3. Leg ANT XIII/5 Punta Arenas - Bremerhaven 22.05. - 21.06.1996

3.1 Summary and Itinerary

The theme of the scientific programme of the last leg of Polarstern´s 13th Antarctic expedition was ´diversity of the deep-sea fauna´. Along the ship´s transect (Fig. 23) the faunistic diversity of microorganisms, zooplankton, meio- and macrobenthic organisms was investigated in order to look for any latitudinal gradients in the distribution patterns. Of special interest were the deep basins in the South Atlantic, where little work has been done to date.

On five deep-sea stations, each greater than 5000 m water depth, four different corers (multibox-corer, rotating-corer, multi- and minicorer) were deployed, providing quantitative sediment samples for analysing the distribution patterns of meio- and macrobenthos. Depth-related and latitudinal distribution patterns of zooplankton were investigated by means of multinet catches from 4 stations; CTD measurements carried out first provided immediate information about the hydrographic structure of the water column at these locations. The microbial deep-sea community was studied by means of a newly developed, deep water sampler which provided enriched samples of barophilic microorganisms under collection pressure by pumping and filtering a large volume of sea water in-situ.

Between 47°S and 24°S, a bathymetric profile 1335 sm long was obtained from Parasound surveys, which provide analyses of the bottom topography and sediment structure. The data are stored on analog paper record and also in digital form.

The multibox-corer and the rotating-corer provided a total of 28 single cores from four stations for macrobenthos analysis. Some basic work on the samples has been carried out on board but detailed analyses have to be done at the home institutions. At a first glance, the macro-benthos at the four locations under study seems to be very poor in both abundance and biomass compared to Weddell Sea samples from similar depths. The mini- and multicorers provided a total of 54 sediment cores from four stations. Eight of these were used for microbiological studies and 23 are for investigation of latitudinal diversity patterns of both nematodes and copepods. From initial examinations of the samples, we formed the impression that the meiofauna appears the same compared to other deep-sea sites further north and south. The newly developed, deep-water sampler obtained concentrated water samples from 4 stations under deep-sea pressure. These samples provide data which will form the basis for a description of the composition of the benthic microbial community structure and its biomass and will allow further insights into the existence and role of a decompression-sensitive fraction of bacteria and its biomass and activity.

Temperature measurements in the mesopause of the atmosphere, accomplished with a newly developed, potassium temperature lidar system, completed the scientific work of this leg. The group from the Institut für Atmosphärenphysik in Kühlungsborn measured profiles of temperature and potassium densities between 47°S and 45°N on 18 nights and obtained unique and very interesting results about the thermal structure and densities of potassium atoms in the atmospheric layer between 80 to 105 km altitude.

4. Scientific programmes

4.1 Investigations of the atmosphere

4.1.1 Weather Conditions

Joachim England, Herbert Köhler, Edmund Knuth (DWD)

During our passage through the Strait of Magellan on the night from the May 22th to 23th, the wind conditions often changed due to orographic effects. Wind strength changed on very short time periods between Force 3 to 10. During our passage, the area of the Magellan Strait lay to the rear of a storm low. Behind this disappearing low, a pronounced shallow low developed east of our cruise track, reaching far south to the Antarctic, thus keeping us away from further deep lows which came up from the west. With these conditions our passage along the Argentinian coast line took place in quite calm weather with wind strengths around Force 3 increasing occasionally towards Force 6, the main direction being west to northwest. The first station at 47°S and 55°W could thus be worked under favourable weather conditions.

Above the central South Atlantic, a strong and wide-spread high developed with a pressure of more than 1040 hPa at its centre. On the other side, an association of clouds in front of the East-Brasilian coast, formed a relatively small low pressure whirl which persisted for several days, moving slowly in a northeasterly direction. From May 27th, this low pressure dominated the weather situation. Work on the second station at 38°S and 43°W was hindered by strong wind and consequently rough sea. On May 30th, the wind decreased to Force 3 to 5 backing towards a northerly direction and remaining so for the following day.

On the western border of a wide-spread, strong high over the central South Atlantic, the relatively strong pressure gradient maintained northeasterly winds of Force 6 during June 1st and 2nd. On June 3rd, the wind decreased to Force 4 and the third station could be worked under good conditions. On June 4th and 5th, the wind increased again to Force 6 turning towards a southeasterly direction. During June 5th, heavy showers with gusts up to 36 kn occurred decreasing, however to Force 3 to 4 towards the evening. On June 6th, another station was worked at 4°S 27°W. The wind decreased further from Force 4 to 2, accompanied however by heavy rainfall. In the late afternoon of June 7th, we crossed the equator with winds of Force 1 to 3 from an easterly direction. Light southeasterly winds Force 1 to 3 also dominated in the area of the Intertropic Convergence Zone which we passed during June 8th, when it rained occasionally. On the morning of June 9th, the wind turned towards the northeast with Force 3 to 4. No further rain occured and weather was influenced by the northeast trades.

This situation remained until June 14th. Winds of Force 3 to 4 were a regular feature from then on and the last station at 23°N 24°30'W was worked under favourable meterological conditions. Between June 15th and 20th, light winds of Force 1 to 4 from different directions dominated along the ship´s track. The feared Bay of Biscay and the Channel were amazingly calm this time. Approaching Bremerhaven on June 21th wind increased again to Force 6 or 7, with northern to northeasterly directions due to a deep low over Scandinavia.

4.1.2 Temperature observations in the mesopause

Matthias Alpers, Veit Eska, Josef Höffner, Ulf von Zahn (IAPR)

Objectives and methods

The scientific objectives of the IAPR participation in the legs ANT XIII/4-5 have been the exploration of both the thermal structure of the atmospheric layers in the 80 to 105 km altitude, and the densities of potassium atoms residing therein. At this altitude, the atmosphere exhibits a permanent deep, local temperature minimum (the so-called mesopause). However, little is known about the precise temperatures at the mesopause and their spatial and temporal variations. This is particularly true for the southern hemisphere. The potassium atoms, present in this region, are remains from the vaporisation of micrometeorides (i.e. shooting stars) and cosmic dust. The loss processes for these atoms are unknown. Yet, there exists a permanent layer of potassium which exhibits a maximum density of about 100 atoms per cm^{-3} at approximately 90 km altitude.

For remote sensing of the air temperature and potassium density, we used for the first time, a transportable, containerized, lidar instrument ('light radar'). It operates at the resonance wavelength of potassium at 770 nm (near infrared). From a measurement of the time which passes between emission of the laser pulse and arrival of the atmospheric echo signal in the instrument's detectors, one can calculate quite accurately the altitude of the scattering air volume. By means of a tiny modulation of the wavelength of the laser light, one can also measure the temperature of the potassium atoms between 80 and 100 km altitude. This temperature is a good approximation to the air temperature.

Work at sea and preliminary results

The observational programme, the data analysis and its interpretation, for legs ANT XIII/4 and ANT XIII/5, all form a scientific entity for us and therefore we summarize the results obtained in both legs here.

The first night of lidar observations was March 25th, the last the June 18th, 1996. Within this period lie a total of 31 nights with measurements of temperature and potassium density and an additional 4 nights with measurements of potassium density only. The excellent performance of the lidar and unexpectedly good weather contributed to these good observation statistics.

Observations were made from 71°S to 45°N. Seasons changed from late autumn/early winter at high southern latitudes to "deep winter" at south-tropical latitudes and then to high summer in the northern hemisphere. For our research program, this type of variation was almost ideal. Almost all measured profiles of air temperature and potassium density are characterized by high wave activity in the upper atmosphere. This general property of the upper atmosphere is well known, but makes the determination of genuine climatological mean parameters difficult. Though in fact one just needs a very large data base. We were fortunate, therefore, to be able to obtain 4 nights of continuous observations lasting more than 12 hours plus 3 nights of more than 9 hours. These long observation series will allow us to characterize and quantify the wave spectrum and to derive corrections for the shorter observation sequences. The altitude and temperature of the mesopause

was measured over a rather wide range of latitudes with high temperature accuracy and altitude resolution. We obtained new and interesting results pertaining to the latitude dependence and seasonal variations of the mesopause altitude and temperature (although we acknowledge that a clean separation of the two effects in our data will be somewhat subjective). In the southern hemisphere there are, however, no other measurements available with which we could compare our newly acquired data.

Before now, potassium density profiles have been measured in the upper atmosphere in only two locations. For that reason, all of the aquired potassium data are entirely new. We observed an outstanding variation of the potassium density with latitude and a previously unobserved high occurrence rate and intensity of so-called sporadic potassium layers. An example of atmospheric wave activity showing up in the potassium profiles is given in Fig. 25. The 59 potassium density profiles, which we aquired on June 7th, 1996, between about 2 and 7 pm. (UT) near 3°S are shown. The temporal separation of the profiles is 4 min. The number density scale at the abcissa applies to the first left profile. Each following profile is offset to the right by a value of 10 atoms per cm^{-3}. During this night, the normal potassium layer extended from 80 to 100 km altitude. The density profiles are modulated by the passage of waves through the background atmosphere. In addition, there are a few short-lived sporadic layers near 90 km.

