Institut für Meereskunde
an der Universität Kiel

Date: 22.03.2004

Cruise Report

Compiled by: Ralf Schiebel

F.S.Poseidon **Cruise No.: 308**

Dates of Cruise: 06.03.-22.03.2004

Areas of Research: Physical oceanography, biological oceanography, paleoceanography

Port Calls: none

Institute: Geological Institute, Swiss Federal Institute of Technology, ETHZ, Zürich

Chief Scientist: Ralf Schiebel

Number of Scientists: 7

Projects:
- Phytoplankton succession during the spring bloom (´Margalefs Mandala´)
- Coccolithophore and planktic foraminifer molecular genetics
- changing of long-term mooring K276/L1

Cruise Report

This cruise report consists of ### pages including cover:

1. Scientific crew

Name	**Function**	**Institute**	**Leg**
Schiebel, Ralf	Chief Scientist	ETH	308
Axelsson, Mikael	Plankton	ETH	308
Brupbacher, Ursi	Plankton	ETH	308
Lan, Hsin-chi	Coccolithophores	ETH	308
Hehl, Uwe	Particle Traps	IOW	308
Schmidt, Sunke	Mooring	IfM-GEOMAR	308
Schmidt, Hauke	Mooring	IfM-GEOMAR	308
Total			**7**

Institutes

ETH	Swiss Federal Institute of Technology, ETHZ, Zürich, Switzerland
IOW	Institut für Ostseeforschung, Warnemünde, Germany
IfM-GEOMAR	Institut für Meeresforschung-GEOMAR, Kiel, Germany

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2. Research programme

The main objectives of Poseidon cruise 308 were

1. exchanging the long-term mooring (current meters and sediment traps) in the Madeira Basin at 33°N, 22°W (K276/L1)
2. sampling the phytoplankton succession in the eastern North Atlantic and verifying ´Margalefs Mandala´ as a paleoceanographic tool
3. water sampling for Cadmium determination
4. sampling coccolithophores and planktic foraminifers for molecular genetic analysis.

The first task (1.) was carried out by an experienced mooring-team of IfM-GEOMAR and IOW. The second objective (2.) was achieved by sampling the upper 200 m of the water column with Niskin bottles attached to a CTD/Rosette sampler. Temperature and salinity were recorded with a ### CTD down to 300 m water depth. Chlorophyll *a* (fluorescence) and oxygen concentration were recorded with ###. The third objective (3.) was achieved by sampling water between 4000 m and 10 m depth, with the CTD/Rosette sampling device. (4.) Coccolithophores and planktic foraminifers were sampled from surface waters (about 4 m depth), pumped onboard through 10 µm and 100 µm nets using the shipboard aquarium pump while sailing.

3. Narrative of cruise with technical details

On March 5, 2004, the scientific crew embarked in Bremerhaven and the whole scientific equipment was set up. The vessel sailed on schedule on March 6, 8:00 am, downstream Weser River, and passed the southern North Sea, and the English Channel with an average of 10 knots. The North Atlantic was entered on March 8 and on March 10 the first position of the cruise track was reached (Fig. 1). Water was sampled and temperature, salinity, oxygen concentration, and fluorescence were recorded with the CTD/Rosette device. On-track sea surface temperature and salinity were measured with the shipboard thermosalinograph. Currents were registered with the ADCP system installed in the ###Lotschacht###. The shipboard echosounding system worked sufficiently only in shallow water depth. When we entered the deep Atlantic, information on water depth was sporadic. Navigational data were provided by the shipboard navigation system.

An east-to-west CTD/deep-water transect was sampled between 48°28´N, 13°34´W, March 10, and 47°N, 20°W, March 11 (Table 1). On the first station, the ship was moving in high swell, the CTD/Rosette device was thrown against the hull of the ship, and two Niskin bottles broke. These were later exchanged by spare bottles, and the rosette device was fully equipped again. Starting at 47°N, 20°W, a north-to-south transect was sampled towards 29°N, 22°W, at a distance of 120 nm between the sampling locations. On station 3, which was the first station of the north-to-south transect, the wire on which the CTD was run was twisted when the device was hauled. The wire had to be cut, and the CTD/Rosette device was savely recovered. A second haul was carried out after the conductive wire was repaired and reconnected to the CTD/Rosette. Stations 3 to 10 were sampled without any problem. At Station 10, mooring K276/L1 was redeployed. After the mooring work, we were about two days ahead of schedule, and the north-to-south transect was extended by two stations. The southernmost station of Poseidon cruise 308 was sampled at 29°N, on March 18, 11.20 pm.

