Cruise Report

LEG AHAB 8: Angola-Benguela Front: Ichthyoplankton Distribution and Training off Northern Namibia and Southern Angola

Walvis Bay – Namibe

04 May – 18 May 2004

Contents:

Name of research ship: *r/v A. v. Humboldt* Cruise No. 44/04/08

Dates of cruise: 4 May to 18 May 2004

Operating authority : Institute of Baltic Sea Research Warnemuende
P.O. Box301038, D-18111 Rostock. Germany.

Particulars of ship: r/v Alexander vonHumboldt
Nationality: Germany
Overall length: 64.23 metres
Maximum draught: 6.30 metres
Gross tonnage:1270.58

Ship's personnel: Captain Gerhard Herzig
No. of crew 16

Scientific personnel: Name and address of scientist in charge:
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No. of scientists 12

Geographical area: 15 – 23 °S, coast – 08 °E

Brief description of cruise:

Investigating hydrographical and biogeographical characteristics and ichthyoplankton distribution of the Angola-Benguela Frontal Zone, monitoring training off Northern Namibia and Southern Angola.

Purpose of research :

To investigate hydrographical and biogeographical characteristics and ichthyoplankton distribution of the Angola-Benguela Frontal Zone; to differentiate ichthyoplankton populations south of , in and north of the front. To conduct training on monitoring lines from Cunene River to Namibe in general CTD operational methods and current measurements in the upper 1000 m, ichthyoplankton and zooplankton sampling in the upper 300 m, bottom samples for sediments and organisms. ethods by which samples were obtained included ship's weather station, satellite image, CTD, ADCP, Rosette, Multinet, Bongo Net, ROV, Multi corer, box corer, grab sampler, dredge,

Participants	Institution	Working Group
Bodo v. Bodungen, Chief Scientist	IOW Warnemuende, Germany	Phytoplankton, Nutrients
Christian John	Senckenberg, University Hamburg, Germany	Zoo/Ichtyoplankton
Jenny Veitch	UCT Cape Town, South Africa	Hydrography
Sven Hoffmann	Senckenberg, Univ. Hamburg, Germany	Zoo/Ichtyoplankton
Stefan Weinreben	IOW Warnemuende, Germany	CTD
Michael Zettler	IOW Warnemünde, Germany	Benthos/Sediments
Fernando Gombo	INIP, Luanda, Angola	Hydrography
Wasaso Messella Domingos	INIP, Luanda, Angola	Zoo/Ichtyoplankton
Domingos da Silva	INIP, Luanda, Angola	Phytoplankton, Chlorophyll
Alice Chicunga	INIP, Namibe, Angola	Zooplankton
Francisco de Almeida	INIP, Luanda, Angola	Nutrients oxygen
Catherine Isibor	GCLME, Nigeria	Benthos

Acknowledgements:

The scientists thank captain Herzig and his crew for their able support. Financial support of the cruise by IOW, MPI-Bremen, Ministry of Education of the Land Mecklenburg-Vorpommern, Federal ience and BCLME is greatly appreciated and BENEFIT and staff at its office in Swakopmund are thanked for logistical support. Scientific work and training took part in the framework of BENEFIT and GEF-BCLME.

Geoff Bailey and Quilanda Fidel are acknowledged for their contribution in collating and editing this abbreviated cruise report.

1. General Aim of Leg AHAB 8

The Angola-Benguela Frontal Zone (ABFZ) is the convergence zone between the Angola Current and the Benguela Current, separating tropical Angolan waters from the cool Benguela upwelling regime. Nearshore, the ABFZ separates the warm, highly saline southward-flowing Angola Current (AC, S>35.9) from the Benguela Upwelling (BU), generally with a small meridional temperature gradient. Farther offshore several fronts fan out southwestwards, separating the BU from the actual Benguela Current (BC, S<35.5) and northwestwards, separating the Angolan Gyre (AG) from the BC. The northward BC deflects towards the west and becomes the South Equatorial Current (SEC) farther north.

The ABFZ oscillates seasonally by some 3 degrees of latitude, and is on average centred at about 16°S, and is about 2 degrees of latitude wide near-shore and much broader offshore. This frontal zone is occasionally breached or displaced southwards, by warm Angolan water from the north. This can take the form of small intrusions, or major events. The latter, called Benguela Niños, have recently been shown to be the result of changes in wind stress patterns in the equatorial Atlantic Ocean.

Biological surveys crossing the ABFZ have been undertaken only recently. The present cruise is the third respective survey. The ABFZ is a zoogeographical boundary for mesopelagic fish, and should generally limit the distribution of tropical species towards the south, and that of cold water forms towards the north. However, the few studies made so far in near-shore waters did not have the necessary spatial and taxonomic resolution to investigate respective oceanographic-faunistic interdependencies. Fish larval abundances in near-shore waters have so far been found to be highest north of the ABFZ, and lowest south of it. It is furthermore hypothesized that a submergence of the Angola Current at the ABFZ might continues as a poleward slope undercurrent (SUC) southwards, and that cross-frontal transport of both water masses and fish larvae might also occur by filaments in the open ocean.

The survey was a multidisciplinary study continuing previous cooperation between the Department of Oceanography of the University of Cape Town, Institute for Baltic Research Warnemuende, National Marine Information and Research Centre, Swakopmund, German Centre for Marine Biodiversity Research, Hamburg and Instituto de Investigação Marinha now INIP (Instituto Nacional de Investigação Pesqueira / National Institute of Fisheries Research), Luanda.

The survey combined in situ CTD/O_2, ADCP oceanography, nutrient chemistry, chlorophyll and phytoplankton composition with ichthyoplankton studies from basic taxonomic work up to fisheries- related studies on faunistic composition, specific abundance, and vertical and horizontal spatial patterns. It was intended to sample 50 stations on four survey lines perpendicular to the coast to 8°E – approximately 210 to 315 nautical miles long. The survey lines were intended to be chosen according to the actual location of the ABFZ derived from satellite images at the start of the survey. The northern and southern two lines would thus be representative of the Angolan and Benguela current regimes and the two central lines would cover the frontal system, proper.

The weather was fair; no time was lost due to rough seas. The sampling and work in the labs went smoothly, rare break-down of equipment was repaired by technicians and scientists on board.

2. General description of the cruise

On May 05 the ship took 14 teachers and students from Namibia just off Walvis Bay to demonstrate equipment – CTD, plankton nets, dredge, multicorer, grab –see Fig.1, station 'stud." Due to some problems with the cooling system the main cruise started a day later than planned originally. On May 07 at 14.00 hrs a station off Walvis Bay (station ADCP, Fig.1) was reached, where a hydrographic mooring was deployed and one hydrocast was taken in the framework of a Namibian-German cooperation within BENEFIT.

Thereafter the cruise continued, at approximately 01.00 hrs on May 8 the ichthyoplankton survey started on transect 1. Between transect 2 and 3 some benthic sampling was done crossing the Angola/Benguela Frontal Zone (ABFZ, stations BEO, see Fig. 1). The northernmost transect 4, was identical to the BENEFIT-Namibe-Monitoring-Line. The pelagic work on the transects was finished on May 17 at 06.30 hrs near the coast at station A47 slightly north of Namibe. At 3 sites directly off Namibe, benthos was sampled by grab and dredge. Cruise work ended on May 17 at 15.00 hrs. The ship sailed into Namibe in the morning of May 18.

3. Brief reports by the working groups and a first cursory look at the results.
3.1 Hydrography and ichthyoplankton survey

Hans-Christian John, Jennifer Veitch, Stefan Weinreben, Sven Hoffmann, Alice Chicunga, Wsaso Domingos & Fernando Gombo

Methods:
The team ran 4 transects normal to the isobaths, with 11 to 13 stations each (Fig. 1). The CTD measured depth, temperature, salinity, oxygen, chlorophyll a, turbidity, and phaeophytin down to 1000 dbar depth or 10 m above the bottom, if shallower than 1000m. Routinely, calibration work was carried out to standardize the temperature, salinity and oxygen probes on the CTD. Water samples for analysis of chlorophyll and nutrients and oxygen titration were handed over to the other groups from desired stations and depths.

All CTD stations were successful, except that we had a breakdown of the chlorophyll sensor between CTD-stations 13 and 15 and some repair work in between. There were no problems with the multinet. The multinet was towed obliquely at ships speeds 1.8 to 2.5 knots, and with winch speeds of generally 0.2 to 0.3 m/s. Expecting generally low fish larval abundances, the tows consequently exceeded somewhat the recommendations for quantitative fish larval surveys, in that they filtered 1.7 to 1.9 m^3 water per 1 m depth. To avoid confusion arising from different depth ranges being sampled, the volume-data were transformed to filtered areas (Table 1) and fish larval abundances are expressed as N/ m^2 (Table 2). On the southern transect, the multinet sampled the overall depth range from 300 to 0 m in 5 steps: 300 - 200 m, 200 - 100 m, 100 - 50 m, 50 - 25 m and 25 - 0 m in order to sample the presumed poleward slope undercurrent depth. The three northern transects sampled 5 steps each as follows: 200 - 150 m, 150 - 100 m 100 - 50 m, 50 - 25 m and 25 - 0 m.

Table 1: Average areas filtered by the Multinet (MCN, based on the first 35 hauls only)

Step #	1	2	3	4	5
Depth	variable	variable	50-100m	50-25m	25-0m
Area filtered	1,66	1,93	1,84	1,69	1,70
SD	0,85	0,67	0,58	0,46	0,58
N	35	35	35	35	35

Working conditions to deploy and recover instruments were excellent. The possibility to maintain constant ships speed and low winch speed was occasionally limited, explaining the standard deviations up to 50 % particularly in the deepest stratum in Table 1.

Results:

Temperature and salinity

All four transects crossed the upwelling region zonally, as well as the other offshore elements of the frontal system (Fig. 2). The warm situation with weak winds prevailing before and during the cruise possibly caused a northward movement of the ABFZ. Available ships time did not permit addition of an extra transect north of the ABFZ in entirely Angolan Current water. Zonal surface temperature gradients were weaker than climatologically expected, but showed the increase from the inshore upwelled region westwards, and conformed with the common „fan-out“ pattern.

Vertical sections of temperature (not shown) show the zonal deepening of isotherms towards offshore, but only inconspicuously the fronts proper. Conspicuous frontal structures appear in vertical sections of salinity (Figs 2 to 5), oxygen (Figs 7 -10) and chlorophyll (Figs 16-19). Besides the frontal structures, a high degree of smaller scale variability is shown by the above- mentioned parameters. This variability, perhaps linked with meridional transports described below, as well as by wind events before and during the cruise, needs future detailed analysis.

Geostrophic flow and oxygen

Meridional geostrophic flows were calculated from the hydrographic variables (pressure, temperature and salinity), relative to the surface flow (lacking, at present, a proper reference level of "no motion"). Equatorward flow prevailed on transect 1. Exceptions were a weak poleward flow east of approximately 8°E (at depths greater than 300m), a narrow (surface to ≈60m) band of poleward flow centered at about 9.5°E, and another narrow, poleward jet at the shelf edge, which may be the common upwelling undercurrent. A subsurface oxygen minimum (<2ml/l) was situated at the shelf edge and deepens (300- 600m) offshore. This oxygen minimum is probably of local origin, as it does not correspond to a poleward flow that might have transported oxygen deficient water from the north. Farther offshore, west of 9°E and at depths of greater than about 300m, "patches" of oxygen minimum water occurred.. These coincide with the poleward flow noted there and are therefore likely to originate further north.

Transect 2 shows alternating bands of northward and southward flow. Two major northward currents were centered at approximately 9.2°E and 10.5°E. West of 8.75°E, east of 10.75°E and between the two northward flowing streams the flow reversed to polewards. On the shelf at approximately 11.7°E a poleward jet occurred which was particularly intense at depths of greater than about 50m. Immediately west of this there was an equally strong northward current. A wedge of oxygen deficient (<2ml/l) water lay between about 300m and 700m narrowing from the continental shelf to approximately 8.5°E at a depth of 450m. This wedge of oxygen- deficient water has been well-documented and has been shown to exist from the equator to approximately 20°S off the African continent. The poleward jet on the continental shelf may have advected the relatively low oxygen concentration found there at depths greater than 70m.

The predominant geostrophic flow calculated for transect 3 was southward, but a relatively strong northward flow was found between 11°E and 10.3°E. Since the offshore part of transect 3 was north of the ABFZ (see salinity), this may be indicative of the presence of a southward-flowing AC. An opposing, northward flow existed near the continental shelf, at 11°E. This flow was most likely due to the extreme northward extent of a narrow coastal portion of the Benguela Upwelling zone. Oxygen deficient water exists in a zonal band from the base of the thermocline to a depth of approximately 700m. The base of this oxygen minimum layer was characterised by an upwards doming centered at about 9.75°E, which decreased in intensity towards the thermocline. Evaluation of transect 4 was not done, having made the final CTD casts on this transect just before reaching the port of Namibe.

Fish - and some phytoplankton

We encountered notable amounts of phytoplankton within the coastal upwelling zone and the inshore part of the front. Along the southern transect phytoplankton appeared to be reasonably healthy, and associated with jellyfish. Along transects 2 to 3 huge amounts of dead or decaying phytoplankton were caught, but jellyfish were less abundant and, if caught, smaller in size.

Few fish larvae were observed on Leg 1 whilst preserving the catch. Later microscopic analysis of samples confirmed that the two strata (25-50m and 50-100m) sampled at each of the stations on transect 1 had a low total catch and low abundance of fish larvae (Table 2). The relative maximum abundances, if representative, coincide with the ABFZ. Fish larvae there belonged exclusively to the mesopelagic community, and, when identifiable, to the Benguela fauna (*Symbolophorus boops, Bathypelagus greyae*), or species with an Atlantic-wide tropical/subtropical distribution (*Diogenichthys atlanticus*).