4.2 Marine Biology

4.2.1 Microbiology

Erich Dunker, Elisabeth Helmke, Ulla Klauke (AWI)

Objectives and methods

During usual sampling of sediment or water, deep-sea organisms experience decompression. The central question of the microbiological work during this leg was whether, and if so, to what extent, such decompression affects the microbial deep-sea assemblages. The results will contribute to a better understanding, as well as to a realistic quantification, of the microbial processes in the deep-sea. A prerequisite of this study was a recently developed water sampler which concentrates particulate organic matter in-situ and brings it up to the surface maintaining in-situ pressure. Subsequent subsampling on board can be conducted without pressure loss.

As well as these investigations on the existence and role of decompression-sensitive bacteria, studies of biomass, activity, and structure of the benthic microbial community from the deep sea were carried out with the decompressed sediment and water samples of the multicorer. The results will supplement our data set from the microbial flora of different deep-sea basins of the north and east Atlantic.

Work at sea

The pressure-retaining water sampler was deployed at four stations. Concentrated water samples were obtained under deep-sea pressure. They were subdivided and subjected to different experimental conditions. The final evaluation of these experiments will be done at the home laboratory. The same is true for the measurements and the experiments with the decompressed multicorer material.

Subsamples of the sediment and bottom water were fixed and preserved for total count and biomass determinations as well as for the chemical analyses. Furthermore, growth and degradation experiments were prepared under simulated deep-sea conditions. In order to describe the structure of the benthic microbial deep-sea community, MPN-cultures were conducted. Since the MPN-cultures were subjected to different pressure and temperature conditions, a differentiation of allochthonous from autochthonous deep-sea bacteria will be possible.

4.2.2 Zooplankton

Harald Bohlmann, Birgit Strohscher (AWI)

Objectives and methods

Studies of mesozooplankton diversity and biomass of the whole water column were addressed by means of multinet hawls (150 µm mesh size) from 5 deep-sea stations at 9 depth intervals. Vertical and horizontal biodiversity, biomass distribution patterns and length/carbon-content relationships of different-sized specimens with species from different water depths will be established. Studies of gut content and reproductive condition of dominant copepod species completed the working programme.

Work at sea

CTD measurements (SEABIRD 911plus) were carried out before the multinet was deployed in order to provide immediate information about the hydrographic structure of the water column at the sampling locations. Four profiles are displayed in Fig. 26. The multinet was successfully deployed at 4 stations. The station data are summarized in Annex 5. Samples were taken from the following depth intervals:

St. Nos. 118 and 122:	3600 - 2600 m, 2600 - 2000 m, 2000 - 1500 m, 1500 - 1000 m, 1000 - 0 m with multinet No.1 1000 - 750 m; 750 - 500 m, 500 - 300 m, 300 - 100 m, 100 - 0 m with multinet No. 2
St. Nos. 119 and 121:	3000 - 2500 m, 2500 - 2000 m, 2000 - 1500 m, 1500 - 1000 m, 1000 - 0 m with multinet No.1

Multinet No. 2 at these stations sampled the same depth intervals as in the first two stations.

All samples were carefully filtered through 100 µm sieves and preserved in a 4% formaldehhyde solution buffered with hexamethylentetramine. The 1000 - 0 m sample of multinet No.1 from each station was split into two halves by means of a plankton splitter. One half was frozen for estimating the biomass later in the laboratory, while from the other half, different species groups were sorted out on board for various analyses, e.g. length/carbon-content relationships and studies of gut content and maturity stage. The detailed analyses of the material obtained has to be done at the home institution.

4.2.3 Meiobenthos

Nicola Jane Debenham (NHM), Timothy John Ferrero(NHM), Pedro Martinez-Arbizu (FBZO), Gisela Silveira Moura (FBZO)

Objectives and methods

Recent studies have indicated the importance of the deep sea as an environment of high species diversity. Latitudinal diversity gradients in the South Atlantic are poorly studied and seem to be highly influenced by interregional variation and regional-historical processes. Patterns of diversity from the North Atlantic have been mainly derived from macrofauna and nematode studies. Only a few studies deal with other groups like foraminiferans and copepods. Our planned study will give us a first indication of latitudinal deep-sea diversity patterns in the South Atlantic. Low abundances and high variability are expected in the deep-sea, therefore a high number of replicates is needed. Quantitative samples were taken with the Multicorer.

The scope of the work is to undertake a latitudinal study of meiofauna abundances, their spatial distribution and their diversity. This allows us to correlate these parameters of the benthic fauna with surface productivity at the different stations. This work provides valuable information on the Southern Atlantic and is invaluable for comparison with data from the Madeira Abyssal Plain, Porcupine Abyssal Plain, and Arctic Ocean (Barents Sea, Laptev Sea) in the North Atlantic, and some Antarctic sampling sites in the Weddell Sea. It is hoped that the data will enable an assessment of the biogeographical range and species turnover rates of abyssal meiofauna, particularly nematodes and copepods.

Work at sea

In total, four stations were successfully sampled with the Multicorer (MUC). Two of these stations were additionally sampled with the Minicorer (MIC). An overview of the sampling regime is given in Tab. 8. The area sampled by each corer covers about 25 cm^2. The individual corers in the MUC were numbered and their position in the gear documented, so that the relative distances between replicates can be determined.

Tab. 8: Material and treatment; A: for microbiology, B: sliced for meiofauna, C: homogenisation technique for meiofauna studies and biochemistry

Station No.	Depth	MUC/MIC	Treatment
40/118	5726 m	Muc 11 corers	2 x A, 9 x B
40/119	5095 m	-	-
40/120	5130 m	Muc 12 corers	2 x A, 10 x B
40/121	5366 m	Muc 12 corers	2 x A, 10 x B
40/122	5055 m	Muc 11 corers	2 x A, 9 x B
40/121	5362 m	Mic 4 corers	2 x B, 2 x C
40/122	5102 m	Mic 4 corers	2 x B , 2 x C

For the study of the meiofauna (treatment B) the cores were sliced in 6 sections. The first section includes the first centimetre of sediment (0-1 cm) and the overlying bottom water, the remaining sections were 1-2 cm, 2-3 cm, 3-4 cm, 4-5 cm and 5-10 cm. Samples were fixed with buffered 4% formaldehyde in filtered seawater.

Homogenisation technique (treatment C): Cores were sectioned to 5 cm in 1cm horizons. Each section was homogenised to a semi-liquid state with the addition of artificial seawater and the resulting homogenate divided into two equal sub-samples. One sub-sample will be for meiofauna studies and the other for sediment biogeochemical analysis (mainly lipids and proteins) at the University of Liverpool, Dept. of Oceanography.

Preliminary results

The sediments at the four stations sampled are very different. At Station No. 40/118, in the Argentinian Basin the sediment has a significant sandy component and gravel is also observed. Station No. 40/120 is a brownish and very compact sediment, while at Station No. 40/121 (both in the Brazilian Basin) the sediment is reddish-brown, soft and with many burrows of macrofaunal organisms. The sediment at Station No. 40/122 (Cape Verde Basin) is pale, and very consistent, with a high component of Globigerina tests.

The preliminary observations of changes in sediment type along this transect, associated with likely differences in productivity and nutrient supply to the benthos, suggest that there will be detectable differences in the meiofauna. This would present similar results to those previously observed in the North Atlantic. Preliminary observations of the fauna (mainly nematodes and copepods) suggest that the greatest difference will be observed at the species level as some typical deep-sea genera have been observed. This is consistent with the concept of the deep-sea as a high diversity environment.

4.2.4 Macrobenthos

Harald Bohlmann, Dieter Gerdes (AWI), Peter Albert Lamont (SAMS)

Objectives and methods

The cruise from Punta Arenas to Bremerhaven provided the opportunity to sample deep-sea organisms across a wide range of latitudinal gradients in the Atlantic. Over the last few decades much deep-sea benthos data has been accumulated for the North Atlantic as far south as the Madeira Abyssal Plain but data for the South Atlantic is sparse. Therefore our main objective was to get as many quantitative samples as possible from the deep basins especially those of the South Atlantic by means of a multibox-corer and a newly developed rotating-corer. These samples provide the data basis for investigation of the vertical distribution of the animals in the sediment and for determining diversity trends along latitudinal gradients. The data will form part of the basis for the BIODEEP proposal.

Work at sea

The multibox-corer (MG) with the attached underwater-video system was deployed at 4 stations. During deployment at Stn. No. 40/119, the Revolvergreifer was damaged by ship movement in the rough sea and the gear could not be used again for the duration of the cruise. The multibox-corer, was not deployed at this station due to the bad weather conditions and rough sea. The results of both corers are summarized in Tab. 9

Tab. 9. Inventory of cores taken with the multibox-corer (MG) with the attached UW-video system and the Revolvergreifer (RG).