On March 16, at perfectly calm weather and sea conditions, mooring K276/L1 at 33°N, 22°W was successfully recovered over the back frame of the ship within less than three hours. Six ###Type### current meters were immediately opened and data were downloaded onto a separate hard disc. It turned out that the current meter number ###, ### meters depth, was drowned, and no data could be recovered. Two Kiel Type (conical) sediment traps and one cylindrical trap setup (three cylinders) were successfully recovered, and samples were freeze stored. All parts of the mooring were cleaned, checked, and replaced by new parts if necessary. Redeployment of the mooring started early next morning, on March 17, with sailing a 'drift course' to determine an optimal point to start deployment. The head-buoy was off-board at about 1:30 pm. Due to perfectly calm sea the mooring was successfully redeployed within less than four hours. Last sight of the head-buoy was at 6:30 pm.

After sampling Station 12 at 29°N, Poseidon sailed towards the north-east, direction Madeira. En-route sampling of live planktic foraminifers and coccolithophores by means of the aquarium pump was continued until the 200 nm EEZ of Spain was reached. Sailing against north-eastern winds and swell, Poseidon reached Madeira Island on Sunday, March 21. Poseidon cruise 308 was finished with Funchal port call on Monday, March 22, 7:00 UTC.

4. Scientific report and first results

4.1 CTD data: Temperature, salinity, and fluorescence

At the first four stations of the 'plankton transect', the upper water column was well mixed and no seasonal thermocline was present (Fig. 2). A seasonal thermocline was recorded at 140 m water depth at Station 5, 43°N, for the first time during the cruise. At Station 8, 37°N, east of the Azores Islands, water temperature and salinity were significantly higher than to the north. At Station 10, Mediterranean Outflow Water (MOW) was recorded at 800-1600 m water depth.

The fluorescence profile showed a deep chlorophyll maximum (DCM) at 40 m depth, indicating enhanced phytoplankton production (Fig. 3). At Station 9, 35°N, we sampled the central Azores Front, at surface water temperature of 18.7°C, and fluorescence was still high. Towards the southern boundary of the Azores Frontal Zone (AFZ), a slight DCM was recorded at 80 m at Station 10. To the south, at Station 11 and 12, fluorescence was low and no DCM was present although distinct stratification of surface waters (Fig. 2).

The Azores Front (AF) was crossed between Station 8 and 9, applying the '15°C criterion' Gould (1985). North of Station 9, the 15°C isotherm was shallower than 200 m, indicating waters north of the front (Fig. 2). At Station 9 and 10, the 15°C isotherm ranged between 200 and 300 m, indicating the central AF. The 15°C isotherm was below 300 m at Station 11 and 12, south of the front. At the northern boundary of the Azores Current (AC), enhanced fluorescence indicates upwelling and enhanced production of chlorophyll (Fig. 3). At the southern boundary of the AC, surface water fluorescence was lowest throughout the whole transect sampled during Poseidon 308 (<0.1 mV), and possibly indicates downwelling.

4.2 Phytoplankton, nutrients and planktic foraminifers

Phytoplankton was sampled with 10-l Niskin bottles, attached to a CTD/Rosette device (12 bottles). Vertical profiles were sampled between 10-200 m water depth at each of the 12 stations (Table 2 and 3). In total, 131 water samples were filtered over polycarbonate membrane filters (Nucleopore) attached to inline gaskets (see Bollmann et al., 2002). Filters will be analyzed for coccolithophores/coccoliths, diatoms and dinoflagellates under the Scanning Electron Mikroscope (SEM) at the shore based laboratory. To account for the differential abundance of the three microplankton groups, water samples were split and different water volumes (on average 2 liters in sample **A** and 6 liters in sample **B**) were filtered (Table 3). In total, 239 microplankton filters were prepared during Poseidon cruise 308.

Nutrients will be analyzed from 100 ml water samples, obtained from the same water samples as the phytoplankton samples. Nutrient samples were immediately frozen at -20°C, and will be analyzed at IOW. Nutrient concentration is an important ecological factor for the development of phytoplankton, and the pelagial food web.