Table 2: The total catch and abundance of fish larvae in the thermocline-strata 100 – 25 m depth in 6 selected stations from transect 1

MCN-station	1	2	4	6	8	10
Longitude [°,']	13,04	12,48	12,10	11,13	9,55	8,40
N fish 25-50m	0	0	8	7	4	2
N fish 50-100m	0	1	0	3	0	6
N/1m² 25-50m	0,0	0,0	4,0	5,8	2,0	0,9
N/1m² 50-100m	0,0	0,3	0,0	1,9	0,0	2,1
minimum N/1m²	0,0	0,3	4,0	7,7	2,0	3,0

During preservation of samples from transects 2 to 4 towards the north, increasingly larger numbers of fishes were visible in the front samples, and also in the adjacent open ocean. Transect 3 yielded among the decaying phytoplankton larvae of coastal fish species like sardine and horse mackerel. Distinctly tropical oceanic epipelagic to mesopelagic species were first observed at the 6 westernmost stations of transect 4, of which the fourth one (MCN-haul #39) revealed a distinctly faunistic influence of the Angolan Gyre (the East Atlantic Equatorial subspecies of *Vinciguerria nimbaria* occurred in numbers, larval *Hygophum macrochir* was also present).

3.2 Nutrients and oxygen titrations

Bodo v. Bodungen & Francisco de Almeida

Methods:

Samples for nutrients were taken from CTD water bottles at 3 stations on transect 1, at 5 stations on transects 2 and 3 and 9 stations on transect 4 (see Fig. 1). Samples were analysed for dissolved inorganic phosphorus as phosphate (PO_4), silicon as silicate (SiO_4) and nitrogen in the form of nitrate (NO_3), nitrite (NO_2) and (NH_4) ammonium according to standard procedures described in the JGOFS-protocols and Grasshoff (1983). Oxygen were taken for Winkler titration from each station from selected depths to cover different water masses and gradients. Titration values were used to calibrate the oxygen sensor on the CTD, which worked perfectly, thus Figs 7-10 are from continuous profiling with the CTD probe.

Figs 11-15 shows surface distributions of the nutrient in the ABFZ and vertical distribution on the 4 transects, for gridding the data kriging was used. Density of the measurements is low in parts. Linear interpolation of the data and graphs for vertical distributions at individual stations will be applied later on. Nitrite and ammonium results are not depicted.

Cursory look at the results:

On transect 1 the upper 30 to 40 m of water are particularly low in SiO_4 (0.8 – 3.01 µmol/l), indicating a previous strong growth of diatoms. Nitrate and phosphorus are more depleted offshore than nearshore with nitrate close to detection limit between 10 to 8°E. Deeper water concentrations reflected the different water bodies such as the BU, poleward undercurrent, BC and South Atlantic Gyre water (see also 3.1).

Transect 2 revealed similar low SiO_4 values, whereas much higher values for PO_4 and NO_3 (>2 and >30 µmol/L) were found in the upper water column. On transect 3 the strong nearshore to offshore gradients were found between 11.2 to and 10.8°E. This also holds true for transect 4 but with a different zonal distribution. On transect 4, PO_4 shows some distinct features from surface to 300m water depth which needs further analysis.

The northern transects showed surprisingly high nutrient concentration in nearshore waters, which are higher than on the 2 southern transects and extend further offshore. Nutrient concentrations below 100m appear to be in accordance with the respective hydrography, however sampling was too sparse to allow more detailed analysis.

A striking difference between the northern and the southern transects is evident from the nitrate deficit or N*-values which are much more negative (-5 to -10) south of the front thus indicating considerable denitrification and excess of phosphorus, which could be a competitive advantage for the growth of blue-green algae. Considerable amounts of phycoerithrin were detected by the fluorescence probe on the CTD . This probe was not calibrated by discrete samples but this phenomenon may be worthwhile to follow up. On transect 4 in the north, N* was positive (> 3) in coastal waters and changed to negative values (-4) to the open ocean. The distribution of N*-values in relation to the redox gradients in the water column should be more intensively investigated.

Oxygen distribution is briefly described in 3.1, however a special situation should be mentioned here. Between transect 2 and 3 off the Cunene region some stations were sampled for benthos after CTD profiles were taken (see stations prefixed by BEO in Fig.1). Low oxygen values of <1.8 mlO_2/L in surface water and <0.5 mlO_2/L in bottom waters (water depth between 28 and 60m) was encountered from station BEO 1 to station 25. However at station 27 and 24 near bottom oxygen depletion was also found but the upper water column showed values of >3.8 mlO_2/l. The oxygen- depleted water at the surface at stations BEO 1 – 25 must have been caused by a very local event of upwelling of oxygen depleted water, which was observed to be black at the surface. The zooplankton net was clogged with black phytoplankton. Discrete phytoplankton samples were taken at stations 25 to 27 and later microscopic analysis will reveal the composition of an obviously huge phytoplankton bloom (see also 3.3). A brief look at the netsamples showed that the large diatom *Coscinodiscus* (>300µ, see photos below) predominated and a few *Thalassiosira* spp. occurred, mostly in poor shape. Decay of this biomass was most likely in full operation as the highest ammonium and nitrite values (>1,5 µmol/L) of the cruise were found in surface waters of this area.

3.3 Phytoplankton and Chorophyll

Domingos da Silva Neto, Stefan Weinreben&Bodo v. Bodungen

Factors driving primary production include the availability of nutrients. Environmental changes affecting the distribution and dynamics of phytoplankton biomass exert an important influence on spawning success and the recruitment of juveniles into the fishery, and consequently, on fish stocks.. On the other hand, dissolved oxygen concentrations can be a complementary factor governing the distribution of fish stocks.

Available information on phytoplankton dynamics and distribution in the northern part of the Benguela Current, the Angola-Benguela Frontal Zone (ABFZ) and boundary between Angolan and Namibian waters is scarce.

This survey (AHAB Leg 8) was carried out from 22° S to 15° S and from the coastal zone to 8° E in order to contribute to an improvement of knowledge about the larval distribution in the northern Benguela Current / ABFZ and to discuss the influence of tropical waters of Angola Current origin on this area.

Methods:

Samples were collected at practically every second station offshore and more frequently near the coastal zone. For the Namibe Monitoring Line (NML) samples were taken for both chlorophyll and phytoplankton analyses, along the entire line.

Samples were collected on board *R/V Humboldt* at three to six depths at 27 CTD-stations, in the range of low and higher values indicated on the CTD fluorescence trace - usually between 0-60m. Values of fluorescence obtained from the measurement of chl *a* in bottle samples were used for the establishment of correlations with values obtained by the CTD fluorometer.

For each depth, 200-500 ml water was filtered in laboratory conditions through a Whatman (25 mm ø) GF/F filter under low vacuum (suction pressure ~ 200 mbar). The moist filters were folded by means of tweezers and they were placed in labelled tubes and stored dark in 10 ml. of 96 % ethanol extractor. After extraction, chl *a* and phaeopigment concentrations were determined according to the fluorescence reaction of chl *a* measured on a Turner 10-AU fluorometer. The values obtained for chl *a* and phaeopigments (phaeo) were calculated according to Edler (1979), HELCOM (1988) and JGOFS (1993).

For further taxonomic analyses, a sub-sample from each depth of the 24 surveyed stations was fixed with 2 % formaldehyde. Generally sampling was accompanied by measurements of water clarity and other physical and chemical parameters.

Preliminary results and prospectives:

The concentration of chl *a* in the northern Benguela was generally very low in Namibian waters, but much higher in the Angolan waters, particularly along the Namibe Monitoring Line. Here values at 0-20 m varied between 1.61 and 4.08 mg m^{-3} (see stations 50-55, along 15° S between 11° 17` and 12° 07`E). Particularly high values of chl *a* were found on the coastal zone of the Cunene River Transect (see stations 32 and 33; 17° 00`S; 11° 41`-11° 39`E). Values here reached a maximum concentration of 31.62 mg m^{-3}, suggesting the occurrence of an algal bloom. This can be accompanied by death of fish, invertebrates and sea birds (Steidinger *et al*. 1981). The bloom might have been caused by nutrient input from both upwelling and the Cunene river. The values of dissolved oxygen in the water column can also be used for a future complementary analysis of the possible role of microalgal organisms on the distribution of ichthyo / zooplankton.

The correlation between the values displayed by the CTD fluorometer and chl *a* in calibration samples was very low ($r^2 = 0.32$). However, this can be improved as correlations should be done separately for the coastal and oceanic areas. The distribution of chlorophyll presented in Figs 16-19 is taken directly from the probe.

3.4 Macrozoobenthos

Michael L. Zettler&Catherine Isibore

Methods:

Benthic samples were taken with a 0.1 m^2 van Veen grab (Fig. 20, left). Due to sediment conditions, grabs of different weights were used. Three (or two, seldom only 1) replicates of grab samples were carried out at each station (Table 3). Additionally sometimes a dredge haul (net mesh size 5 mm) was taken in order to obtain mobile or rare species. All samples were sieved through a 1-mm screen and animals were preserved in the field with 4% formaldehyde. An underwater video-system was used at selected locations for the characterisation of the habitat i.e., assessment of sediment structure, species on the sediment surface and current (Fig. 20, right). The salinity and temperature of near bottom waters were measured by ship-based CTD-sensor and the oxygen content by titration according to the Winkler method. Altogether 13 stations in water depths between 28 and 340 m were sampled.

Table 3: Stations sampled for macrozoobenthos during AHAB-8

station	date	depth	Lat. (S) °, decimal	Lon.(E) °, decimal	Salinity (psu)	Oxygen mg/l	T°C	replicates	dredge
BE1	12.05.2004	42	18,39	11,92	35,3	0,12	13,4	3	1
BE2	12.05.2004	32,3	18,19	11,84	35,4	1,46	14,3	1	1
BE3	12.05.2004	45	17,96	11,77	35,3	0,13	13,3	2	1
BE4	13.05.2004	60,7	17,60	11,70	35,3	0,08	12,9	3	0
BE5	13.05.2004	65	17,26	11,68	35,3	0,05	13,0	3	0
BE6	13.05.2004	28,7	17,00	11,70	35,5	0,78	14,9	3	1
BE7	13.05.2004	105,4	16,99	11,52	35,4	0,42	13,6	2	1
BE8	13.05.2004	117	17,02	11,46	35,4	0,53	13,8	2	0
BE9	17.05.2004	340	15,01	12,08	35,2	0,59	11,1	1	0
BE10	17.05.2004	115	15,00	12,13	35,6	0,77	15,8	3	0
BE11	17.05.2004	83,6	15,13	12,11	35,6	0,92	16,0	2	0
BE12	17.05.2004	37,6	15,18	12,08	35,6	0,88	16,2	3	1
BE13	17.05.2004	67,2	15,29	12,00	35,6	0,8	15,9	1	1

Fig. 21 : The macro-zoobenthos was sampled by a 0.1 m² van Veen grab (left). For imaging and assessing the underwater habitat a ROV was used at some stations (right).

***Preliminary results*:**

The 29 replicates and the 7 dredge samples have not yet been analysed. Both sub-antarctic and subtropical taxonomical groups are to be expected in the waters off Namibia and Angola. Due to the enormous effort to learn the taxonomy of macrozoobenthos of these waters we decided to write a proposal to the DFG. Together with sampling stations from the AHAB-9 survey 55 replicates and 11 dredge haul samples have to be analysed.

The dominant taxonomical groups observed during onboard examination of the samples were the echinoderms, molluscs and cnidarians. Representatives were found from all other groups as well. The warmer waters of the north (see Table 3) were more biodiverse and groups like crustaceans, polychaetes and sponges became more dominant. Other taxa found in the samples included brachiopods.

Fig. 21: Sea fans (left) and brittle stars (right) were found often within the grab samples during AHAB-8.

During our benthic sampling we observed the tropical East Atlantic coastal snake eel *Dalophis boulengeri* and in cooperation with Dr. Christian John (Hamburg) noteworthy results in terms of fish biology were published recently (John & Zettler 2005).