Stn. No.	water depth (m)	MG number of cores	RG number of cores
40/118	5732	0	1
40/119	5088	-	0
40/120	5152	9	-
40/121	5374	9 (*)	-
40/122	5118	9(*)	-

(*) bottom pictures via UW-video - not deployed

In total, 28 single cores were obtained from 4 stations between 47°S and 23°N for analysis of the macrofauna. The mean core length was 38 cm. Part of the MG cores from Stn. Nos. 40/120 and 40/121 had disturbed surfaces, because the cores were very full due to the soft sediments at these locations. All cores were treated according to the following procedure:

Each core was divided vertically by syphoning off the top water and removing the top centimetre, approximately, of sediment. The remainder of the core was then divided into ten centimetre slices and the sediment placed directly into five litre tubes containing 2 litres of 4% formaldehyde cooled to 4°C. As soon as possible after immediate processing of the cores, the sediment was gently manipulated by hand to mix in the formalin. Sieving through 500 and 300 µm mesh was carried out at least 3 days after collection to allow time for preservation. After sieving, samples were stored in 4 % formaldehyde prior to sorting. It is considered that this procedure improves the condition of more vulnerable fauna such as polychaetes, which are often damaged on sieves when freshly collected.

Preliminary results

The main work on the samples has to carried out at home institutions. The basis for our preliminary impression given here is due to the careful sample treatment described above and first microscopic sorting of some core fractions on board ship, especially those from the Revolvergreifer core of Stn. No. 40/118.

The dominant elements of the small, deep-sea macrofauna in our samples are polychaetes (sabellids, spionids, cirratulids, nephthyids, ophelids, and ampharetids plus a number of undetermined worms in tubes), bivalves, sipunculids and a few crustaceans. It appears that highest organism numbers occur at the southernmost station 40/118, followed by the northern station 40/122, whereas abundance values at the other two stations seemed to be lower.

The sediment at Stn. No. 40/120 is especially fine and for all 9 MG cores obtained there is virtually no material, including organisms, remaining on the 500 µm sieve, and only a few mineral grains were retained on the 300 µm sieve. Macrofauna abundance at this station appears to be very low. Samples from Stn. No. 40/121 have burrows extending the full depth of the core. Some of these burrows are up to 6 mm in diameter and 1 sipunculid worm about 40 mm in length was recovered from the base of a core at about 25 cm depth.

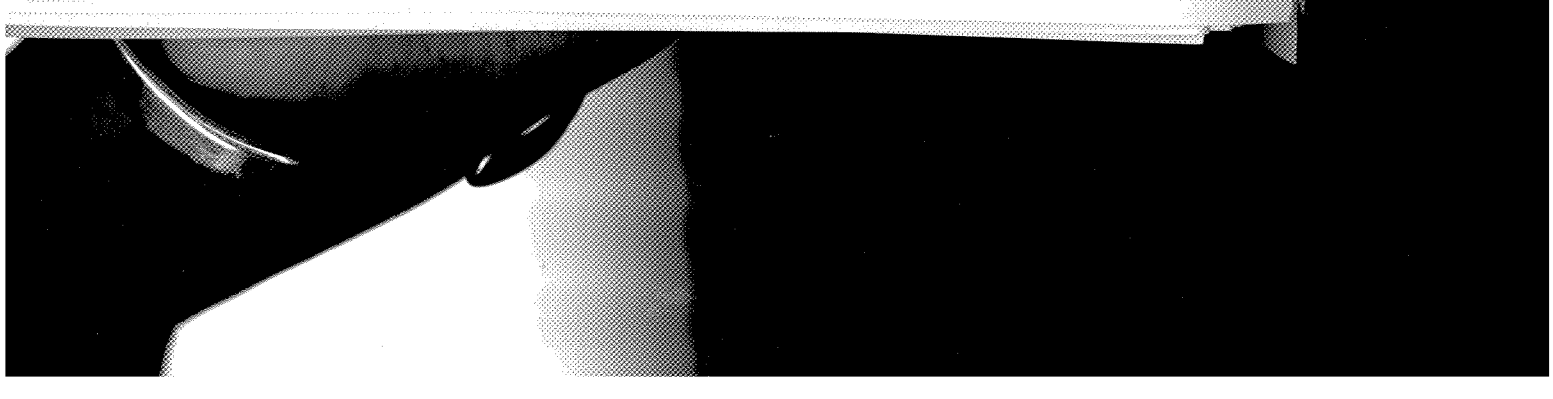
5. Acknowledgement

The achievements during both legs were to are large extent due to the effective and heartful cooperation between the ship's crews and the participating scientific personal. We are grateful to the Masters Pahl and Keil and theirs crews for the active support which helped us to overcome difficult situations and resulted not only in a scientific success, but as well in a cheerful experience. We are grateful as well to all those who were involved in the different levels of the preparations for cruise and built up the basis for our success.

6. Beteiligte Institutionen / Participating Institutions

Adresse Address		Teilnehmer Participants	Fahrtabschnitt Leg
Chile			
UACH	Instituto de Zoologia Universidad Austral de Chile Valdivia	1	4
UCV	Esc. de Cs. del Mar Universidad Catolica de Valparaiso Valparaiso	1	4
UMAG	Instituto de la Patagonia Universidad de Magallanes Avenida Bulnes Punta Arenas	3	4
Federal Republic of Germany			
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung Columbusstraße D-27568 Bremerhaven	26,8	4,5
AWIP	Alfred-Wegener-Institut für Polar- und Meeresforschung Forschungsstelle Potsdam c/o Zoologisches Museum Berlin Invalidenstr. 43 D-10115 Berlin	1	4
DWD	Deutscher Wetterdienst Seewetteramt Postfach 301190 D-20304 Hamburg	2,3	4,5
FBZO	FB/7AG Zoomorphologie Carl-von-Ossietzky-Universität D-26111 Oldenburg	1,2	4,5
HSW	Helicopter-Service Wasserthal GmbH; Kätnerweg 43 D-22393 Hamburg	4	4
IAPR	Institut für Atmosphärenphysik Schloßstr. 4-6 D-18221 Kühlungsborn	2,4	4,5

Adresse Address		Teilnehmer Participants	Fahrtabschnitt Leg
IPÖ	Institut für Polarökologie Universität Kiel Wischofstr. 1-3, Geb. 12 D-24148 Kiel	1	4
IUPB	IUP - Institut für Umweltphysik Abt. Tracer-Ozeanographie Universität Bremen, FB 1 Postfach 330 440 D-28334 Bremen	5	4
The Netherlands			
NIOZ	Netherlands Institute for Sea Research P.O. Box 59 1790 Ab den Burg Texel	2	4
UK			
NHM	The Natural History Museum Department of Zoology Cromwell Road London, SW7B 5BD	2	5
SAMS	The Scottish Association for Marine Science P.O. Box 3 Oban, Argyll PA34 4AD, Scotland	1	5
Russia			
ZMMU	Zoological Museum of the Moscow University Bolshaya Nikitskaya 6 Moscow, 103009	1	4



7. Fahrtteilnehmer/ Cruise participants

ANT XIII/4

Name	Vorname	Institut
Arntz	Wolf	AWI
Bakker	Karel	NIOZ
Bittkau	Anke	AWI
Böhm	Joachim	HSW
Büchner	Jürgen	HSW
Bulsiewicz	Klaus	IUPB
Buschmann	Alexander	AWI
Dubischar	Corinna	AWI
Eska	Veit	IAPR
Fahrbach	Eberhard	AWI
Fraas	Gerhard	IUPB
George	Kai Horst	FBZO
Gerdes	Dieter	AWI
Gorny	Janja	AWI
Gorny	Matthias	AWI
Hansjosten	Andreas	AWI
Heras De las	Miriam	AWI
Höffner	Josef	IAPR
Hoppema	Mario	AWI
Horstmann	Uta	AWI
Jochum	Markus	AWI
Köhler	Herbert	DWD
Kolb	Leif	AWI
Lardies Carrasco	Marco Antonio	UACH
Linse	Katrin	IPÖ
Maturnana	Jenny	UCV
Meyer	Ralf	AWI
Möller	Hans-Joachim	DWD
Montiel	Americo	UMAG
Mühlebach	Anneke	AWI
Mutschke	Erika	UMAG
Nowaczyk	Jochen	AWI
Rauschert	Martin	AWIP
Riewesell	Christian	HSW
Rios	Carlos	UMAG
Rohardt	Gerd	AWI
Rohr	Harald	AWI
Runge	Malte	IUPB
San Miguel	Esteban	Armada de Chile
Schlenker	Björn	IUPB
Schneider	Hans	HSW
Schröder	Michael	AWI
Sieverding	Hiltrud	IUPB
Spiridonov	Vassili	ZMMU
Stoll	Michel	NIOZ

Name	Vorname	Institut
Tan	GiokNio	AWI
Winterrath	Tanja	AWI
Wisotzki	Andreas	AWI
Witte	Hannelore	AWI
Woodgate	Rebecca	AWI
Zimmermann	Andreas	AWI