Planktic foraminifers were sampled from sea water pumped from 4 m water depth on deck by the shipboard 'aquarium pump'. Water was filtered through of 100 µm plankton net, and planktic foraminifers were qualitatively picked. During the first part of the cruise, no planktic foraminifers were obtained that were large enough to be recognized as such. The absence of planktic foraminifers may be due to the low availability of food before the spring bloom, and low growth rates of the foraminifers. First planktic foraminifers that could be identified were sampled between Station 9 and 10, long distance south of and several days after the start of phytoplankton spring bloom. Planktic foraminifers had therefore several days to feed and grow to a size larger than 100 µm to be captured by the 100 µm plankton net. In addition to the poor feeding situation, reproduction of planktic foraminifers could be reason for sampling failure during the first days of Poseidon cruise 308. The majority of planktic foraminiferal species reproduce on a lunar cycle (Schiebel et al., 1997). Many of these species may still be small during the first days after full moon (Table 1), and we had to wait until the ninth day after full moon before getting the first individuals for analysis.

Most abundant species (sorted from high to low abundance) were *Globigerinoides ruber* (white), *Globigerinella siphonifera*, *Globigerina bulloides*, and *Globorotalia truncatulinoides*. In addition, *Globigerinita glutinata, Globigerinoides sacculifer, Globorotalia hirsuta, Neogloboquadrina incompta, Globigerina calida*, and *Turbogloborotalita humilis* were present. All specimens were prepared for molecular genetic analysis, which will be carried out at Tübingen University (Germany). The species composition is typical spring community at the Azores Current region, described by Schiebel et al. (2002a) from former RV Poseidon sampling campaigns. Results of the molecular genetic analysis will be part of an interannual study, which will be carried on during the next years. All results on the recent oceanography and plankton of the Azores/Madeira region will be applied to disentangle paleoceanography of the north Atlantic (see Schiebel et al., 2002b; Rogerson et al., in press).

5. Scientific equipment: moorings and instruments

###hier bitte Sunke, Hauke oder Tom: CTD and Moorings###
###wer schreibt etwas zu den Fallen???###

5.x Water filtration

Sea water filtration for phytoplankton analysis was carried out with a filtration rack designed and built at the Geological Institute, ETHZ (see Bollmann et al., 2002).

5.y Underway plankton sampling

Underway plankton sampling was carried out by means of the shipboard aquarium pump. Sea water was permanently pumped through 10 µm and 100 µm plankton nets to sample coccolithophores and planktic foraminifers. Samples were investigated every 12 hours for specimens of each of these groups.

5.z Molecular genetics

Planktic foraminifers were sampled and prepared for molecular genetic analysis. After cleaning planktic foraminiferal test with deionized water, tests were transferred either to 50 ml lysis-buffer of type I or lysis-buffer of type II. Preparation with lysis-buffer type II requires breaking up the test to expose cytoplasm to the buffer, to heat the sample at 60°C and moderately shaken for one hour, and to freeze it at -20°C until final analysis. Preparation with lysis-buffer I enables PCR from unbroken tests. In addition, lysis-buffer type II does not dissolve calcareous tests. After washing and buffering, tests do only have to be frozen at -20°C. From first PCR, we know that both methods were successful and provide similar results.

6. Acknowledgements

Captain and crew of RV Poseidon cruise 308 are gratefully acknowledged for their great work onboard. We are grateful to the Steuergruppe Mittlere Forschungschiff to be given the change to sample the eastern North Atlantic using RV Poseidon. We really appreciate the help of Tom Müller in coordinating RV Poseidon cruise 308. The Swiss National Fund (SNF) is acknowledged for funding the sampling program of the ETH scientists.

7. Appendices

A. Map with cruise track (Fig. 1)
B. Temperature profile (Fig. 2) and fluorescence profile (Fig. 3)
C. Station list (Table 1)
D. Sampling list (Table 2)
E. Filtration list (Table 3)

8. References

Bollmann, J., Cortés, M.Y., Haidar, A.T., Brabec, B., Close, A.B., Hofmann, R., Palma, S., Tupas, L. and Thierstein, H.R., 2002. Techniques for quantitative analyses of calcareous marine phytoplankton. Marine Mircropaleontology 44, 163-185.

Gould, W.J., 1985. Physical oceanography of the Azores Front. Progress in Oceanography 14, 167–190.

Rogerson, M., Rohling, E.J., Weaver, P.P.E., and Murray, J.W., in press. The Azores Front since the Last Glacial Maximum. Earth and Planetary Science Letters, 2004.