JOHN, H.-C., ZETTLER, M.L. 2005: Occurrences of *Dalophis boulengeri* (Teleostei, Ophichthidae) off Northern Namiba. Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 102: 167-172

Glossary to acronyms used in text:

AC	Angola Current
ABFZ	Angola – Benguela Frontal Zone
BCLME	Benguela Current Large Marine Ecosystem
BENEFIT	Benguela Environmental and Fisheries Interaction Training progamme
GCLME	Guinea Current Large Marine Ecosystem
INIP	Instituto Nacional de Investigação Pesqueira / National Institute of Fisheries Research (of Angola)
IOW	Institute of Baltic Sea Research, Warnemuende, Germany.
NML	Namibe Monitoring Line
SUC	Poleward Slope Undercurrent

4. LIST OF FIGURES, TABLES AND APPENDICES

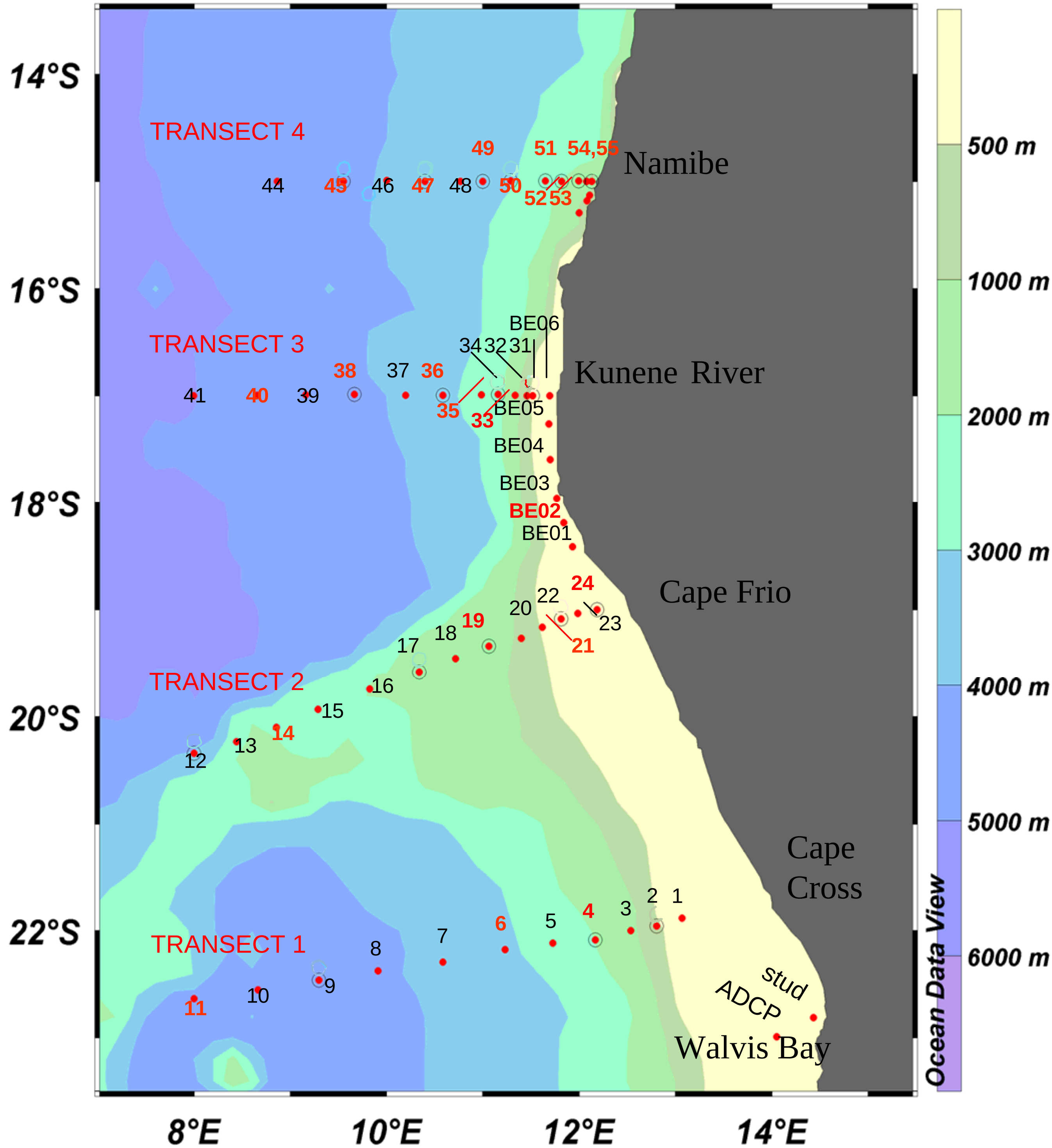

Figure 1: ***R.V. Humboldt*** **Leg 8 station distribution map. Stations at which nutrient samples were taken are indicated in red.**