ANT XIII/5

Alpers	Matthias	IAPR
Bohlmann	Harald	AWI
Debenham	Nicola Jane	NHM
Dunker	Erich	AWI
England	Joachim	DWD
Eska	Veit	IAPR
Ferrero	Timothy John	NHM
Gerdes	Dieter	AWI
Helmke	Elisabeth	AWI
Höffner	Josef	IAPR
Klauke	Ulla	AWI
Knuth	Edmund	DWD
Köhler	Herbert	DWD
Lamont	Peter Albert	SAMS
Martinez-Arbizu	Pedro	FBZO
Menßen	Klaus	AWI
Schröder	Sabine	AWI
Silveira Moura	Gisela	FBZO
Strohscher	Birgit	AWI
Zahn von	Ulf	IAPR

8. Schiffspersonal/ Ship's Crew

	ANT XIII/4	ANT XIII/5
Kapitän	Pahl	Keil
1. nautischer Offizier	Keil	Rodewald
Leitender techn. Offizier	Schulz	Schulz
2. nautischer Offizier	Block	Block
2. nautischer Offizier	Schwarze	Schwarze
2. nautischer Offizier	Spielke	
Arzt	Schuster	Schuster
Funfoffizier	Koch	Hecht
2. technischer Offizier	Delff	Delff
2. technischer Offizier	Folta	Folta
2. technischer Offizier	Simon	Simon
Elektroniker	Dimmler	
Elektroniker	Fröb	Fröb
Elektroniker	Holtz	Holtz
Elektroniker	Pabst	Pabst
Elektroniker	Piskorzynski	
Schiffbetriebsmeister	Loidl	Loidl
Zimmermann	Neisner	Neisner
Facharbeiter/Deck	Bäcker	Bäcker
Facharbeiter/Deck	Bohne	
Facharbeiter/Deck	Burzan	
Facharbeiter/Deck	Hagemann	
Facharbeiter/Deck	Hartwig	Hartwig
Facharbeiter/Deck	Kreis	
Facharbeiter/Deck	Moser	Moser
Facharbeiter/Deck	Schmidt	Schmidt
Storekeeper	Renner	Renner
Facharbeiter/Maschine	Dinse	Dinse
Facharbeiter/Maschine	Fritz	Fritz
Facharbeiter/Maschine	Hartmann	Arias Iglesias
Facharbeiter/Maschine	Krösche	Krösche
Facharbeiter/Maschine	Schade	Schade
Koch	Silinski	Silinski
Kochsmaat	Hünecke	
Kochsmaat	Tupy	Tupy
1. Stewardess	Dinse	Dinse
Stewardess/Krankenschwester	Lehmbecker	Lehmbecker
2. Stewardess	Klemet	Klemet
2. Stewardess	Schmidt	Schmidt
2. Stewardess	Silinski	Silinski
2. Steward	Tu	Huang.
2. Steward	Wu	Mui
Wäscher	Yu	Yu

9. Appendix 1, Stationsliste/Station list ANT XIII/4

Date	Station No.	Time (UTC)	Latitude	Longitude	Depth (m)	Operation
19.03.96	40/001	10.05 10.46	40°07.7'S	23°24.6'E	4859	CTD
20.03.96	40/002	13.21 14.48	44°00.2'S	27°05.2'E	5487	CTD
23.03.96	40/003	06.02 08.11	54°00.0'S	38°59.8'E	3326	CTD
	40/004	09.29 11.44	54°00.0'S	38°47.0'E	3578	CTD, APSN
	40/005	14.00 18.35	53°59.9'S	38°22.9'E	4044	CTD, MN, APSN, CTD
	40/006	22.05 01.22	54°00.2'S	37°36.6'E	4688	CTD
24.03.96	40/007	04.23 10.06	54°00.0'S	36°45.0'E	4770	CTD, APSN, CTD, MN
	40/008	14.23 17.45	53°59.9'S	35°50.1'E	4862	CTD
25.03.96	40/009	00.47 04.01	54°00.0'S	34°08.1'E	5423	CTD
	40/010	10.05 13.18	54°00.0'S	32°27.2'E	5455	CTD
	40/011	20.04 23.30	53°59.9'S	30°45.9'E	5039	CTD, APSN
26.03.96	40/012	09.22 12.52	54°00.2'S	29°06.6'E	4613	CTD
	40/013	19.42 23.14	54°00.1'S	27°23.0'E	4291	CTD, MN, CTD, APSN
27.03.96	40/014	07.11 13.48	54°00.0'S	26°30.2'E	4743	CTD, ADCP, CTD
	40/015	17.06 23.18	54°00.1'S	25°44.4'E	3304	RMT, CTD, MN, CTD
28.03.96	40/016	03.30 05.46	53°47.8'S	24°41.0'E	3564	CTD
	40/017	12.03 14.43	54°45.2'S	24°38.4'E	3551	CTD, APSN
	40/018	21.41 00.46	55°30.0'S	23°26.2'E	4569	CTD
29.03.96	40/019	06.56 13.38	56°15.1'S	22°14.7'E	5102	CTD, MN, CTD, RMT
	40/020	19.14 22.06	57°00.0'S	21°00.4'E	4903	CTD
30.03.96	40/021	06.53 09.56	57°10.8'S	19°08.6'E	4813	CTD
	40/022	18.45 22.11	57°21.4'S	17°15.4'E	4940	CTD, MN, CTD, APSN
31.03.96	40/023	08.42 11.30	57°32.4'S	15°22.7'E	5144	CTD

	40/024	19.27 23.16	57°42.8'S	13°29.2'E	5508	CTD
01.04.96	40/025	08.04 15.21	57°53.4'S	11°35.1'E	5619	CTD, MN, CTD, RMT
02.04.96	40/026	00.54 04.45	58°04.2'S	9°40.5'E	5503	CTD
	40/027	11.54 16.58	58°14.8'S	7°45.5'E	4095	CTD, RL test ADCP test, ACM test, RL test
03.04.96	40/028	00.10 06.56	58°25.4'S	5°50.0'E	5115	CTD, MN, CTD, APSN, RMT
	40/029	13.05 16.45	58°36.6'S	3°53.5'E	5397	CTD
	40/030	22.17 01.33	58°47.0'S	1°56.8'E	4447	CTD
04.04.96	40/031	07.59 18.05	59°00.0'S	0°00.0'E	4592	CTD, MN, APSN, BO, CTD, 227-3 DPL
05.04.96	40/032	06.30 15.53	59°27.5'S	3°10.5'W	5007	227-2 REC, CTD
07.04.96	40/033	04.10 13.30	54°23.4'S	3°17.9'W	2551	CTD, BO5 REC, BO6 DPL, ACM test
09.04.96 10.04.96	40/034	06.04 21.12	50°11.2S	5°53.9'E	3851	PF8 REC, CTD, MN, CTD, ADCP, PF6 DRD, PF4 DRD
12.04.96	40/035	08.17 14.54	55°00.0'S	0°00.1'W	1705	CTD, MN, ADCP, APSN, CTD, ACM test, RMT,
	40/036	18.02 22.07	55°29.9'S	0°00.0'E	3750	CTD, ADCP
13.04.96	40/037	02.12 07.38	56°00.0'S	0°00.1'W	3788	CTD, MN, APSN, ADCP
	40/038	14.07 23.45	56°59.9'S	0°04.0'E	3614	228 DPL, CTD, MN, ADCP, APSN, CTD, RMT
14.04.96	40/039	02.59 05.35	57°30.1'S	0°00.0'E	3908	CTD
	40/040	10.12 13.03	58°00.2'S	0°00.2'W	4502	CTD
	40/041	16.17 18.52	58°30.0'S	0°00.0'E	4202	CTD
15.04.96	40/042	22.17 01.20	59°00.2'S	0°00.1'W	4570	CTD
	40/043	04.59 07.45	59°29.9'S	0°00.0'E	4606	CTD
	40/044	10.57 17.35	60°00.2'S	0°00.3'W	5342	CTD, MN, CTD, APSN, RMT
16.04.96	40/045	20.55 00.03	60°30.6'S	0°00.5'W	5352	CTD
	40/046	03.12 06.35	61°00.1'S	0°00.1'W	5352	CTD
	40/047	09.46 13.40	61°30.2'S	0°00.3'W	5378	CTD, 3 ACM test