Schiebel, R., Waniek, J. and Zeltner, A. and Alves, M., 2002a. Impact of the Azores Front on the distribution of planktic foraminifers, shelled gastropods, and coccolithophorids. Deep-Sea Research II, 49: 4035-4050.

Schiebel, R., Schmuker, B., Alves, M. and Hemleben, Ch., 2002b. Tracking the Recent and late Pleistocene Azores front by the distribution of planktic foraminifers. Journal of Marine Systems, 37: 213-227.

9. Figure captions

Fig. 1. RV Poseidon 308 cruise track (hatched line) and Stations 1-12. Station 3 is the long-term station at the central BIOTRANS site. Station 10 is the K276/L1 mooring site.

Fig. 2. CTD recorded water temperature (°C) at 0-300 m water depth along the sampled RV Poseidon 308 transect. The vertical hatched lines indicate the northern and southern limits of the Azores Current (for definition see Gould, 1985).

Fig. 3. Fluorescence along RV Poseidon 308 transect, showing DCM at 33°N-37°N (Station 8, 9, 10)

Appendix A

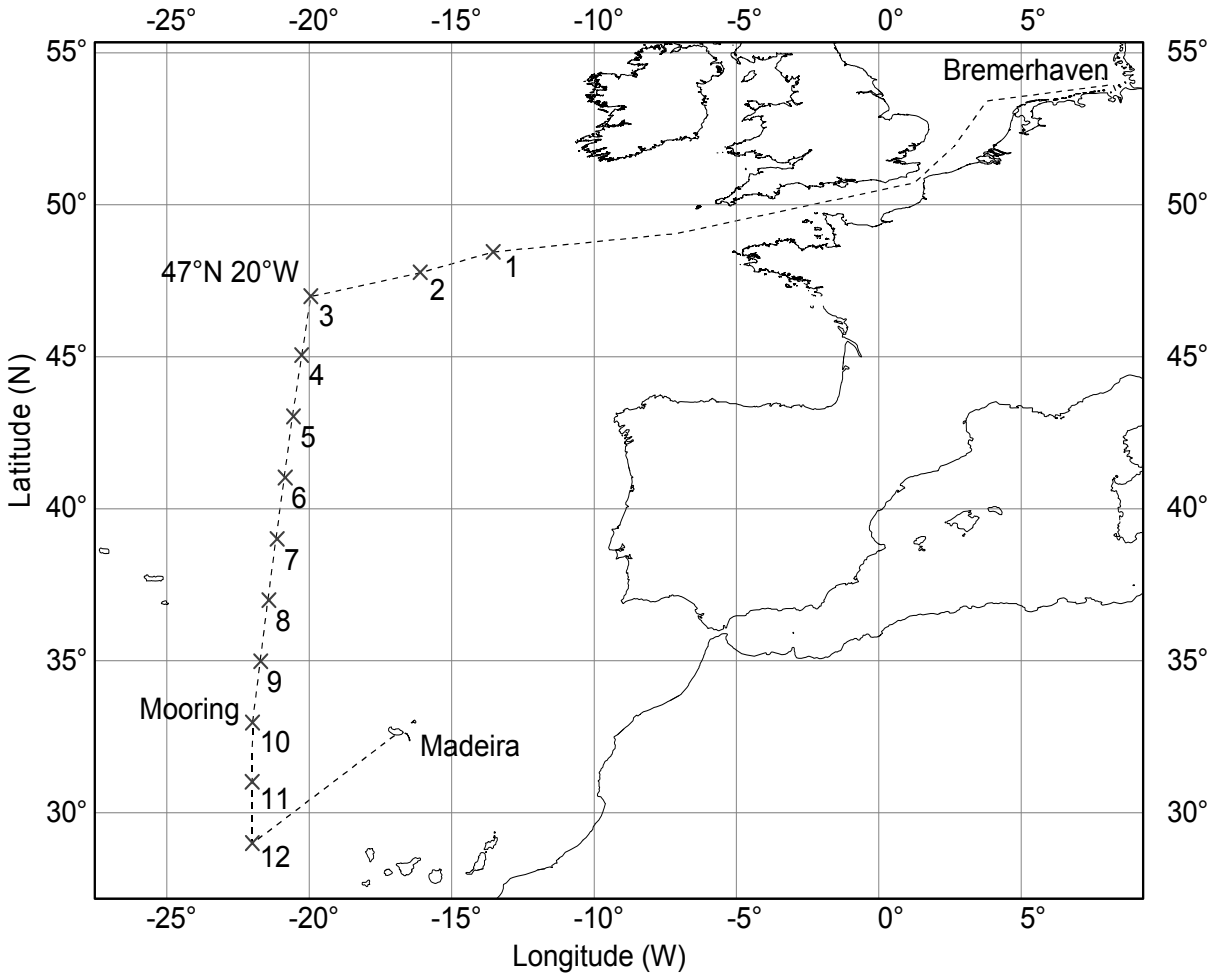

Figure 1.