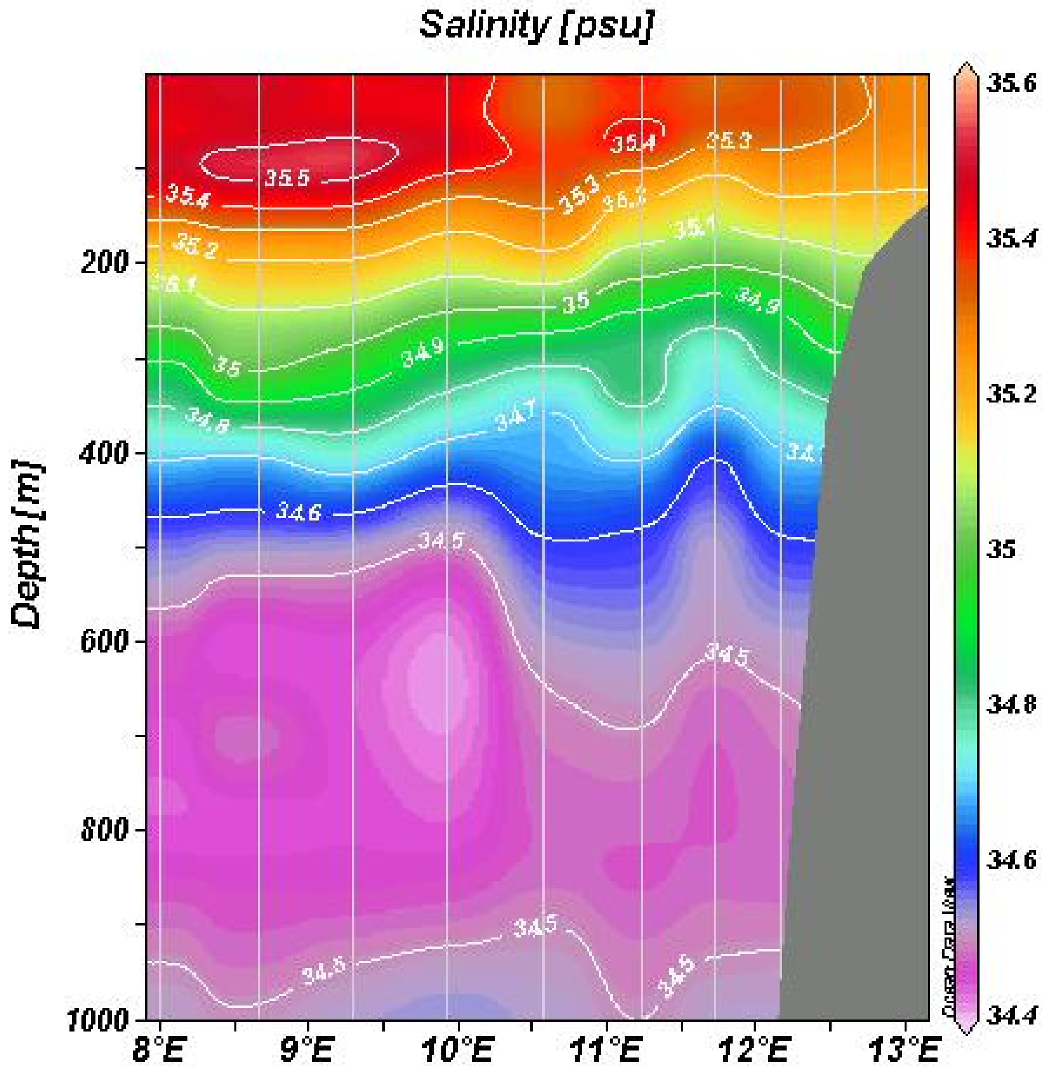

Figure 2: ***Salinity*** **distribution on Transect 1**

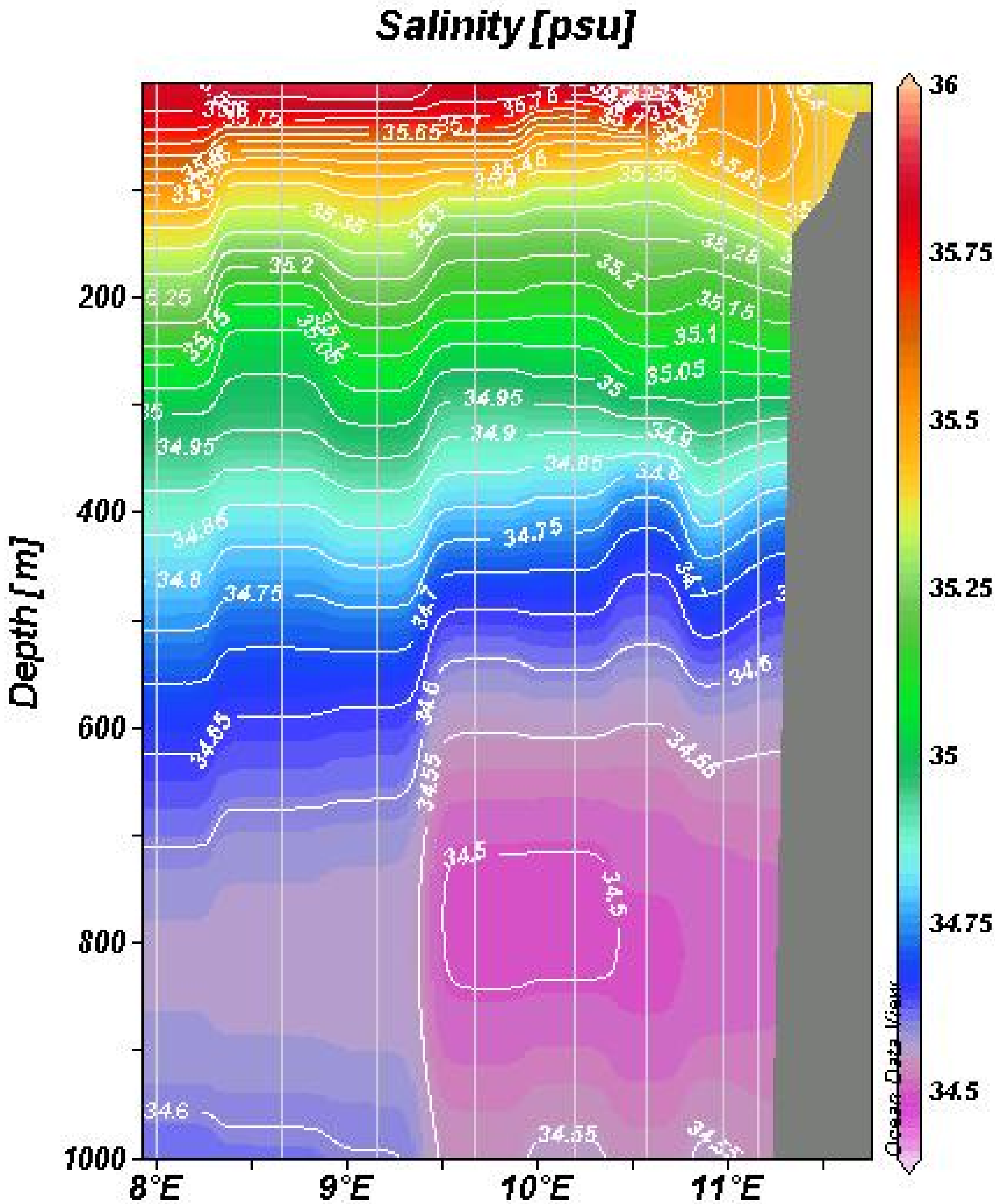

Figure 3: ***Salinity*** **distribution on Transect 2**

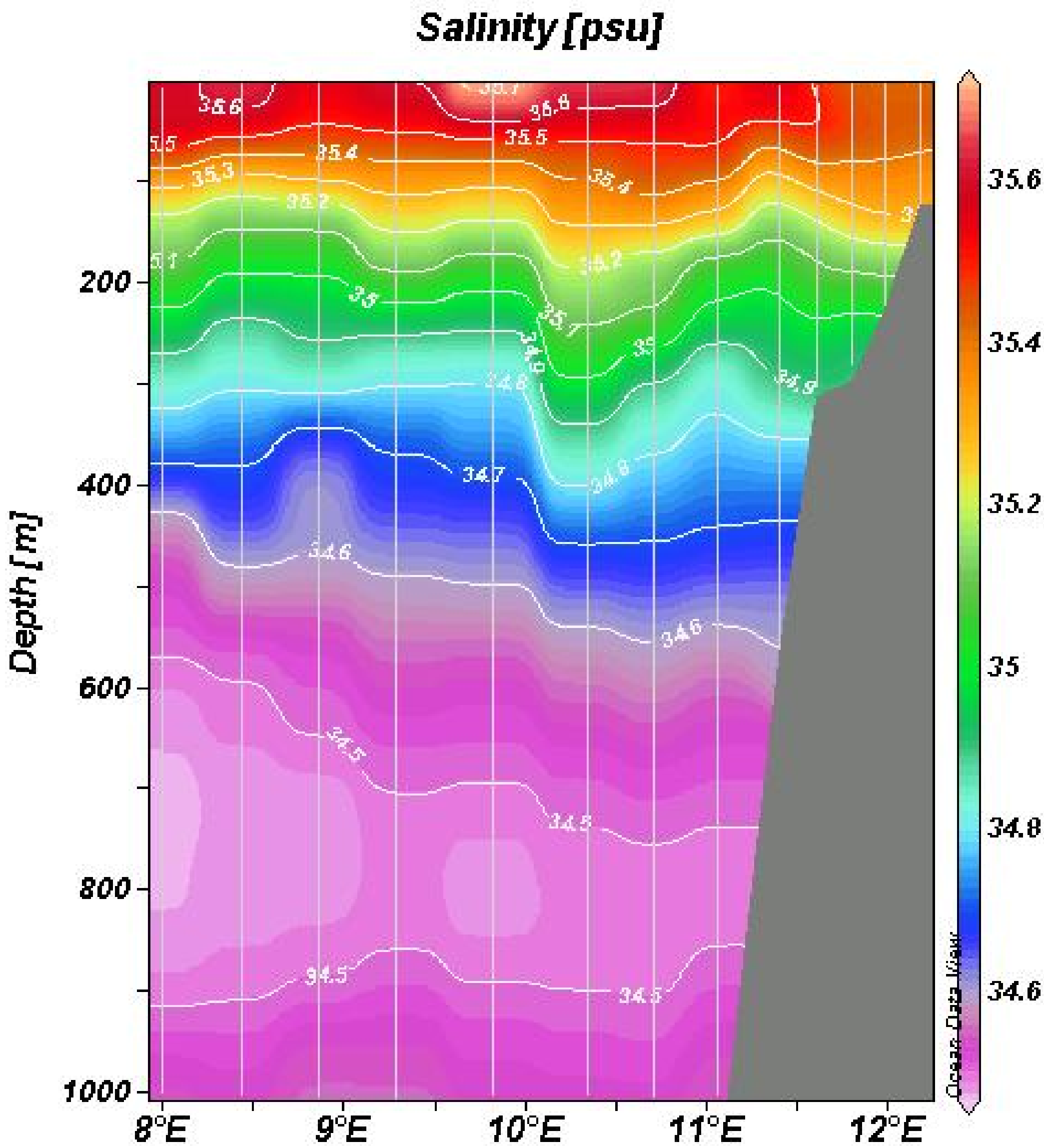

Figure 4: ***Salinity*** **distribution on Transect 3**

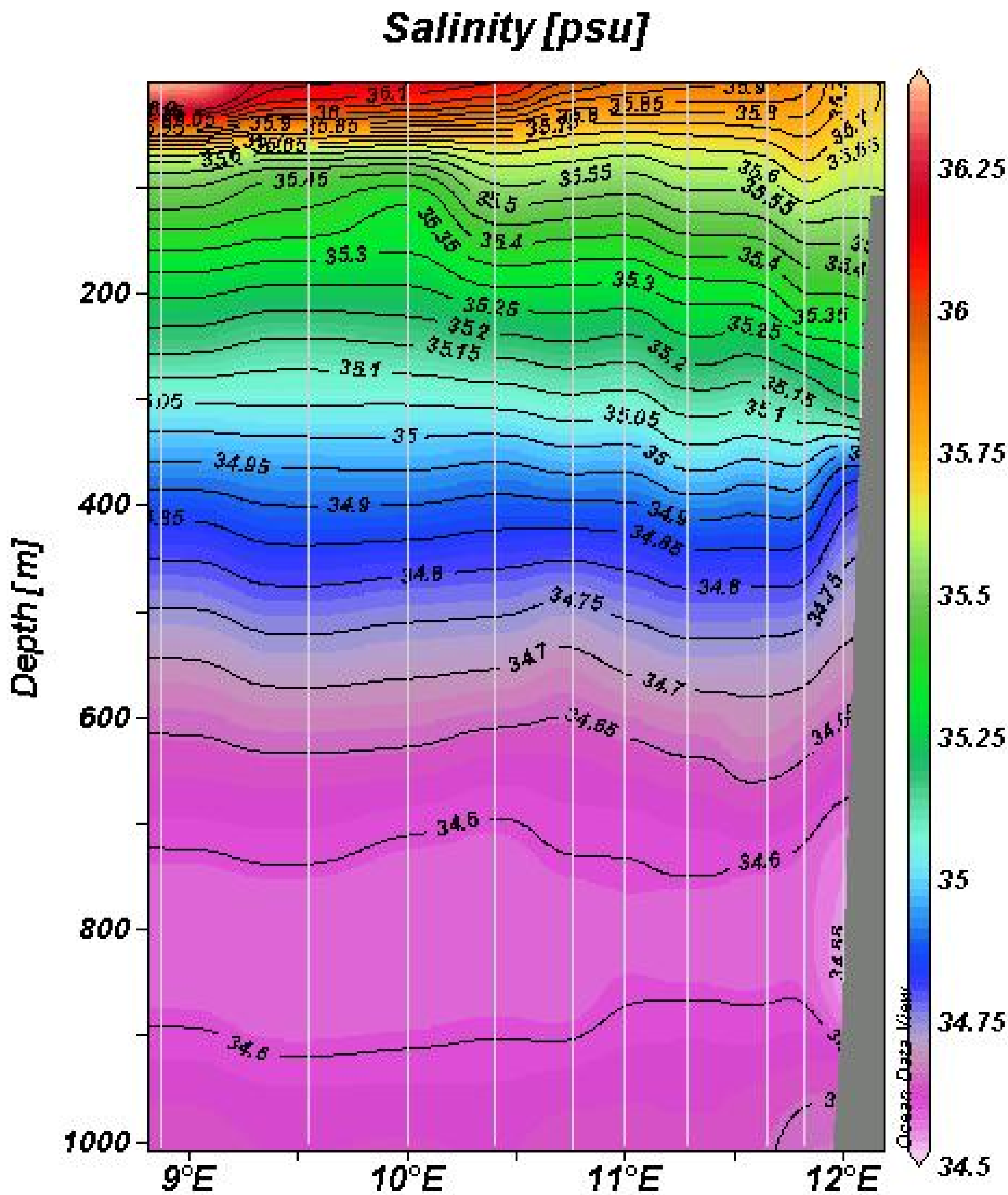

Figure 5: ***Salinity*** **distribution on Transect 4 (Namibe Line)**

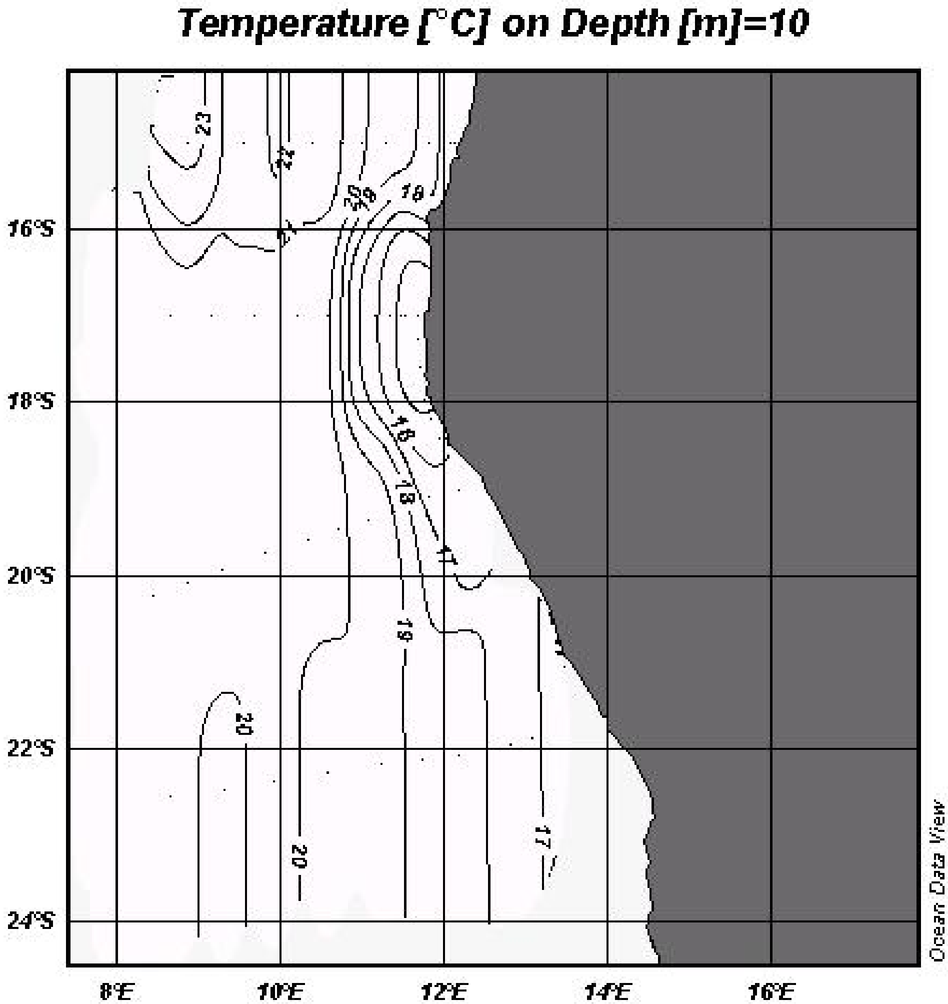

Figure 6 Surface *temperature* distribution from the 4 transects

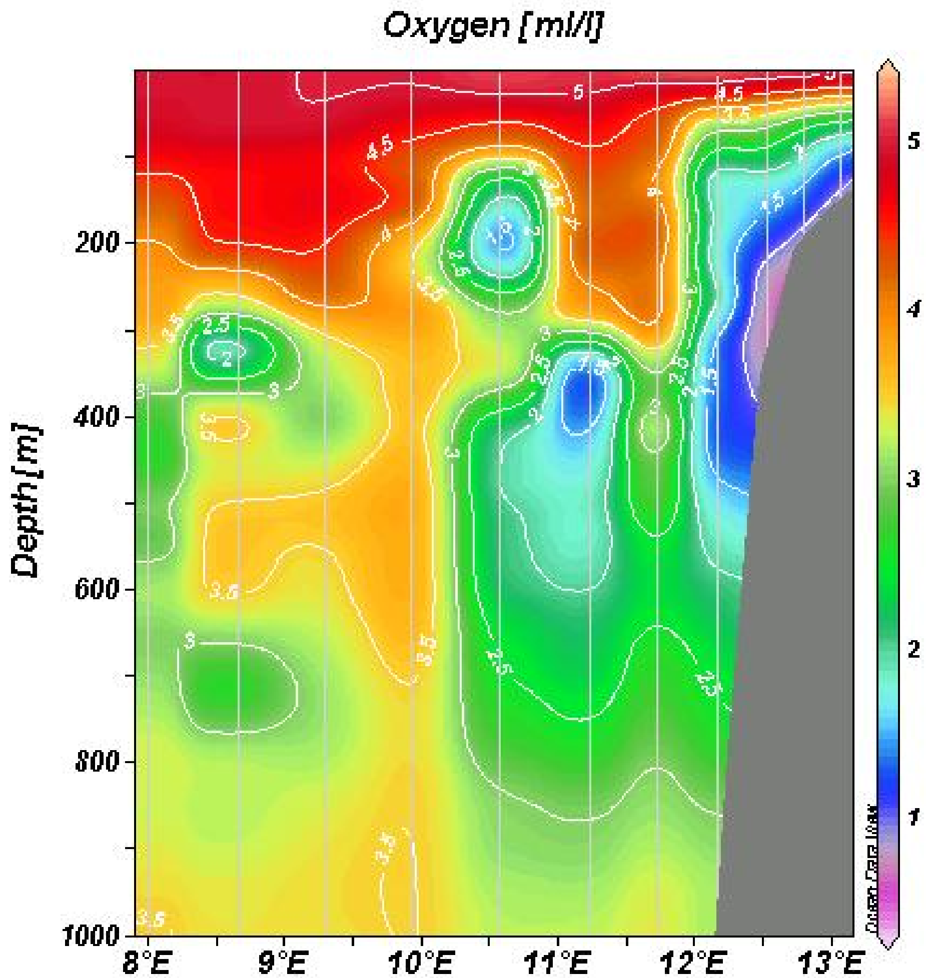

Figure 7 : ***Dissolved oxygen*** **(ml/l) distribution on Transect 1**

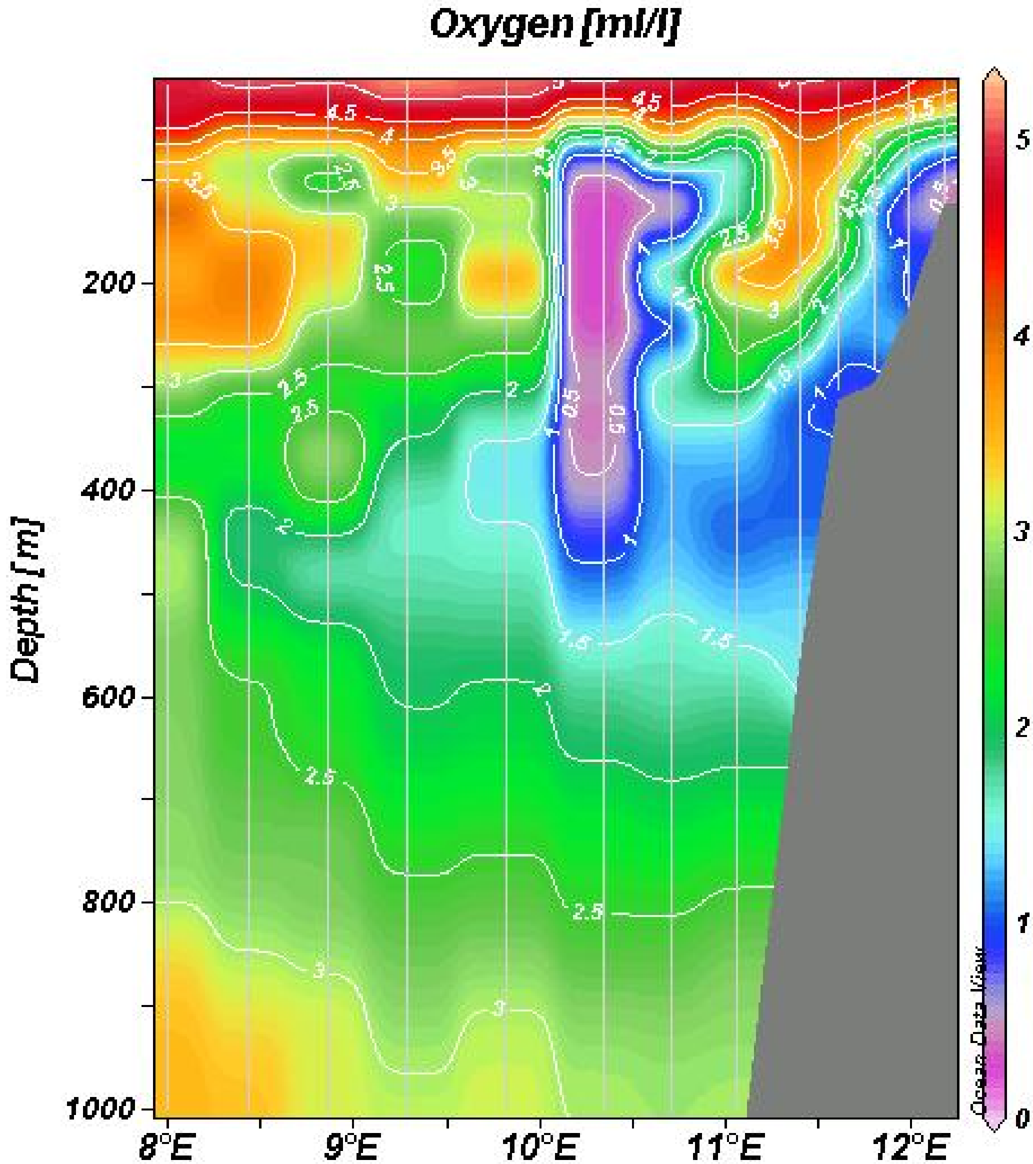