	40/048	16.47 23.14	61°59.9'S	0°00.0'E	5356	CTD, MN, CTD, APSN, RMT
17.04.96	40/049	02.49 06.05	62°30.0'S	0°00.0'E	5332	CTD
	40/050	09.16 10.40	63°00.2'S	0°00.1'E	5287	MN, CTD, APSN
	40/051	16.57 20.54	63°30.1'S	0°00.2'W	5251	CTD, ADCP
18.04.96	40/052	00.19 12.12	64°00.1S	0°00.2'W	5177	CTD, MN, APSN, CTD, 229 DPL
	40/053	15.52 18.50	64°29.9'S	0°00.3'W	4635	CTD
19.04.96	40/054	21.58 03.02	65°00.1'S	0°01.0'E	3684	CTD, APSN, MN, CTD
	40/055	06.45 09.12	65°35.1'S	0°00.0'E	3768	CTD
	40/056	12.42 21.55	65°59.9'S	0°01.8'W	3471	230 DPL, CTD, MN, APSN, CTD
20.04.96	40/057	01.06 11.14	66°30.1'S	0°00.0'E	4518	CTD, MN, BO, APSN, CTD, RMT, 231 DPL
	40/058	15.06 18.08	67°00.0'S	0°00.2'E	4679	CTD
21.04.96	40/059	21.20 00.15	67°30.1'S	0°00.3'E	4605	CTD
	40/060	03.31 09.01	68°00.0'S	0°00.3'E	4483	CTD, MN, APSN, BO, CTD
	40/061	12.12 15.24	68°30.1'S	0°00.5'E	4230	CTD, ACM test
22.04.96	40/062	18.30 00.28	68°59.9'S	0°00.2'W	3364	CTD, MN, CTD, APSN, RMT
	40/063	02.13 04.14	69°15.0'S	0°00.2'E	2553	CTD
	40/064	07.08 09.50	69°00.0'S	0°00.6'W	3352	232 DPL
	40/065	14.07 17.40	69°24.5'S	0°02.3'E	2051	233 DPL, CTD
23.04.96	40/066	20.42 00.25	69°38.5'S	0°07.4'W	1849	CTD, MN, CTD
24.04.96	40/067	08.34 08.56	70°26.5'S	8°23.9'W	397	CTD
25.04.96	40/068	04.00 05.31	71°01.3'S	11°36.6'W	378	CTD, ADCP
	40/069	07.30 10.20	70°57.5'S	11°41.5'W	752	CTD, MN, ADCP
	40/070	13.24 14.50	70°53.6'S	12°00.5'W	1595	CTD
	40/071	18.35 23.42	70°37.4'S	12°42.4'W	2157	CTD, APSN, MN, BO, ADCP, CTD
26.04.96	40/072	03.47 05.35	70°22.0'S	13°35.2W	2973	CTD

	40/073	07.02 10.52	70°20.6'S	13°37.4'W	3668	CTD, ADCP
	40/074	11.54 16.07	70°18.7'S	13°44.0'W	4326	ADCP, CTD
27.04.96	40/075	20.00 02.57	69°59.3'S	14°44.0'W	4715	CTD, MN, ADCP, CTD
	40/076	06.28 09.53	69°39.4'S	15°39.4'W	4774	CTD
	40/077	14.14 17.39	69°14.7'S	16°48.8'W	4734	CTD
28.04.96	40/078	22.24 01.28	68°50.1'S	17°54.3'W	4766	CTD
	40/079	05.48 11.05	68°25.1'S	18°55.8'W	4797	CTD, MN, CTD
	40/080	15.41 18.44	68°00.0'S	19°58.9'W	4886	CTD
29.04.96	40/081	00.17 03.47	67°41.5'S	21°38.6'W	4892	CTD, APSN
	40082	09.26 12.30	67°23.2'S	23°17.2'W	4866	CTD
30.04.96	40083	18.10 01.31	67°03.5'S	24°52.2'W	4834	CTD, APSN, CTD
	40084	08.30 13.15	66°37.3'S	27°07.6'W	4845	CTD
01.05.96	40085	21.36 01.06	66°21.9'S	29°29.9'W	4795	CTD
	40086	11.00 16.57	66°07.9'S	31°51.4'W	4772	CTD, APSN, MN, CTD, ACM test
02.05.96	40087	23.14 02.25	65°57.9'S	33°20.0'W	4777	CTD
	40088	09.15 12.40	65°48.6'S	34°57.6'W	4740	CTD
	40089	18.55 22.06	65°38.3'S	36°29.9'W	4750	CTD
03.05.96	40090	06.30 10.50	65°27.3'S	38°01.6'W	4704	CTD, MN, BO, CTD, APSN
	40091	18.54 21.59	65°11.8'S	39°33.0'W	4752	CTD
04.05.96	40092	04.28 0806	65°00.8'S	41°03.7'W	4743	CTD
	40093	14.04 17.45	64°48.5S	42°28.5'W	4694	CTD
05.05.96	40094	04.27 07.30	64°37.4'S	44°10.0'W	4596	CTD, MN, CTD, APSN
	40095	16.12 19.10	64°25.4'S	45°49.6'W	4428	CTD
06.05.96	40096	02.23 03.30	64°11.5'S	47°29.7'W	4178	CTD
	40097	12.06 17.09	63°57.0'S	49°07.6'W	3524	CTD, 216/2 DPL

07.05.96	40098	22.04 02.09	63°50.9'S	50°02.4'W	2863	CTD, ADCP
	40099	11.15 20.45	63°44.1'S	50°50.6'W	2506	CTD, MN, APSN, BO, CTD, ADCP, 207/4 DPL
08.05.96	40100	04.23 10.49	63°37.7'S	51°31.0'W	2025	CTD, ADCP, 236 DPL
	40101	13.15 17.20	63°32.8'S	52°06.0'W	989	CTD, APSN, ADCP, 206/4 DPL
09.05.96	40102	21.33 00.52	63°20.1'S	52°47.6'W	448	215/3 DPL, CTD, MN
	40103	15.22 16.52	62°52.6'S	53°39.5'W	290	CTD, 234 DPL
11.05.96	40104	20.03 21.49	62°15.4'S	57°39.2'W	1974	RMT, CTD, APSN
12.05.96	40105	17.03 19.56	59°21.7'S	61°07.8'W	4115	CTD
14.05.96 15.05.96	40106	12.10 09.54	55°47.8'S	65°48.8'W	2550	CTD, Dredge, AGT, EBS, MUC, FTS
16.05.96	40107	10.56 02.18	55°47.5'S	65°58.8'W	1518	CTD, AGT, EBS, MUC, MKG, MKG, GKG
	40108	04.14 07.35	55°44.1'S	66°16.9'W	187	CTD, AGT, MKG, MKG
	40109	12.42 18.29	55°44.2'S	66°14.9'W	428	CTD, Dredge, MKG, MUC, EBS, FTS
17.05.96	40110	20.58 01.08	55°26.5'S	66°14.3'W	105	CTD, AGT, EBS, MKG, MUC, FTS
	40111	03.47 15.00	55°28.8'S	66°04.5'W	1147	CTD, AGT, EBS, MKG, MUC, EBS
	40112	19.43 21.27	55°44.2'S	66°14.8'W	386	FTS (Abbruch), FTS
	40113	22.16 23.03	55°44.5'S	66°17.2'W	176	FTS
18.05.96	40114	00.56 12.03	55°33.4'S	65°54.6'W	2468	CTD, AGT, MKG, MUC
	40115	14.35 17.37	55°27.4'S	66°05.7'W	580	AGT, MKG, MKG
	40116	18.33 19.37	55°28.1'S	66°09.1'W	336	MUC, FTS
	40117	20.20 21.23	55°24.9'S	66°15.6'W	98	AGT, AGT

ACM=Acoustic module
ADCP=Acoustic Doppler Current Profiler
AGT=Agassiz trawl
APSN=Apstein net
BO=Bongo net
CTD=Conductivity, temperature, depth-sonde
DPL=Mooring deployment
DRD=Dredging of mooring
EBS=Epibenthos sledge
FTS=Foto sledge
MKG=Multiboxcorer
MN=Multinet
MUC=Multicorer
REC=Mooring recovery
RL=Acoustic releaser
RMT=Rectangular Midwater Trawl

10. Appendix 2, XBT Data ANT XIII/4

No.		Date	Time (GMT)	Latitude	Longitude	Depth (m)
001		18.03.1996	17.54	37°52'S	21°23'E	5074
002			20.03	38°12'S	21°41'E	5205
004			22.06	38°33'S	21°59'E	5119
005			23.55	38°50'S	22°15'E	4988
006	f	19.03.1996	02.09	39°12'S	22°34'E	5165
007			02.18	39°13'S	22°36'E	5156
008			03.59	39°27'S	22°49'E	5128
009	f		05.59	39°44'S	23°03'E	5126
010			06.09	39°44'S	23°03'E	5139
011			08.02	39°54'S	23°15'E	5041
012			11.19	40°10'S	23°27'E	4791
013			13.44	40°24'S	23°39'E	4460
014			17.58	40°34'S	23°48'E	4348
015			20.00	40°55'S	24°08'E	4327
016			21.59	41°15'S	24°27'E	4008
017			23.58	41°37'S	24°47'E	2714
018		20.03.1996	01.59	41°59'S	25°09'E	3534
019			03.02	42°12'S	25°20'E	3765
020			04.00	42°22'S	25°30'E	4157
021			05.00	42°33'S	25°40'E	4469
022			05.55	42°43'S	25°50'E	4731
023			07.00	42°55'S	26°01'E	4981
024			08.02	43°06'S	26°13'E	4987
025			08.59	43°17'S	26°23'E	5376
026			09.56	43°28'S	26°33'E	5223
027			10.55	43°38'S	26°43'E	5400
028			11.57	43°48'S	26°53'E	5704
029			13.04	43°59'S	27°04'E	5270
030			17.00	44°02'S	27°08'E	5300
031			18.02	44°12'S	27°19'E	5404
032			18.59	44°21'S	27°28'E	5454
033			20.06	44°33'S	27°39'E	5414
034			20.59	44°41'S	27°48'E	5422
035			22.00	44°49'S	28°00'E	5385
036	f		23.03	44°59'S	28°10'E	5416
037	f		23.11	44°59'S	28°10'E	5420
038			23.14	45°00'S	28°11'E	5422
039			23.58	45°08'S	28°20'E	5180
040		21.03.1996	00.59	45°17'S	28°30'E	5829
041			02.00	45°26'S	28°40'E	5404
042			02.59	45°36'S	28°50'E	5281
043			03.59	45°44'S	29°00'E	5274
044			04.56	45°54'S	29°11'E	5354
045			06.00	46°05'S	29°23'E	4283
046			07.00	46°15'S	29°35'E	5318
047			08.00	46°24'S	29°46'E	5247
048			09.00	46°35'S	29°56'E	4991