Appendix B

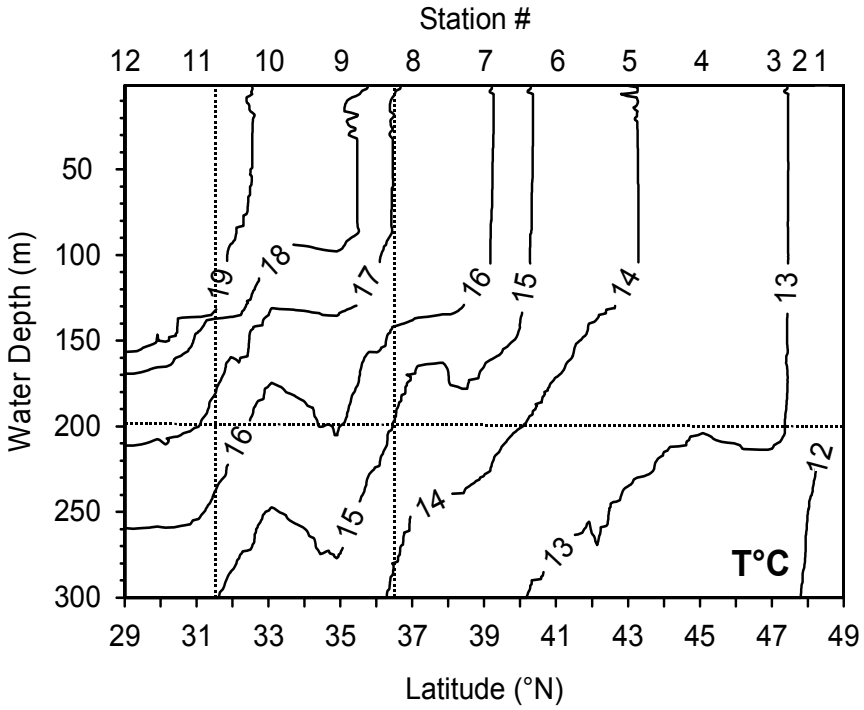

Figure 2.

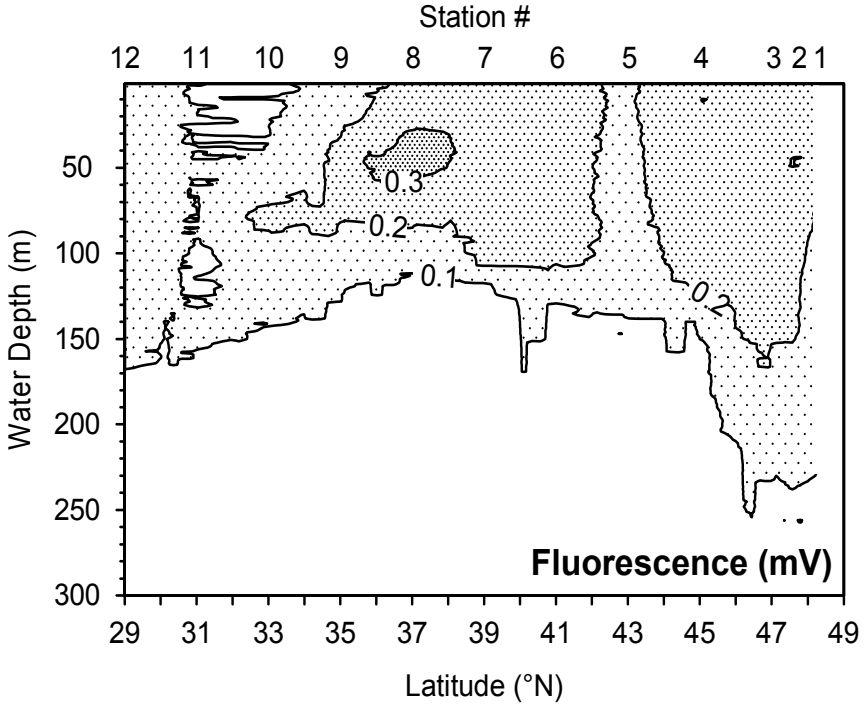

Figure 3.