Figure 8 : *Dissolved oxygen* (ml/l) distribution on Transect 2

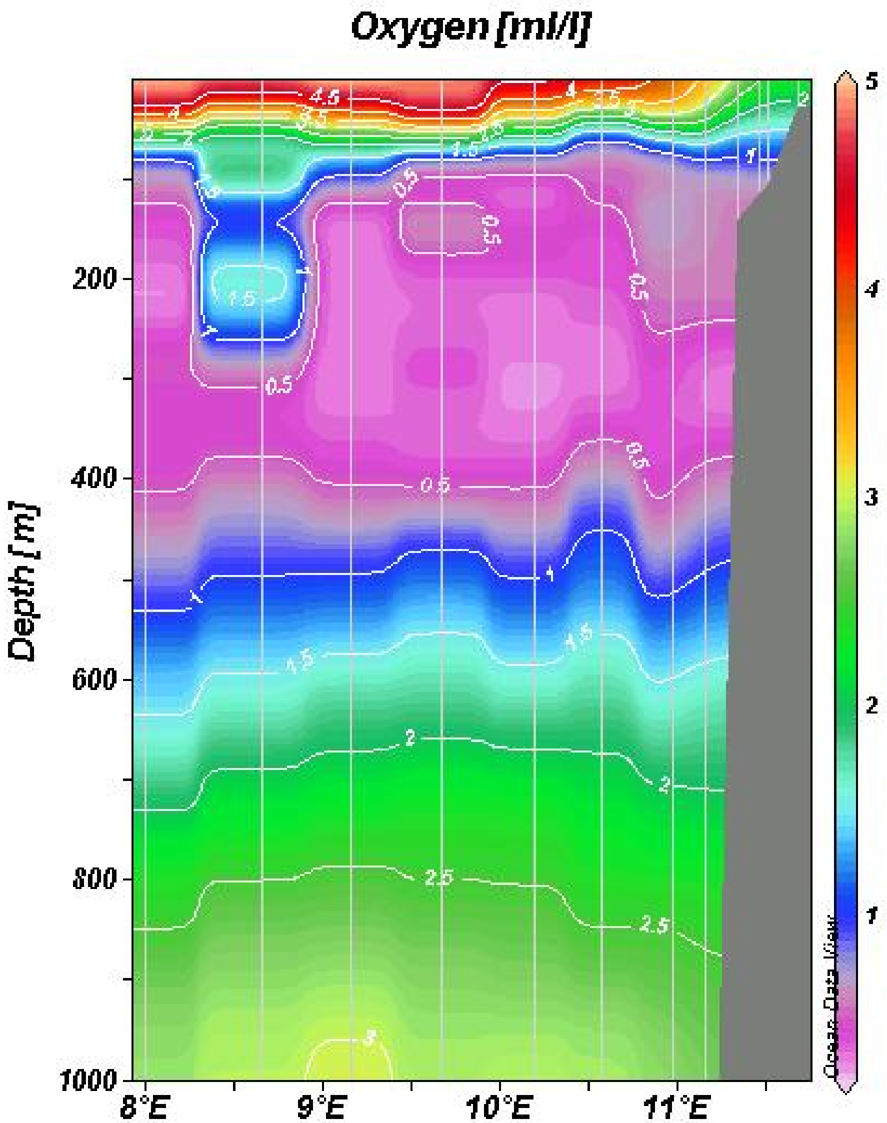

Figure 9 : ***Dissolved oxygen*** **(ml/l) distribution on Transect 3**

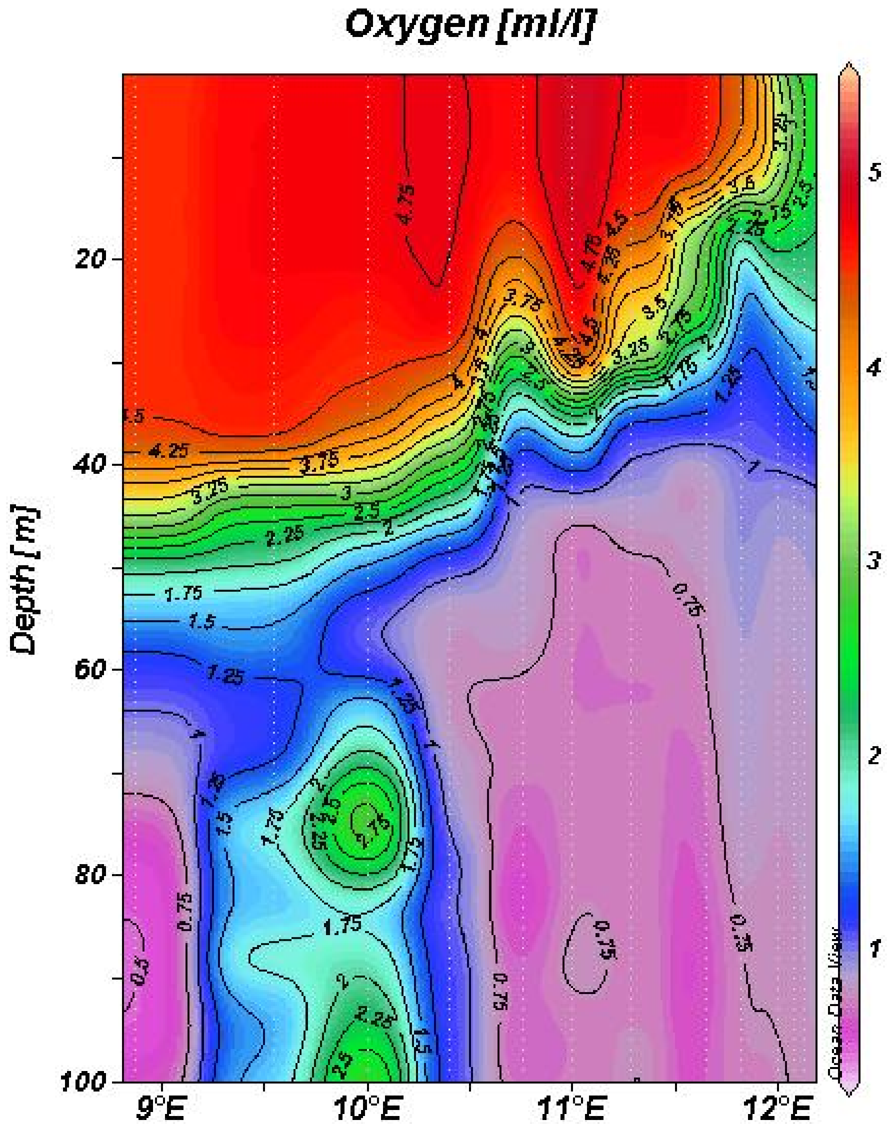

Figure 10 : ***Dissolved oxygen*** **(ml/l) distribution on Transect 4**

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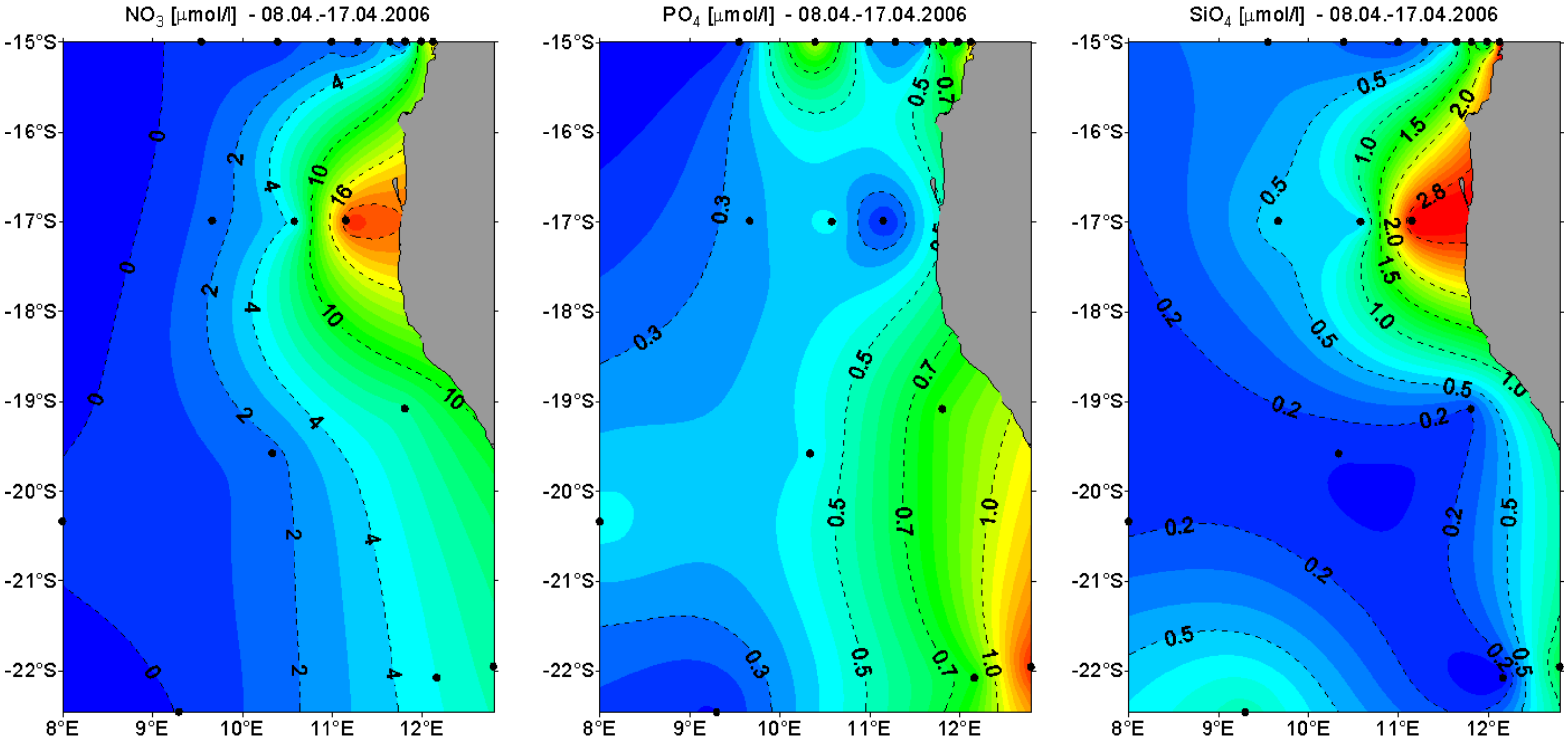

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Figure 11: Surface distribution of nutrients *nitrate, phosphate* and *silicate* (µmol/l)

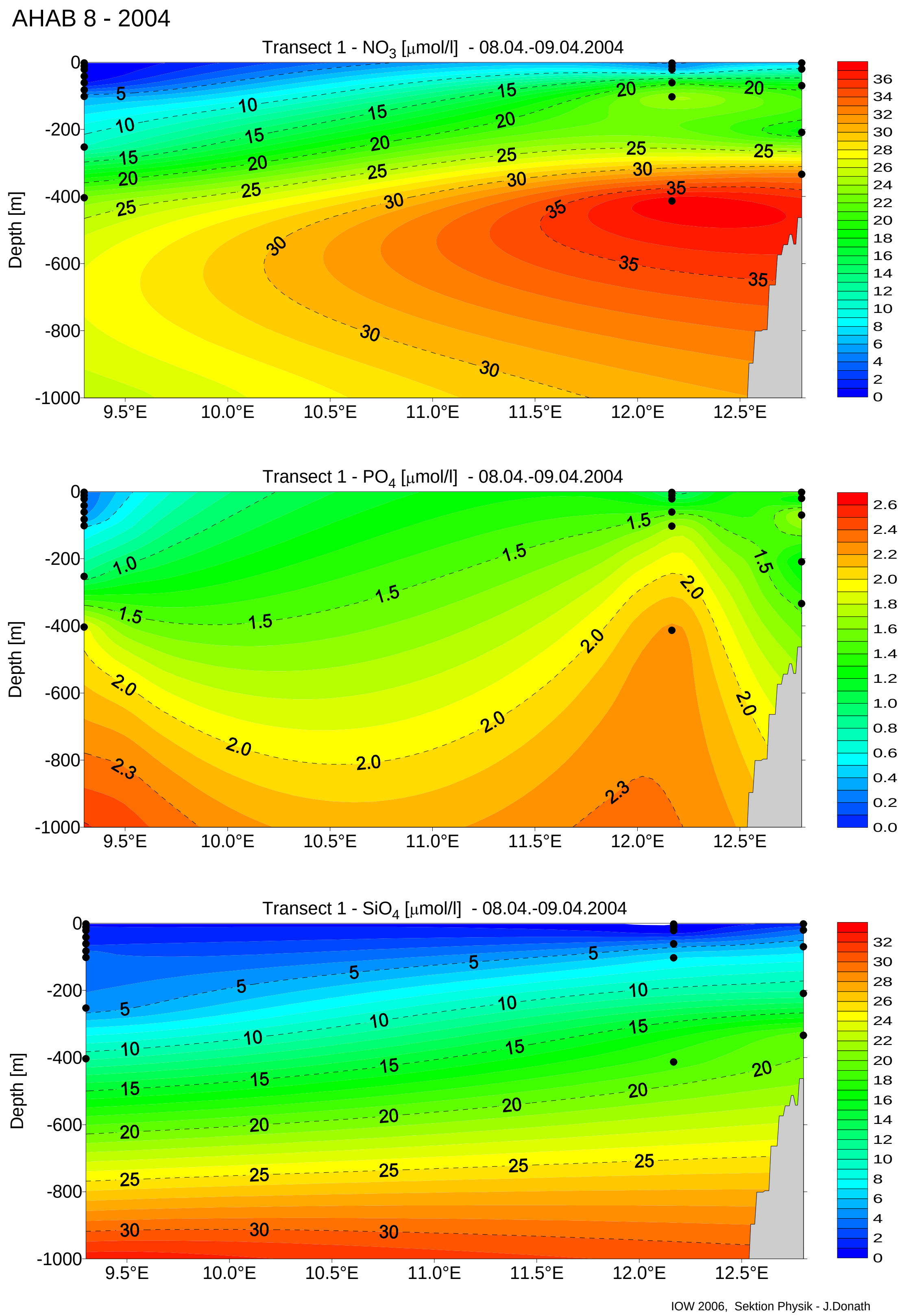

Figure 12: **N*itrate*, *phosphate* and *silicate* (µmol/l) distribution on transect 1.**

