:35	54° 28.23'S	3° 11.10' E	250.0	BT	profile start
PS77 312-2	09.04.2011	16:56	54° 29.36'S	3° 12.29' E	296.0	BT	profile end
PS77 312-2	09.04.2011	16:56	54° 29.36'S	3° 12.29' E	296.0	BT	hoisting
PS77 312-2	09.04.2011	17:00	54° 29.50'S	3° 12.47' E	291.0	BT	off ground
PS77 312-2	09.04.2011	17:09	54° 29.83'S	3° 12.82' E	274.7	BT	surface
PS77 312-2	09.04.2011	17:20	54° 30.45'S	3° 13.52' E	261.0	BT	on deck

Sta-tion PS77	**Date**	**Time**	**Position (Lat.)**	**Position (Lon.)**	**Depth (m)**	**Gear**	**Action**
PS77 312-3	09.04.2011	17:35	54° 30.09'S	3° 13.82' E	266.5	RD	in the water
PS77 312-3	09.04.2011	17:52	54° 30.14'S	3° 13.50' E	264.2	RD	on ground
PS77 312-3	09.04.2011	17:52	54° 30.14'S	3° 13.50' E	264.2	RD	profile start
PS77 312-3	09.04.2011	18:02	54° 30.20'S	3° 13.35' E	262.7	RD	hoisting
PS77 312-3	09.04.2011	18:02	54° 30.20'S	3° 13.35' E	262.7	RD	profile end
PS77 312-3	09.04.2011	18:20	54° 30.28'S	3° 13.05' E	266.5	RD	on deck
PS77 312-4	09.04.2011	18:46	54° 28.24'S	3° 9.76' E	333.7	BT	in the water
PS77 312-4	09.04.2011	18:52	54° 27.99'S	3° 9.32' E	333.0	BT	information
PS77 312-4	09.04.2011	19:01	54° 27.73'S	3° 9.88' E	286.2	BT	information
PS77 312-4	09.04.2011	19:02	54° 27.82'S	3° 9.97' E	288.5	BT	in the water
PS77 312-4	09.04.2011	19:03	54° 27.91'S	3° 10.06' E	296.0	BT	lowering
PS77 312-4	09.04.2011	19:17	54° 28.84'S	3° 11.33' E	300.0	BT	on ground
PS77 312-4	09.04.2011	19:17	54° 28.84'S	3° 11.33' E	300.0	BT	profile start
PS77 312-4	09.04.2011	19:37	54° 29.83'S	3° 12.74' E	274.2	BT	profile end
PS77 312-4	09.04.2011	19:37	54° 29.83'S	3° 12.74' E	274.2	BT	hoisting
PS77 312-4	09.04.2011	19:40	54° 29.96'S	3° 12.91' E	276.0	BT	off ground
PS77 312-4	09.04.2011	19:51	54° 30.29'S	3° 13.34' E	266.2	BT	surface
PS77 312-4	09.04.2011	19:58	54° 30.58'S	3° 13.84' E	254.0	BT	on deck

A.5 ABBREVIATIONS OF GEAR

	Gear
AGT	Agassiz trawl (3m)
AGTs	Agassiz trawl small (1.5m)
ATC	Amphipod trap
BONGO	Bongo net
BPN	Bentho-pelagic net
BT	Bottom trawl
BWS	Bottom water sampler
CAL	Calibration EK 60
CTD	Conductivity-temperature-depth data logger
CTD/RO	CTD & rosette water sampler
FLS	Fish lot survey (EK 60)
HS_PS	Hydrosweep & parasound profile
LANDER	Bottom lander
MG	Multigrab
MN	Multinet
MOORST	Mooring (short time)
MOR	Mooring
MUC	Multibox corer
POS	Posidonia
RD	Rauschert dredge
RMT	Rectangular midwater trawl (1+8)
ROV	Remotely operated vehicle
SWS	Surface water sampler
TRAPF	Fish trap
WSB	Water sample bucket

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