Appendix C

Table 1. Stations sampled on RV Poseidon cruise 308.

Gear #	Station #	Date	Year Day	Lunar Day	Latitude (N)	Longitude (W)	Water Depth (m)
1	1	10.03.2004	70	4	48°28.174'	13°34,092'	1410
2	2	10.03.2004	70	4	47°46.119'	16°08.570'	4200
3	3	11.03.2004	71	5	46°59.808'	19°59.801'	4450
4	3	12.03.2004	72	6	46°59.607'	19°55.681'	4550
5	4	12.03.2004	72	6	44°59.817'	20°16.500'	4400
6	5	13.03.2004	73	7	42°59.870'	20°33.934'	3120
7	6	13.03.2004	73	7	41°00.191'	20°50.939'	3400
8	7	14.03.2004	74	8	39°00.148'	21°07.959'	4600
9	8	15.03.2004	75	9	37°00.549'	21°24.679'	3880
10	9	15.03.2004	75	9	34°59.785'	21°42.624'	5074
11	10	16.03.2004	76	10	33°00.039'	21°59.346'	5216
12	10	16.03.2004	76	10	32°49.100'	22°00.000'	5215
13	10	16.03.2004	76	10	32°50.334'	22°00.635'	5200
14	10	16.03.2004	76	10	33°00.018'	22°00.105'	5200
15	10	16.03.2004	76	10	32°49.100'	22°00.000'	5215
16	10	17.03.2004	77	11	32°47.401'	22°00.125'	5200
17	11	18.03.2004	78	12	31°00.244'	22°00.274'	5000
18	12	18.03.2004	78	12	29°00.119'	22°00.003'	4850

DCM = Deep Chlorophyll Maximum
n.d. = not determined
Lunar Day 0 = full moon

Appendix D

Table 2. Devices run on RV Poseidon cruise 308, and obtained nutrient samples.

Gear #	Station #	Device #	Start Time	End Time	Max. Depth (m)	Filtered Water Samples	Nutrient Samples (m)
1	1	CTD 1	08:05	08:40	300	yes	200, 175, 150, 125, 100, 75, 50, 30, 20, 10
2	2	CTD 2	20:05	20:30	300	yes	200, 175, 150, 125, 100, 75, 50, 30, 20, 10
3	3	CTD 3	23:50	02:10	4000	no	-
4	3	CTD 4	04:30	04:45	200	yes	200, 175, 150, 125, 100, 75, 50, 30, 20, 10
5	4	CTD 5	18:06	18:30	300	yes	200, 175, 150, 125, 100, 75, 50, 30, 20, 10
6	5	CTD 6	08:35	08:55	300	yes	200, 150, 125, 100, 50, 10
7	6	CTD 7	22:08	22:29	300	yes	200, 150, 125, 100, 50, 10
8	7	CTD 8	11:55	12:20	300	yes	200, 150, 125, 110, 100, 50, 10
9	8	CTD 9	01:31	01:52	300	yes	200, 150, 100, 50, 30, 10
10	9	CTD 10	14:00	14:19	300	yes	200, 150, 100, 75, 50, 10
11	10	CTD 11	06:02	06:19	300	yes	200, 100, 85, 75, 65, 50, 10
12	10	Mooring KL276/L1	07:15	12:00	-	no	-
13	10	CTD 12	11:50	15:03	5265	no	-
14	10	CTD 13	18:15	19:04	1000	no	-
15	10	Mooring KL276/L1	13:27	18:16	-	no	-
16	10	CTD 14	18:48	18:58	100	no	-
17	11	CTD 15	08:02	08:22	300	yes	200, 150, 125, 100, 50, 10
18	12	CTD 16	23:00	23:20	300	yes	200, 160, 150, 100, 50, 10

Appendix E

Table 3. Plankton filters from seawater samples obtained on RV Poseidon cruise 308. Polycarbonate membrane filters (Nucleopore) were used. reg. cell. = cellulose mixed-ester membrane (Millipore). Filters **A** and **B** differ in filtered water volume only. For further information about the filtration setup see Bollmann et al. (2002).