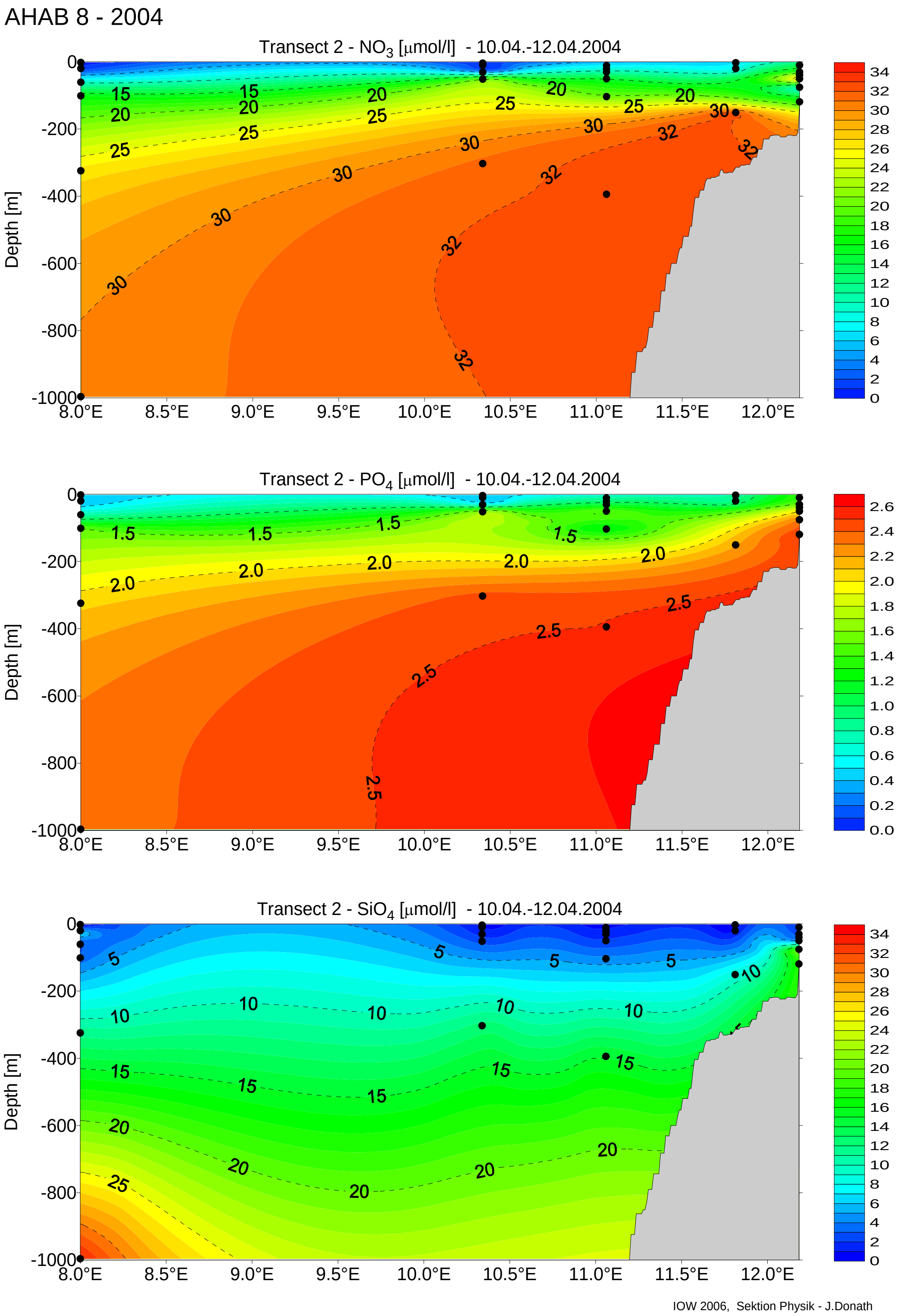

Figure 13: **N*itrate, phosphate* and *silicate* (µmol/l) distribution on transect 2.**

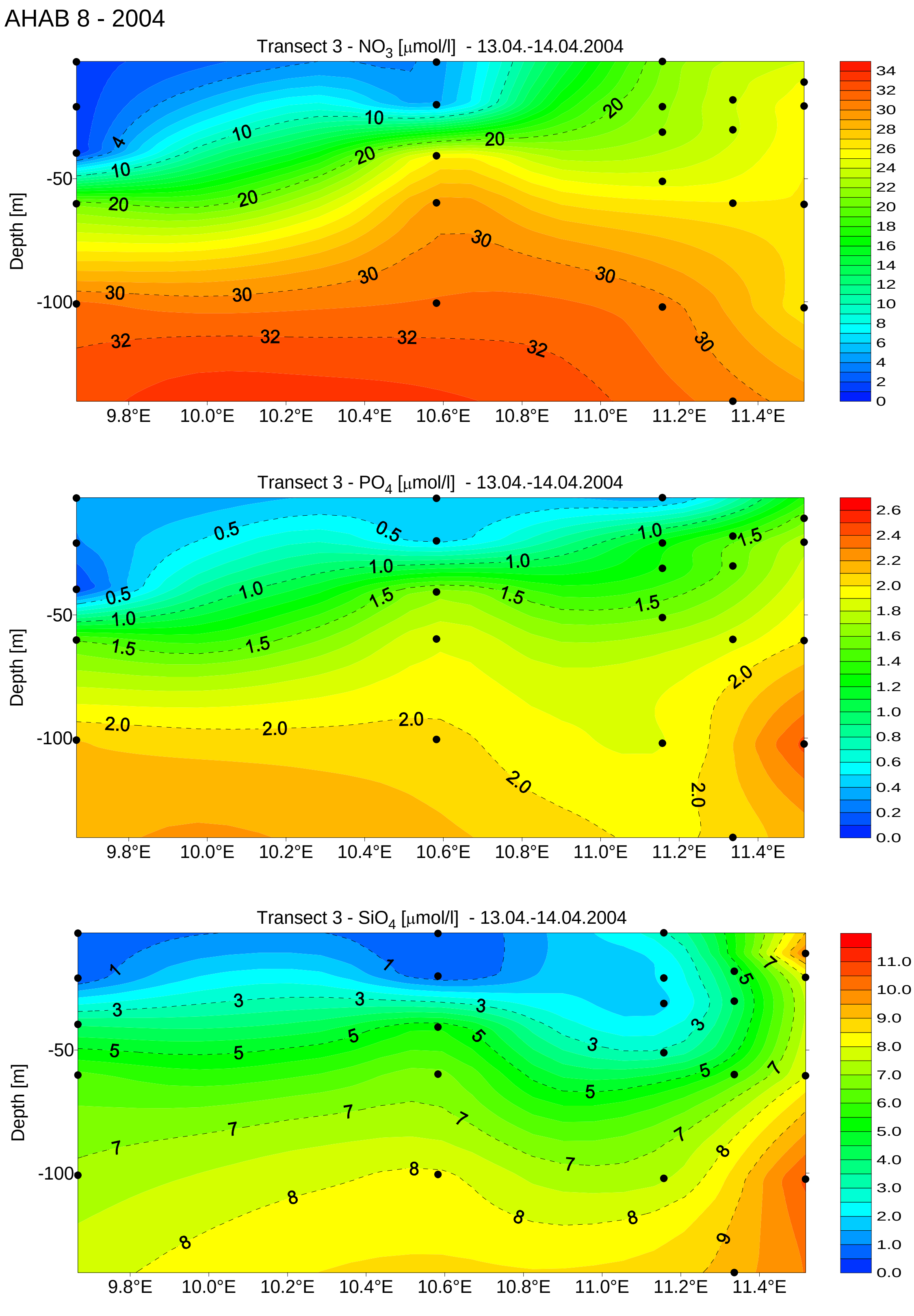

Figure 14: **N*itrate*, *phosphate* and *silicate* (µmol/l) distribution on transect 3.**

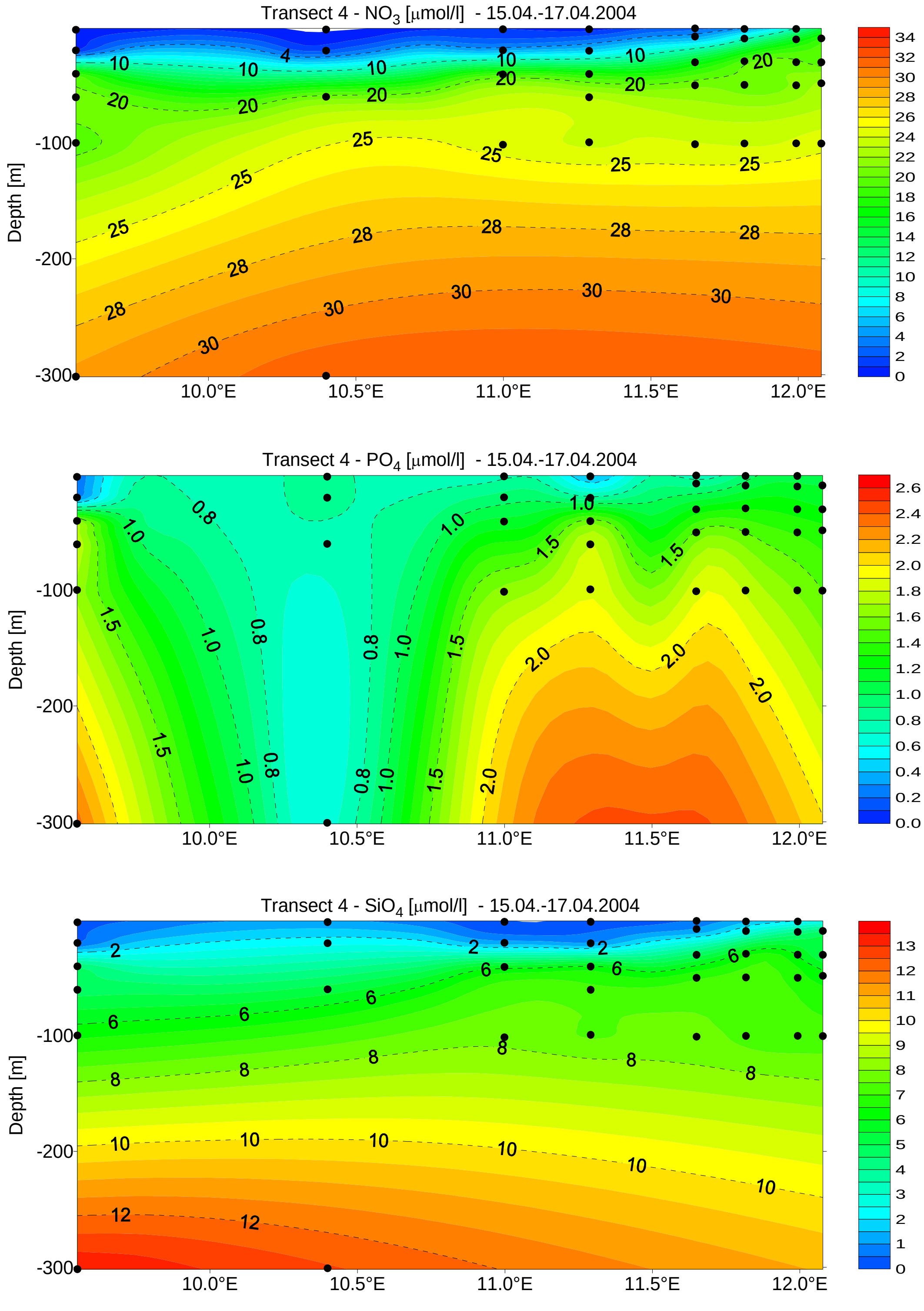

Figure 15: **N*itrate, phosphate* and *silicate* (µmol/l) distribution on transect 2.**