049		09.59	46°44'S	30°07'E	5430
050		11.03	46°54'S	30°18'E	5220
051		11.58	47°03'S	30°29'E	4309
052		12.58	47°13'S	30°40'E	4135
053		14.00	47°23'S	30°51'E	4463
054		14.56	47°31'S	31°01'E	5102
055		15.55	47°39'S	31°10'E	2769
056		16.55	47°48'S	31°20'E	3697
057		17.56	47°57'S	31°31'E	4513
058		18.56	48°07'S	31°42'E	5603
059		19.57	48°16'S	31°53'E	4579
060		20.56	48°26'S	32°03'E	2648
061		21.57	48°35'S	32°15'E	3975
062		22.58	48°45'S	32°27'E	3973
063	22.03.1996	00.01	48°55'S	32°39'E	4411
064		00.59	49°04'S	32°50'E	4066
065	f	01.59	49°14'S	33°01'E	4003
066		02.07	49°15'S	33°03'E	3966
067		02.57	49°23'S	33°12'E	4975
069		04.55	49°42'S	33°35'E	4074
069		06.03	49°54'S	33°49'E	5237
070		06.59	50°03'S	34°00'E	4733
071		07.58	50°11'S	34°12'E	4610
072		08.59	50°20'S	34°23'E	4566
073		09.58	50°30'S	34°34'E	5163
074		10.57	50°39'S	34°44'E	5235
075		12.04	50°50'S	34°58'E	5185
076		12.58	50°58'S	35°07'E	4880
077		13.53	51°07'S	35°18'E	4775
078		14.57	51°17'S	35°31'E	4901
079		15.55	51°26'S	35°42'E	5198
080		16.55	51°36'S	35°55'E	4261
081		17.57	51°46'S	36°08'E	4875
082		19.00	51°58'S	36°23'E	4596
083		20.08	52°10'S	36°39'E	4237
084		21.01	52°21'S	36°52'E	4516
085		22.01	52°32'S	37°07'E	4508
086		23.06	52°45'S	37°22'E	4492
087	23.03.1996	00.00	52°55'S	37°36'E	4459
088		00.57	53°06'S	37°50'E	4412
089		02.02	53°19'S	38°06'E	4296
090		03.00	53°30'S	38°21'E	4271
091		03.59	53°41'S	38°35'E	4185
092		04.58	53°53'S	38°50'E	3500
093		18.46	54°01'S	38°20'E	4129
094		19.55	54°01'S	38°03'E	4314
095		21.04	54°00'S	37°46'E	4622
096	24.03.1996	02.02	54°00'S	37°26'E	4710
097		02.53	54°00'S	37°10'E	4736
098		03.50	54°00'S	36°53'E	4772
099		11.09	54°00'S	36°36'E	4560

100		12.17	54°00'S	36°19'E	4844
101		13.23	54°00'S	36°02'E	4701
102		18.18	54°00'S	35°45'E	4724
103		19.32	53°59'S	35°28'E	4822
104		20.42	54°00'S	35°11'E	5034
105		21.52	54°01'S	34°54'E	4778
106		22.58	54°00'S	34°37'E	5310
107	25.03.1996	00.05	54°00'S	34°17'E	5327
108		04.32	54°00'S	34°02'E	5432
109		05.40	54°00'S	33°42'E	5440
110		06.37	54°00'S	33°25'E	4571
111		07.40	54°00'S	33°07'E	5448
112		08.32	54°00'S	32°51'E	5433
113		09.29	54°00'S	32°34'E	5296
114		14.00	54°00'S	32°17'E	5470
115		14.57	54°00'S	32°00'E	4630
116		16.12	53°59'S	31°43'E	5483
117		17.20	53°59'S	31°25'E	5514
118		18.31	54°00'S	31°07'E	5483
119		19.29	54°00'S	30°52'E	4981
120	26.03.1996	00.06	54°00'S	30°36'E	5272
121		01.09	54°00'S	30°19'E	5510
122		02.28	54°00'S	30°01'E	5044
123		03.39	54°00'S	29°44'E	5510
124		04.51	54°00'S	29°27'E	5227
125		06.04	54°00'S	29°10'E	4603
126		13.51	54°00'S	28°54'E	5294
127		14.59	54°00'S	28°34'E	4871
128		15.53	54°00'S	28°19'E	5173
129		16.56	54°00'S	28°02'E	4053
130		18.06	54°00'S	27°45'E	5297
131	27.03.1996	01.49	54°02'S	27°21'E	4185
132		02.58	54°01'S	27°03'E	4544
133		04.46	54°00'S	26°46'E	4896
134		14.02	54°00'S	26°29'E	4779
135		15.05	54°00'S	26°13'E	3302
136		16.04	54°00'S	25°55'E	3318
137		23.54	54°00'S	25°35'E	4179
138	28.03.1996	00.42	54°00'S	25°22'E	4147
139		01.43	53°58'S	25°04'E	4534
140		02.41	53°52'S	24°51'E	4844
141		06.15	53°46'S	24°37'E	3294
142		07.21	53°58'S	24°38'E	4132
143		08.13	54°08'S	24°38'E	4935
144		09.13	54°19'S	24°37'E	4518
145		10.08	54°29'S	24°37'E	4186
146		11.16	54°41'S	24°36'E	4449
147		16.38	54°54'S	24°22'E	3823
148		17.38	55°01'S	24°11'E	4141
149		18.36	55°08'S	23°59'E	3870
150		19.36	55°16'S	23°48'E	3961

151		20.33	55°23'S	23°37'E	4685
152	29.03.1996	01.05	55°32'S	23°26'E	4668
153		02.07	55°38'S	23°12'E	4657
154		03.02	55°46'S	23°02'E	5115
155		04.05	55°54'S	22°49'E	5237
156		05.02	56°02'S	22°37'E	5113
157		06.05	56°10'S	22°23'E	5088
158		13.57	56°14'S	22°09'E	5222
159		15.03	56°26'S	21°57'E	4805
160		16.01	56°34'S	21°44'E	5116
161		17.19	56°45'S	21°25'E	5023
162		18.09	56°52'S	21°13'E	5009
163		22.22	57°00'S	21°01'E	4738
164		23.20	57°01'S	20°46'E	5213
165	30.03.1996	10.34	57°11'S	19°06'E	4824
166		11.53	57°12'S	18°46'E	4878
167		12.51	57°14'S	18°32'E	4994
168		13.49	57°16'S	18°19'E	4941
169		14.52	57°17'S	18°04'E	5318
170		16.23	57°19'S	17°44'E	3850
171		17.57	57°21'S	17°23'E	5396
172	31.03.1996	00.14	57°23'S	17°12'E	4803
173		02.01	57°25'S	16°48'E	5327
174		03.34	57°27'S	16°26'E	5116
175		04.59	57°29'S	16°06'E	5351
176		06.33	57°30'S	15°46'E	5232
177		07.59	57°32'S	15°29'E	4965
178		12.20	57°32'S	15°29'E	5345
179		13.46	57°35'S	14°52'E	5655
180		14.56	57°37'S	14°34'E	4955
181		16.30	57°39'S	14°11'E	5607
182		18.00	57°41'S	13°49'E	5711
183		23.34	57°43'S	13°28'E	5513
184	01.04.1996	01.04	57°45'S	13°07'E	5655
185		02.27	57°47'S	12°48'E	5550
186		04.01	57°49'S	12°24'E	5506
187		05.38	57°51'S	12°02'E	5175
188		07.08	57°52'S	11°44'E	5609
189		15.55	57°54'S	11°22'E	5999
190		17.30	57°36'S	11°02'E	5379
191		19.01	57°58'S	10°46'E	5375
192		20.35	58°00'S	10°29'E	5570
193		22.11	58°01'S	10°12'E	5621
194		23.30	58°02'S	09°57'E	5589
195	02.04.1996	05.07	58°05'S	09°36'E	5501
196		06.24	58°06'S	09°18'E	5284
197		07.40	58°08'S	08°56'E	4947
198		08.45	58°10'S	08°38'E	4908
199		09.42	58°11'S	08°21'E	4440
200		10.42	58°13'S	08°04'E	3248
201		17.17	58°16'S	07°42'E	3998