CTD #	Water Depth (m)	Filter Pore Size (µm)	Drain Filter Pore Size (µm)	Drainage Filter Type	Filtered Volume (liters) **A**	Filtered Volume (liters) **B**
1	200	0.4	2	reg. cell.	2.6	5.4
1	175	0.4	2	reg. cell.	2	6.5
1	125	0.4	2	reg. cell.	1.5	6
1	100	0.4	2	reg. cell.	2	6.6
1	75	0.4	2	reg. cell.	2	5.9
1	50	0.4	2	reg. cell.	2	6.5
1	20	0.4	2	reg. cell.	2	6.2
1	10	0.4	2	reg. cell.	2	6.3
2	200	0.4	2	reg. cell.	2	6.3
2	175	0.4	2	reg. cell.	2	6.2
2	150	0.4	2	reg. cell.	2	6.4
2	125	0.4	2	reg. cell.	2	6.3
2	100	0.4	2	reg. cell.	2	6.4
2	75	0.4	2	reg. cell.	2	6
2	50	0.4	2	reg. cell.	2	5.9
2	30	0.4	2	reg. cell.	2	6
2	20	0.4	2	reg. cell.	2	6.3
2	10	0.4	2	reg. cell.	2	6
4	200	0.4	2	reg. cell.	2	6.5
4	175	0.4	2	reg. cell.	2	6.5
4	150	0.4	2	reg. cell.	2	6.4
4	125	0.4	2	reg. cell.	2	7.3
4	100	0.4	2	reg. cell.	2	6
4	75	0.4	2	reg. cell.	2	6
4	50	0.4	2	reg. cell.	2	6.5
4	30	0.4	2	reg. cell.	2	6.2
4	10	0.4	2	reg. cell.	2	6.2
5	200	0.4	2	reg. cell.	2	6.5
5	175	0.4	2	reg. cell.	2	6.8
5	150	0.4	2	reg. cell.	2	6.6
5	125	0.4	2	reg. cell.	2	6
5	100	0.4	2	reg. cell.	2	6.2
5	75	0.4	2	reg. cell.	2	6
5	50	0.4	2	reg. cell.	2	6.4
5	30	0.4	2	reg. cell.	2	5.4
5	20	0.4	2	reg. cell.	4.8	-
5	10	0.4	2	reg. cell.	2	6.2
6	200	0.4	2	reg. cell.	2	6.2
6	175	0.4	2	reg. cell.	2	6.1
6	150	0.4	2	reg. cell.	2	6.5
6	125	0.4	2	reg. cell.	2	6
6	100	0.4	2	reg. cell.	2	6.3
6	75	0.4	2	reg. cell.	1.5	6.4
6	50	0.4	2	reg. cell.	2	6.2

Table 3. Plankton filters from seawater samples obtained on RV Poseidon cruise 308. Polycarbonate membrane filters (Nucleopore) were used. reg. cell. = cellulose mixed-ester membrane (Millipore). Filters **A** and **B** differ in filtered water volume only. For further information about the filtration setup see Bollmann et al. (2002).