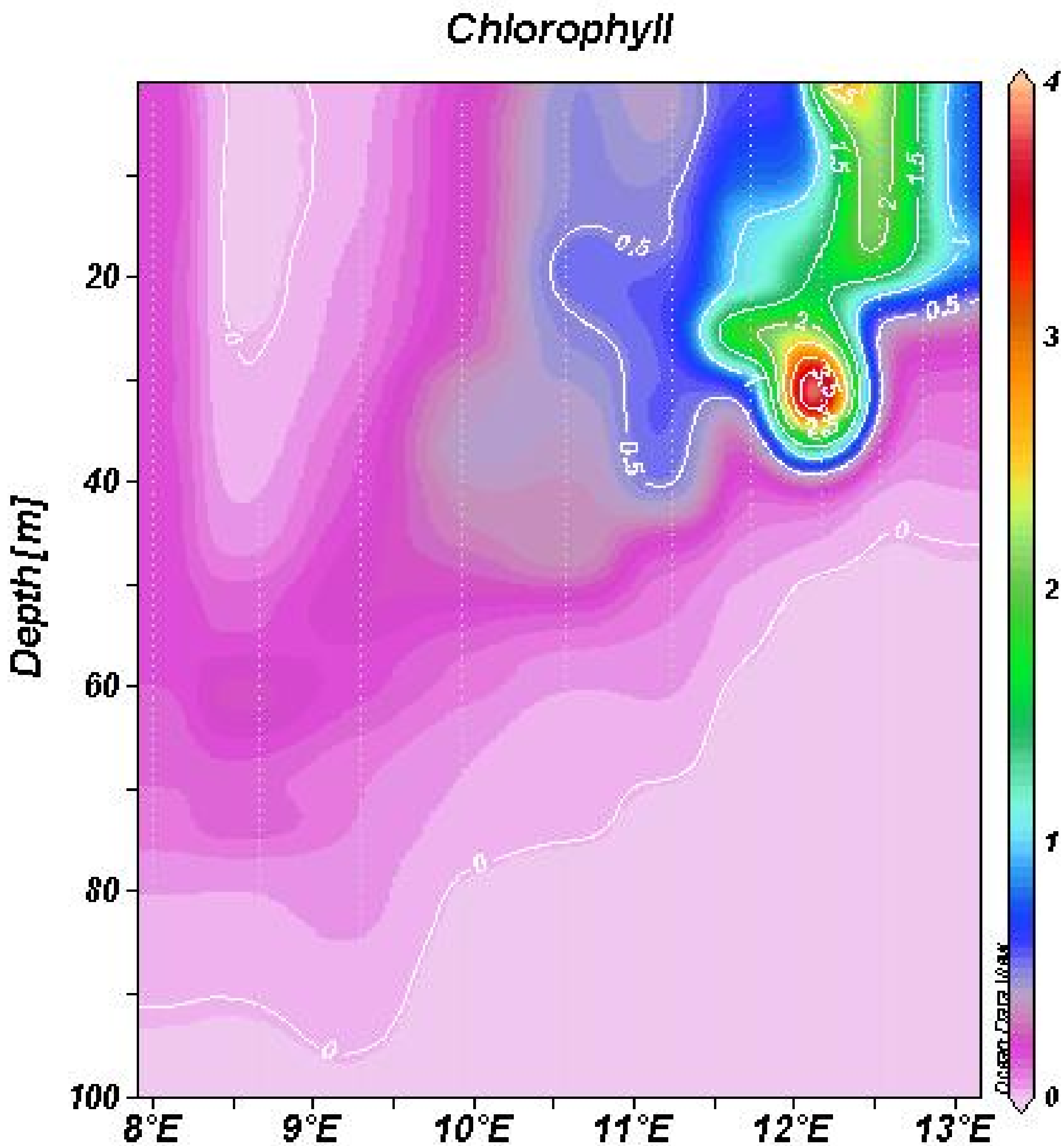

Figure 16: *Chlorophyll a* **distribution (µg/l) on transect 1.**

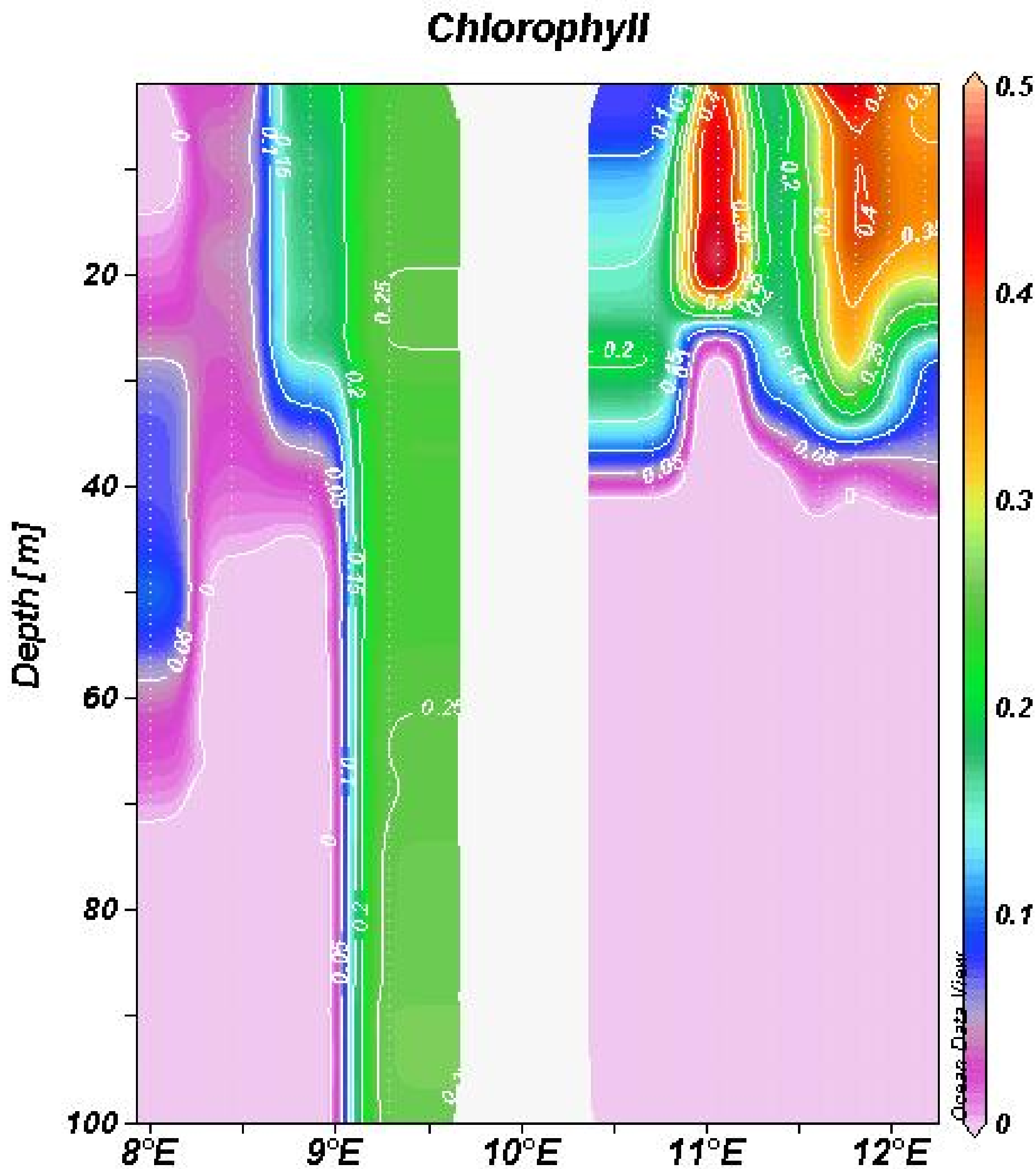

Figure 17 : *Chlorophyll a* distribution (µg/l) on transect 2.

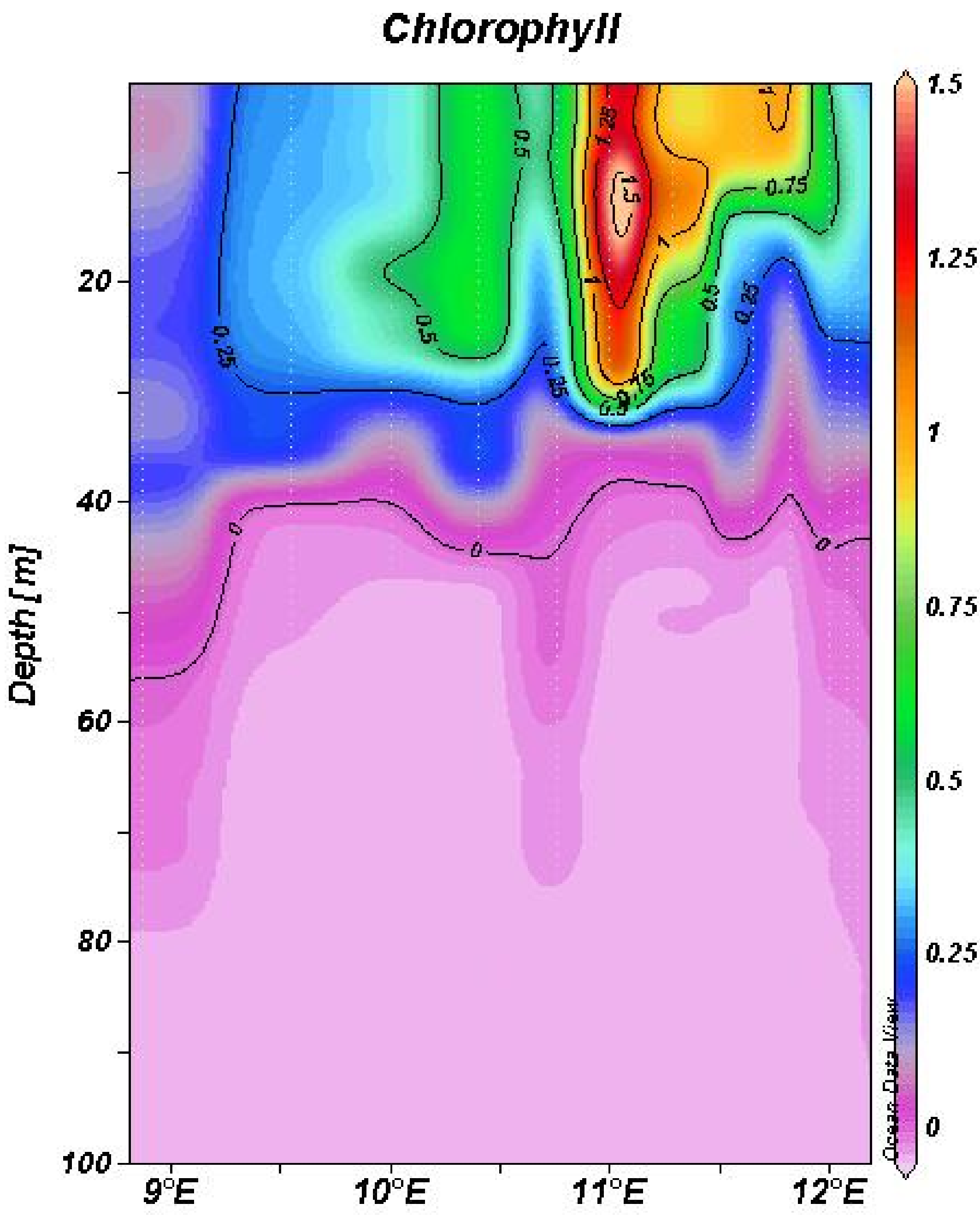

Figure 18: *Chlorophyll a* distribution (µg/l) on transect 3.

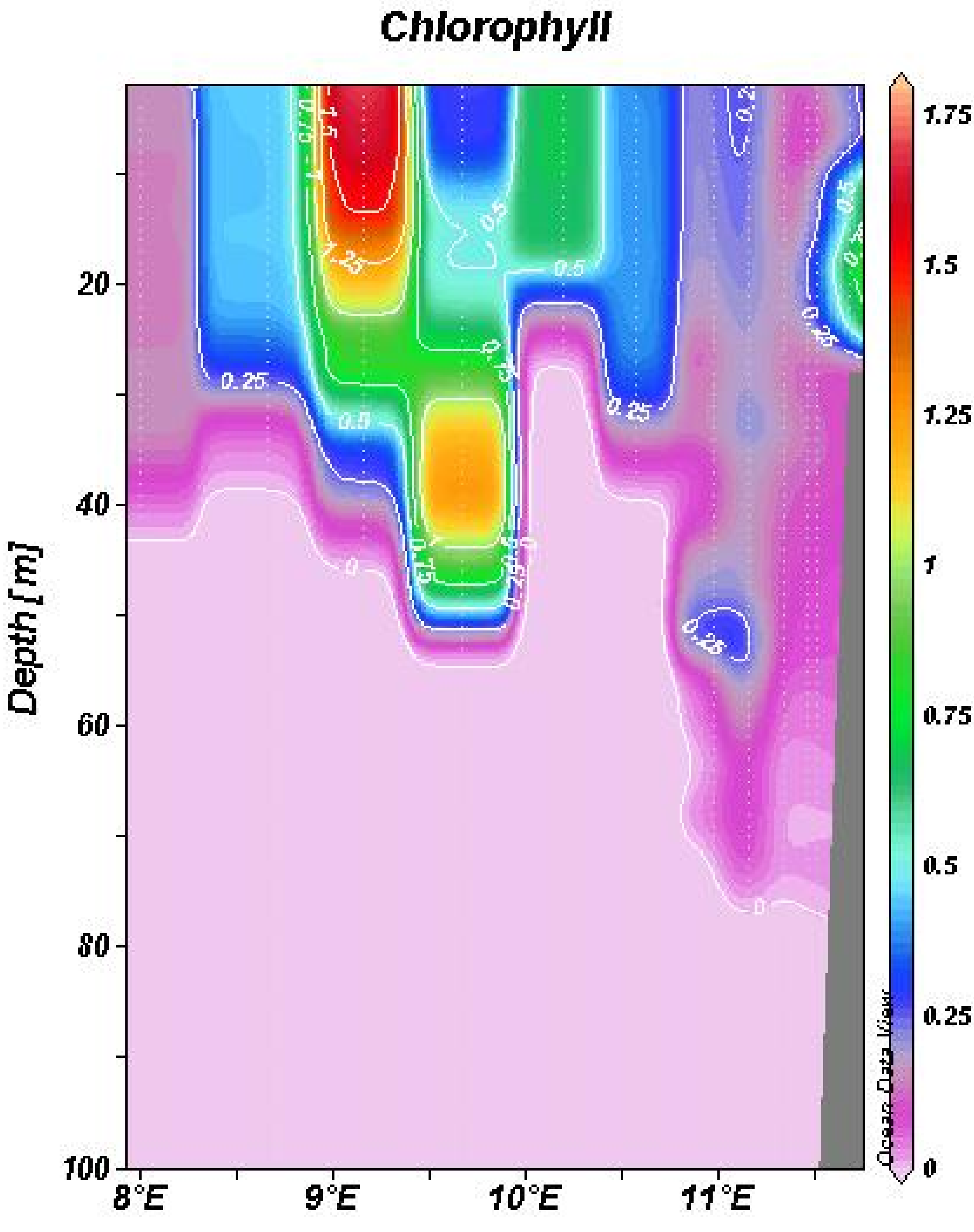

Figure 19: *Chlorophyll a* distribution (µg/l) on transect 4.