202		18.29	58°17'S	07°20'E	4009
203		19.25	58°19'S	07°03'E	5004
204		20.31	58°20'S	06°45'E	5067
205		21.56	58°22'S	06°26'E	5342
206		23.10	58°24'S	06°06'E	5143
207	03.04.1996	07.12	58°27'S	05°44'E	5172
208		08.07	58°28'S	05°27'E	5040
209		09.04	58°29'S	05°10'E	5331
210		10.00	58°31'S	04°52'E	5209
211		11.02	58°33'S	04°32'E	5445
212		12.13	58°35'S	04°10'E	5514
213		17.05	58°37'S	03°48'E	5083
214		18.14	58°39'S	03°22'E	5611
215		18.58	58°41'S	03°06'E	4722
216		19.55	58°43'S	02°45'E	4925
217		20.58	58°45'S	02°21'E	4983
218		21.55	58°47'S	02°01'E	4186
219	04.04.1996	02.38	58°48'S	01°43'E	4644
220		03.50	58°50'S	01°22'E	4734
221		04.50	58°53'S	01°02'E	5326
222		05.47	58°55'S	00°43'E	4028
223		06.47	58°57'S	00°22'E	3912
224		07.36	59°00'S	00°04'E	4459
225	05.04.1996	16.50	59°24'S	03°11'W	4765
226		18.00	59°13'S	03°11'W	4897
227		19.05	59°02'S	03°12'W	4994
228		20.18	58°52'S	03°12'W	5371
229		21.24	58°42'S	03°10'W	4017
230		22.28	58°32'S	03°09'W	4535
231		23.37	58°22'S	03°11'W	4978
232	06.04.1996	00.49	58°12'S	03°13'W	3723
233		01.00	58°10'S	03°13'W	4187
234		01.44	58°03'S	03°13'W	4656
235		02.52	57°53'S	03°13'W	3688
236		04.05	57°43'S	03°13'W	3653
237		05.04	57°33'S	03°14'W	3984
238		06.07	57°23'S	03°14'W	3788
239		07.12	57°13'S	03°14'W	3895
240		08.17	57°03'S	03°14'W	4022
241		09.26	56°53'S	03°14'W	3461
242		10.36	56°43'S	03°14'W	3325
243		13.20	56°33'S	03°14'W	3731
244		14.21	56°23'S	03°15'W	3774
245		15.26	56°13'S	03°15'W	2834
246		16.28	56°03'S	03°16'W	3616
247		17.32	55°53'S	03°16'W	2812
248		18.36	55°43'S	03°16'W	4623
249		19.35	55°33'S	03°16'W	1834
250		20.42	55°23'S	03°16'W	3011
251		21.49	55°13'S	03°17'W	3154
252		22.58	55°03'S	03°17'W	3219

12. Appendix 4, Summary of AGT catches south of Isla Nueva

AGT No.	1	2	3	4	5	6	7	8
Station No.	40/106	40/107	40/108	40/109	40/110	40/111	40/114	40/115
Date	14/05/96	15/05/96	16/05/96	16/05/96	17/05/96	18/05/96	18/05/96	18/05/96
Average depth [m]	2505	1507	185	430	107	1270	2165	780
Duration of haul [min]	30	30	18	15	17	30	31	15
Porifera	0	-	-	+	+	0	0	+
Hydroidea	-	-	+	+	-	-	-	-
Actiniaria	0	-	-	-	-	0	-	-
Gorgonaria	0	+	-	+	-	+	+	+
Pennatularia	-	0	0	-	0	0	+	-
Alcyonaria	0	-?	-	-	-	-	0	-
Scleractinia	0	0	0	++	0	-	+	+
Nemertini	0	0	0	-	0	0	0	0
Bivalvia	0	0	+	-	++	-	0	-
Aplacophora	0	0	0	0	0	0	0	0
Prosobranchia	0	0	-	-	+	-	-	-
Ophistobranchia	0	0	0	-	-	0	0	-
Polyplacophora	0	0	-	-	-	0	0	0
Cephalopoda Octopoda	0	0	0	-	-	0	-	0
Scaphopoda	0	0	0	0	0	0	0	0
Polychaeta Sedentaria	-	-	-	-	+	0	0	+
Polychaeta Errantia	-	-	-	+	-	-	-	-
Priapulida	0	0	0	0	0	0	0	0
Sipunculida	0	0	0	-	-	0	0	0
Echiurida	0	0	0	0	0	0	0	-
Cirripedia	0	-	0	0	0	-	+	0
Amphipoda	-	-	0	-	-	0	-	-
Isopoda	-	-	-	-	-	-	-	-
Cumacea	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
Decapoda Natantia	-	+	0	-	+	++	-	-
Decapoda Reptantia	0	-	+	+	+	++	0	+
Pantopoda	0	-	-	-	-	0	-	0
Bryozoa	0	-	-	+	+	-	0	+
Brachiopoda	0	0	0	-	-	0	0	0
Pterobranchia	0	0	+	++	++	-	0	-
Ophiuroidea	0	-	+	++	++	-	-	+
Asteroidea	0	0	-	-	+	0	-	-
Echinoidea	-	0	-	-	+	0	-	0
Crinoidea	-	0	+	-	0	0	0	-
Holothuroidea	+	0	0	-	-	0	-	-
Ascidiacea	0	0	-	0	0	0	0	-
Pisces	0	-	-	0	+	++	-	-
Total amount [kg]	0.25	4	2	80	200	20	20	15

0 absent - rare + regular occurrence ++ very abundant/dominant

13. Appendix 5, Stationsliste/Station list ANT XIII/5

Date	Station No.	Time (UTC)	Latitude	Longitude	Depth (m)	Operation
25.05.96	40/118	02.47	47°02,2´S	55°05,4´W	5751	CTD, MIC
		06.32				
		07.10	47°04,1´S	55°05,3´W	5732	MKG
		11.30				
		11.59	47°04,9´S	55°05,5´W	5730	TWS
		16.24				
		16.49	47°05,6´S	55°06,8´W	5733	MN (3600-1000 m)
		20.07				
		20.45	47°04,5´S	55°05,1´W	5744	MN (1000 - 0 m)
		21.40				
26.05.96		22.12	47°04,7´S	55°05,2´W	5721	RG
		02.04				
		02.50	47°04,9´S	55°05,6´W	5726	MUC
		07.05				
28.05.96	40/119	14.49	37°59,9´S	43°00,1´W	5088	CTD, MIC
		17.50				
		18.34	38°00,6´S	43°02,3´W	5088	RG
		22.28				
29.05.96		23.24	38°02,8´S	43°05,6´W	5092	MN (3000 - 1000 m)
		01.56				
		02.10	38°02,0´S	43°05,6´W	5095	MUC
		06.07				
		06.34	38°02,3´S	43°07,6´W	5088	MN (1000 - 0 m)
		07.29				
		07.54	38°02,8´S	43°08,2´W	5092	TWS
		12.07				
03.06.96	40/120	16.33	14°59,9´S	29°02,7´W	5130	MUC
		20.18				
04.06.96		21.00	14°59,7´S	29°02,2´W	5152	MKG
		00.46				
06.06.96	40/121	00.55	04°00,1´S	27°12,2´W	5362	CTD, MIC
		04.43				
		05.11	03°59,8´S	27°11,6´W	5366	MUC
		08.39				
		08.48	03°59,9´S	27°11,1´W	5362	MKG (Abbruch)
		10.07				
		10.21	04°00,6´S	27°10,8´W	5374	MKG
		14.27				
		14.43	04°00,6´S	27°10,4´W	5372	MN (3000 - 1000 m)
		17.30				
		17.55	04°00,5´S	27°10,2´W	5374	TWS
		22.19				
		22.29	04°00,8´S	27°09,0´W	5371	MN (1000 - 0 m)
		23.29				