CTD #	Water Depth (m)	Filter Pore Size (µm)	Drain Filter Pore Size (µm)	Drainage Filter Type	Filtered Volume (liters) **A**	Filtered Volume (liters) **B**
6	30	0.4	2	reg. cell.	2	6.2
6	20	0.4	2	reg. cell.	2	6.4
6	10	0.4	2	reg. cell.	2	6.3
7	200	0.4	2	reg. cell.	2	6.1
7	175	0.4	2	reg. cell.	2	6.5
7	150	0.4	2	reg. cell.	2	6.3
7	125	0.4	2	reg. cell.	2	6.2
7	100	0.4	2	reg. cell.	2	6.3
7	75	0.4	2	reg. cell.	2	6.2
7	50	0.4	2	reg. cell.	2	6.3
7	30	0.4	2	reg. cell.	2	6.3
7	20	0.4	2	reg. cell.	2	5.8
7	10	0.4	2	reg. cell.	1.2	6
8	200	0.4	2	reg. cell.	2	6.3
8	175	0.4	2	reg. cell.	2	6.3
8	150	0.4	2	reg. cell.	2	6.4
8	125	0.4	2	reg. cell.	2	6.5
8	110	0.4	2	reg. cell.	2	6.2
8	100	0.4	2	reg. cell.	2	6
8	75	0.4	2	reg. cell.	2	6
8	50	0.4	2	reg. cell.	2	5.4
8	30	0.4	2	reg. cell.	2	6
8	20	0.4	2	reg. cell.	2	6
8	10	0.4	2	reg. cell.	2	6.3
9	200	0.4	2	reg. cell.	2	6
9	175	0.4	2	reg. cell.	2	6.1
9	150	0.4	2	reg. cell.	2	6.3
9	125	0.4	2	reg. cell.	2	6.4
9	100	0.4	2	reg. cell.	2	6.2
9	50	0.4	2	reg. cell.	2	4.5
9	30	0.4	2	reg. cell.	2	4.2
9	20	0.4	2	reg. cell.	2	4.3
9	10	0.4	2	reg. cell.	2.2	5.3
10	200	0.4	2	reg. cell.	2	6
10	175	0.4	2	reg. cell.	2	6
10	150	0.4	2	reg. cell.	2	6
10	125	0.4	2	reg. cell.	2	6
10	100	0.4	2	reg. cell.	2	6.2
10	75	0.4	2	reg. cell.	2	6.4
10	50	0.4	2	reg. cell.	2	5.4
10	30	0.4	2	reg. cell.	2	5.2
10	20	0.4	2	reg. cell.	2	5
10	10	0.4	2	reg. cell.	2	4.8
11	200	2	2	reg. cell.	2	6
11	175	2	2	reg. cell.	-	6
11	150	2	2	reg. cell.	2	6

Table 3. Plankton filters from seawater samples obtained on RV Poseidon cruise 308. Polycarbonate membrane filters (Nucleopore) were used. reg. cell. = cellulose mixed-ester membrane (Millipore). Filters **A** and **B** differ in filtered water volume only. For further information about the filtration setup see Bollmann et al. (2002).

CTD #	Water Depth (m)	Filter Pore Size (µm)	Drain Filter Pore Size (µm)	Drainage Filter Type	Filtered Volume (liters) **A**	Filtered Volume (liters) **B**
11	125	2	2	reg. cell.	2	6
11	100	2	2	reg. cell.	2	6.5
11	85	2	2	reg. cell.	2	6.3
11	75	2	2	reg. cell.	2	6.4
11	65	2	2	reg. cell.	2	6.3
11	50	0.4	2	reg. cell.	6	-
11	30	0.4	2	reg. cell.	2	6.5
11	20	0.4	2	reg. cell.	2	6.3
11	10	0.4	2	reg. cell.	2	6.2
13	200	0.8	8	membrane filters	2	6.4
13	175	0.8	8	membrane filters	2	6.6
13	150	0.8	8	membrane filters	2	6.3
13	125	0.8	8	membrane filters	2	6.2
13	100	0.8	8	membrane filters	2	6
13	85	0.8	8	membrane filters	2	6
13	75	0.8	8	membrane filters	2	6
13	50	0.8	8	membrane filters	2	5.3
13	30	0.8	8	membrane filters	2	6.3
13	20	0.8	8	membrane filters	2	6.4
13	10	0.8	8	membrane filters	2	6.5
15	200	0.8	8	membrane filters	8	-
15	175	0.8	8	membrane filters	8.2	-
15	150	0.8	8	membrane filters	8.2	-
15	125	0.8	8	membrane filters	8.4	-
15	100	0.8	8	membrane filters	8.4	-
15	75	0.8	8	membrane filters	8.5	-
15	50	0.8	8	membrane filters	8.5	-
15	30	0.8	8	membrane filters	8	-
15	10	0.8	8	membrane filters	8	-
16	200	0.8	n.i.	coffee filters	8.4	-
16	175	0.8	n.i.	coffee filters	7.9	-
16	160	0.8	n.i.	coffee filters	8.4	-
16	150	0.8	n.i.	coffee filters	8.5	-
16	140	0.8	n.i.	coffee filters	8.3	-
16	125	0.8	n.i.	coffee filters	8	-
16	100	0.8	n.i.	coffee filters	8.1	-
16	75	0.8	n.i.	coffee filters	8.5	-
16	50	0.8	n.i.	coffee filters	8.3	-
16	30	0.8	n.i.	coffee filters	8	-
16	20	0.8	n.i.	coffee filters	8.4	-
16	10	0.8	n.i.	coffee filters	8.4	-

n.i. = not identified