253	07.04.1996	00.06	54°53'S	03°17'W	2699
254		01.17	54°44'S	03°17'W	2542
255		02.22	54°35'S	03°17'W	2698
256		03.37	54°25'S	03°18'W	1812
257		13.55	54°19'S	03°13'W	2520
258		15.00	54°11'S	02°55'W	2302
259		16.01	54°03'S	02°38'W	2592
260		17.05	53°56'S	02°21'W	2157
261		18.03	53°49'S	02°04'W	2405
262		19.01	53°42'S	01°48'W	2457
263		20.03	53°34'S	01°31'W	2416
264		21.04	53°27'S	01°14'W	2318
265		22.02	53°20'S	01°00'W	2378
266		23.02	53°13'S	00°43'W	2505
267	08.04.1996	00.02	53°06'S	00°28'W	2554
268		01.03	52°59'S	00°11'W	2493
269		02.04	52°52'S	00°05'E	2684
270		03.03	52°44'S	00°22'E	2825
271		04.04	52°37'S	00°38'E	2725
272		05.02	52°30'S	00°53'E	2836
273		05.59	52°23'S	01°08'E	2635
274		06.57	52°16'S	01°24'E	2706
275		08.00	52°09'S	01°40'E	2766
276		09.00	52°02'S	01°56'E	2658
277		10.07	51°55'S	02°13'E	2817
278		11.04	51°47'S	02°29'E	3122
279		11.58	51°40'S	02°42'E	2843
280		12.58	51°34'S	02°57'E	2947
281		14.04	51°28'S	03°09'E	3490
282		15.01	51°23'S	03°21'E	3323
283		16.04	51°17'S	03°34'E	3318
284		17.05	51°11'S	03°46'E	3285
285		18.04	51°06'S	03°58'E	3585
286		19.02	51°00'S	04°09'E	3612
287		20.10	50°55'S	04°21'E	3474
288		21.10	50°49'S	04°34'E	2890
289		22.23	50°43'S	04°45'E	3536
290		23.45	50°36'S	05°02'E	3389
291	09.04.1996	01.11	50°29'S	05°15'E	1208
292		02.13	50°25'S	05°24'E	2691
293		03.20	50°21'S	05°33'E	3639
294		04.50	50°15'S	05°45'E	3425
295	11.04.1996	11.54	52°15'S	03°25'E	3177
296		13.37	52°30'S	03°05'E	1437
297		14.52	52°40'S	02°53'E	2736
298		16.04	52°50'S	02°42'E	2602
299		17.26	53°00'S	02°29'E	2638
300		18.35	53°10'S	02°17'E	2718
301		19.50	53°20'S	02°05'E	2659
302		20.54	53°30'S	01°54'E	2595
303		22.27	53°40'S	01°40'E	2718

304		23.41	53°50'S	01°29'E	2400
305	12.04.1996	01.00	54°00'S	01°16'E	3090
306		02.19	54°10'S	01°03'E	3077
307		03.38	54°20'S	00°50'E	2085
308		04.50	54°30'S	00°38'E	2508
309		05.58	54°40'S	00°26'E	1864
310		07.04	54°50'S	00°13'E	1243

f= probe failure with repeat f= XBT Ausfall mit Wiederholung.

11. Appendix 3, Station list of benthos work south of Isla Nueva

Station			Date	Time		Position from board		Position on board		Depth [m]			
No.	Gear	No.	1996	from	/ on board	Lat. S	Long. W	Lat. S	Long. W	from	/ on board	Weather	Failure
40 / 106	CTD	1	14.05.	12:58		55°47,8	65°48,8			2524		WSW 6	
40 / 106	D	1	14.05.	16:18	16:45	55°46,8	65°52,7	55°46,5	65°53,6	2276	2171	SW 3	
40 / 106	AGT	1	14.05.	20:56	21:28	55°47,7	65°49,3	55°47,3	65°49,0	2505		var. 2	
40 / 106	EBS	1	15.05.	01:33	02:00	55°48,0	65°49,3	55°48,2	65°49,3	2516	2539	NE 4	+
40 / 106	MUC	1	15.05.	06:08		55°44,9	65°49,2			2536		N4	+
40 / 106	FS	1	15.05.	07:45	09:54	55°45,7	65°48,0	55°45,3	65°48,1	2507	2528	N5	
40 / 107	CTD	2	15.05.	11:27		55°47,5	65°58,8			1565		NNE 5	
40 / 107	AGT+D	2	15.05.	13:47	14:18	55°45,6	65°58,7	55°45,4	65°58,7	1507	1474	NNE 5	
40 / 107	EBS	2	15.05.	17:18	17:47	55°45,3	65°58,0	55°44,9	65°57,3	1490	1542	N 6	+
40 / 107	MUC	2	15.05.	20:21		55°45,8	65°58,6			1575		N 6	+
40 / 107	MG	1	15.05.	22:04		55°47,1	65°58,6			1545		NWN 5/6	+
40 / 107	MG	2	15.05.	23:15		55°46,9	65°58,4			1565		NNW 5	+
40 / 107	GKG	1	16.05.	01:31		55°45,8	65°58,6			1519		WNW 3	
40 / 108	CTD	3	16.05.	04:24		55°44,1	66°16,9			191		SW 4	
40 / 108	AGT+D	3	16.05.	05:16	05:33	55°44,5	66°17,1	55°44,6	66°17,3	185	198	SW 4	
40 / 108	MG	3	16.05.	06:26		55°44,1	66°16,7			203		SW 4	
40 / 108	MUC	3	16.05.	07:28		55°44,1	66°16,7			208		SW 3	+
40 / 109	CTD	4	16.05.	12:54		55°44,2	66°14,9			377		SW 3	
40 / 109	AGT+D	4	16.05.	13:57	14:12	55°44,0	66°14,5	55°44,3	66°14,7	430	397	WNW 3	
40 / 109	MG	4	16.05.	15:22		55°44,7	66°15,3			384		NW 3/4	
40 / 109	MUC	4	16.05.	16:01		55°45,0	66°14,8			429		NW 4	
40 / 109	EBS	3	16.05.	16:51	17:02	55°44,4	66°15,0	55°44,5	66°18,0	382	395	NW 4	
40 / 110	CTD	5	16.05.	21:02		55°26,5	66°14,3			97		NNW 3	
40 / 110	AGT+D	5	16.05.	21:39	21:56	55°26,3	66°13,5	55°26,6	66°13,8	107	107	WNW 3	
40 / 110	EBS	4	16.05.	22:40	22:49	55°26,5	66°15,0	55°26,4	66°15,3	104	102	var. 0.5	
40 / 110	MG	5	16.05.	23:22		55°26,1	66°15,5			102		NNW 3	
40 / 110	MUC	5	17.05.	00:02		55°26,4	66°15,6			101		NNW 3	
40 / 110	FS	2	17.05.	00:25	01:08	55°26,4	66°15,8	55°26,3	66°15,7	100	99	NW 3	
40 / 111	CTD	6	17.05.	04:09		55°28,8	66°04,5			1139		NW 3	
40 / 111	AGT+D	6	17.05.	06:06	06:36	55°28,8	66°03,4	55:28,6	66°04:06	1270	1005	W 4	
40 / 111	EBS	5	17.05.	08:54	09:03	55°29,0	66°04,1	55°29,0	66°04,3	1220	1222	WSW 4/5	+
40 / 111	MG	6	17.05.	10:42		55°28,9	66°04,4			1145		WSW 3	
40 / 111	MUC	6	17.05.	11:55		55°29,0	66°04,4			1154		WSW 3/4	
40 / 111	EBS	6	17.05.	13:46	13:56	55°28,8	66°03,4	55°28,8	66°03,5	1279	1253	W 5	
40 / 112	FS	3	17.05.	20:22	21:27	55°44,4	66°14,8	55°44,1	66°14,3	406	480	WNW 4/5	
40 / 113	FS	4	17.05.	22:16	23:03	55°44,5	66°17,2	55°44,0	66°16,8	176	183	NNW 4/5	
40 / 114	CTD	7	18.05.	01:48		55°33,4	66°54,6			2457		NNW 5	
40 / 114	AGT+D	7	18.05.	04:58	05:29	55°31,6	65°56,8	55°30,7	65°58,8	2165	2008	W 8/7	
40 / 114	MG	7	18.05.	08:50		55°33,4	65°54,2			2523		WSW 8	+
40 / 114	MUC	7	18.05.	11:16		55°33,4	65°54,0			2524		WSW 9	+
40 / 115	AGT+D	8	18.05.	15:03	15:18	55°27,4	66°06,3	55°28,1	66°06,2	780	712	WSW 6	
40 / 115	MG	8	18.05.	16:30		55°27,9	66°06,8			876		SW 7	+
40 / 115	MG	9	18.05.	17:22		55°28,4	66°07,1			510		W 7/8	+
40 / 116	MUC	8	18.05.	18:42		55°27,8	66°09,1			336		WNW 6	
40 / 116	FS	5	18.05.	19:00	19:37	55°27,2	66°09,2	55°26,7	66°08,8	233	173	WNW 4/3	
40 / 117	AGT+D	9	18.05.	20:25	20:35	55°24,6	66°15,6	55°24,1	66°15,3	97	99	var. 4/5	
40 / 117	AGT	10	18.05.	21:02	21:17	55°23,8	66°13,8	55°24,1	66°13,8	103	104	NNW 5	

11.06.96	40/122	22.45	23°10,9´N	24°26,2´W	5102	CTD, MIC
		02.14				
12.06.96		02.47	23°10,9´N	24°26,3´W	5055	MUC
		06.13				
		06.32	23°11,0´N	24°26,3´W	5118	MKG
		10.14				
		10.27	23°11,3´N	24°27,3´W	5119	MN (3600 - 1000 m)
		13.30				
		14.06	23°11,6´N	24°27,8´W	5125	TWS
		18.36				
		18.44	23°10,4´N	24°29,0´W	5128	MN (1000 - 0 m)
		19.43				

CTD=Conductivity, temperature, depth-sonde
MIC=Minicorer
MKG=Multiboxcorer
MN=Multinet
MUC=Multicorer
RG=Rotating corer
TWS=Deep-water sampler