Appendix 1: Station details.

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs [ug/l]	NO3 Nitrate [uM]	NO2 Nitrite [uM]	NH4 Ammonia [uM]	PO4 Phosphate [uM]	SiO4 Silicate [uM]	Remarks
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	1.6	15.638	35.238	4.53							
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	10.4	14.489	35.247	3.919							
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	20.4	13.159	35.241	0.803							
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	30.4	12.924	35.236	0.133							
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	40.5	12.794	35.227	0.041							
stud	1	05/05/2004	10:12:52	-22.80955	14.43138	48.1	46.4	12.798	35.225	0.025							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	2.2	15.942	35.235	4.973							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	10.5	13.974	35.233	3.019							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	20.5	13.14	35.237	0.546							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	30.5	12.915	35.234	0.066							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	40.4	12.79	35.226	0.033							
stud	1	05/05/2004	10:57:23	-22.80947	14.43145	48.1	45.2	12.791	35.225	0.017							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	3.8	15.884	35.224	7.365							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	21.7	14.349	35.225	4.084							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	41.1	13.391	35.21	1.921							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	61.4	12.588	35.144	1.705							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	89.8	12.141	35.134	0.373							
ADCP	2	05/07/2004	14:02:26	-22.9934	14.0477	129.9	121.4	12.14	35.141	0.025							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	2.8	16.843	35.239	5.529							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	10.4	16.849	35.251	5.569							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	20.3	16.26	35.27	5.165							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	30.4	15.234	35.269	3.852							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	40.5	14.966	35.271	3.262							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	50.4	14.346	35.262	2.605							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	60.2	14.085	35.265	2.177							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	70.1	13.715	35.269	1.906							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	90.4	13.035	35.236	1.211							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	100.5	12.909	35.227	1.018							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	125.2	12.525	35.196	0.728							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	150.1	12.104	35.147	0.592							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	199.9	11.436	35.072	0.32							
1	3	05/08/2004	1:33:39	-21.88235	13.06578	256.7	255.9	11.211	35.043	0.337							
2	4	05/08/2004	4:17:48	-21.95793	12.8016	336.2	2.2	17.598	35.289	5.527		6.48	0.06	0.61	1.46	1.29	
2	4	05/08/2004	4:17:48	-21.95793	12.8016	336.2	20.4	17.206	35.288	5.027		10.46	0.12	0.59	1.15	3.37	
2	4	05/08/2004	4:17:48	-21.95793	12.8016	336.2	70.3	14.347	35.275	2.33		19.02	0.01	0.41	1.78	6.15	
2	4	05/08/2004	4:17:48	-21.95793	12.8016	336.2	209.3	11.722	35.09	0.759		18.48	0.01	0.32	1.15	11.22	
2	4	05/08/2004	4:17:48	-21.95793	12.8016	336.2	334.4	9.542	34.858	0.706		32.55	0.01	0.62	1.46	19.66	
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	2.6	17.979	35.316	5.491							
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	20.4	17.947	35.315	5.437							
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	101.0	13.591	35.242	2.449							
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	299.8	9.985	34.901	0.592							
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	603.2	5.749	34.524	2.088							
3	5	05/08/2004	7:05:49	-21.99978	12.53367	793.8	791.1	4.574	34.494	2.596							
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	2.7	19.072	35.354	5.534		5	0.21	0.32	0.75	0.01	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	11.8	18.963	35.351	5.552		4.97	0.23	0.66	0.82	0.01	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	21.7	18.587	35.34	5.504		5.84	0.23	0.66	0.82	0.01	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	41.1	15.536	35.359	3.569							
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	61.1	14.846	35.378	2.53		19.67	0.02	0.37	1.7	4.27	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	103.2	13.626	35.277	1.797		24.29	0.01	0.4	1.83	7	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	413.8	7.729	34.677	1.202		37.94	0.01	0.4	2.26	18.49	
4	6	05/08/2004	10:46:31	-22.08398	12.1685	1690.8	1000.1	3.855	34.533	3.303							
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	2.4	18.655	35.307	5.467	0.41						
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	11.4	18.483	35.304	5.523	0.33						
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	21.0	18.032	35.294	5.187	0.23						
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	46.1	15.133	35.375	4.534							
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	377.8	7.947	34.615	3.352							
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	600.7	5.578	34.502	2.443							
5	7	05/08/2004	14:57:54	-22.11607	11.72535	2410.8	1004.6	3.713	34.533	3.518							
6	8	05/08/2004	19:53:32	-22.17557	11.2289	3075.9	2.0	19.761	35.421	5.212							

6	8	05/08/2004	19:53:32	-22.17557	11.2289	3075.9	343.7	9.428	34.829	0.911

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs	NO3 Nitrate	NO2 Nitrite	NH4 Ammonia	PO4 Phosphate	SiO4 Silicate	Remarks
6	8	05/08/2004	19:53:32	-22.17557	11.2289	3075.9	1003.7	3.857	34.518	3.42							
7	9	05/09/2004	0:20:32	-22.29258	10.58385	3716.1	0.9	19.357	35.31	5.303							
7	9	05/09/2004	0:20:32	-22.29258	10.58385	3716.1	194.5	12.557	35.172	1.322							
7	9	05/09/2004	0:20:32	-22.29258	10.58385	3716.1	350.3	8.796	34.69	3.651							
8	10	05/09/2004	5:28:43	-22.37613	9.91528	4074	1.6	20.393	35.483	5.175							
8	10	05/09/2004	5:28:43	-22.37613	9.91528	4074	232.9	11.869	35.051	3.161							
8	10	05/09/2004	5:28:43	-22.37613	9.91528	4074	1002.2	3.69	34.557	3.623							
8	10	05/09/2004	6:13:14	-22.37398	9.91155	4073	5.3	20.399	35.484	5.177							repeat CTD dip
8	10	05/09/2004	6:13:14	-22.37398	9.91155	4073	5.3	20.399	35.484	5.175							
8	10	05/09/2004	6:13:14	-22.37398	9.91155	4073	5.9	20.399	35.484	5.177							
9	11	05/09/2004	10:24:06	-22.46608	9.30022	4305	102.0	15.889	35.516	4.769		5.77	0.03	0.19	0.48	3.05	
9	11	05/09/2004	10:24:06	-22.46608	9.30022	4305	252.9	12.332	35.092	4.585		11.03	0.01	0.18	0.93	4.32	
9	11	05/09/2004	10:24:06	-22.46608	9.30022	4305	403.9	9.411	34.772	2.786		23.24	0.01	0.1	1.93	10.82	
9	11	05/09/2004	10:24:06	-22.46608	9.30022	4305	1006.8	3.831	34.552	3.37		25.16	0.04	0.1	2.52	32.9	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	2.3	20.404	35.429	5.162		0.01	0.01	0.19	0.19	0.88	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	11.6	19.783	35.432	5.182		0.05	0.01	0.16	0.19	1.26	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	21.8	19.749	35.43	5.183		0.03	0.01	0.19	0.19	1.16	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	41.8	19.59	35.429	5.175		0.09	0.01	0.19	0.21	1.16	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	61.2	19.004	35.387	5.112		0.89	0.08	0.35	0.26	1.74	
9	11	05/09/2004	11:14:28	-22.4596	9.29393	4310	82.8	16.944	35.589	4.857		3.21	0.41	0.19	0.33	3.13	
10	12	05/09/2004	15:58:02	-22.55167	8.66635	4420	1.2	20.892	35.49	5.059							
10	12	05/09/2004	15:58:02	-22.55167	8.66635	4420	320.5	10.928	34.975	1.567							
10	12	05/09/2004	15:58:02	-22.55167	8.66635	4420	1003.6	3.771	34.515	3.541							
11	13	05/09/2004	21:37:21	-22.63313	8.00188	4488.7	2.3	20.574	35.48	5.095							
11	13	05/09/2004	21:37:21	-22.63313	8.00188	4488.7	40.1	20.127	35.451	5.103							
11	13	05/09/2004	21:37:21	-22.63313	8.00188	4488.7	40.9	20.128	35.451	5.089							
11	13	05/09/2004	21:37:21	-22.63313	8.00188	4488.7	435.4	8.013	34.645	2.651							
11	13	05/09/2004	21:37:21	-22.63313	8.00188	4488.7	1004.7	3.675	34.536	3.649							
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	2.4	21.097	35.57	5.047	0.18	0.45	0.01	0.19	0.43	0.17	
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	10.1	20.892	35.56	5.064	0.22						
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	20.5	20.797	35.552	5.072	0.24	0.59	0.01	0.33	0.36	6.47	
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	40.0	20.669	35.6	4.936	0.32						
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	61.2	16.28	35.434	3.06	0.15	9.87	0.01	0.32	0.75	2.61	
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	101.8	13.545	35.203	4.574		16.06	0.01	0.2	1.49	3.35	
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	201.9	11.762	35.033	3.684							
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	324.8	9.311	34.786	2.279		26.38	0.07	0.3	2.07	11.55	
12	14	05/10/2004	11:34:02	-20.34068	7.9998	3162.4	996.6	3.808	34.55	3.552		30.26	0.04	0.15	2.35	33.39	
13	15	05/10/2004	16:06:13	-20.23212	8.44102	2059	3.3	20.444	35.624	5.304							
13	15	05/10/2004	16:06:13	-20.23212	8.44102	2059	61.1	16.103	35.424	3.025							
13	15	05/10/2004	16:06:13	-20.23212	8.44102	2059	450.5	7.365	34.635	1.793							
13	15	05/10/2004	16:06:13	-20.23212	8.44102	2059	1001.3	3.845	34.538	3.494							
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	3.2	20.521	35.545	5.256	0.46						
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	10.3	20.525	35.544	5.254	0.56						
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	21.3	20.483	35.537	5.245	0.54						
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	40.6	18.546	35.507	4.565	0.27						
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	59.8	16.492	35.497	4.193	0.09						
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	114.8	13.725	35.288	2.119							
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	463.3	6.661	34.593	1.638							
14	16	05/10/2004	20:25:10	-20.09985	8.85815	2279.2	1001.7	3.88	34.555	3.283							
15	17	05/11/2004	0:43:34	-19.93332	9.2902	2360.2	3.0	20.378	35.617	5.426							
15	17	05/11/2004	0:43:34	-19.93332	9.2902	2360.2	60.1	16.82	35.463	3.663							
15	17	05/11/2004	0:43:34	-19.93332	9.2902	2360.2	326.7	8.833	34.731	2.273							
15	17	05/11/2004	0:43:34	-19.93332	9.2902	2360.2	1006.1	3.871	34.558	3.252							
16	18	05/11/2004	5:48:20	-19.7414	9.82458	2085.1	2.7	20.831	35.724	5.218							
16	18	05/11/2004	5:48:20	-19.7414	9.82458	2085.1	390.5	8.012	34.705	1.284							
16	18	05/11/2004	5:48:20	-19.7414	9.82458	2085.1	1001.3	3.942	34.542	3.22							
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	4.4	20.278	35.651	5.485	1.74	1.61	0.08	0.73	0.41	0.11	
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	10.7	20.269	35.65	5.491	1.77	1.63	0.09	0.63	0.41	0.11	
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	21.7	20.163	35.647	5.437	1.88						

17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	31.0	19.933	35.625	5.229	1.28	1.81	0.09	1.4	0.47	0.16	
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	40.9	17.471	35.54	4.483	0.25						

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs	NO3 Nitrate	NO2 Nitrite	NH4 Ammonia	PO4 Phosphate	SiO4 Silicate	Remarks
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	52.2	15.943	35.53	1.789	0.14	22.2	0.16	0.63	1.79	2.86	
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	303.5	10.408	34.959	0.54		31.23	0.01	0.24	2.44	12.92	
17	19	05/11/2004	10:40:14	-19.58293	10.33937	1378.6	962.6	4.102	34.516	3.055							
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	4.0	20.407	35.663	5.228	0.73						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	11.4	20.402	35.661	5.215	0.71						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	20.5	20.407	35.662	5.208	0.74						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	30.9	20.38	35.669	5.129	0.76						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	40.9	17.889	35.555	4.509	0.88						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	51.4	16.768	35.506	3.857	0.16						
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	124.7	14.242	35.405	0.302							
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	246.5	11.648	35.106	0.437							
18	20	05/11/2004	14:26:54	-19.4572	10.71527	1199.9	1001.9	4.019	34.541	3.077							
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	3.5	19.482	35.498	5.405	0.85						
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	11.7	19.479	35.496	5.397	0.81	7.02	0.25	0.3	0.78	0.3	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	22.4	19.49	35.494	5.388	0.83	7.32	0.26	0.3	0.78	0.07	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	31.0	17.919	35.504	4.153	0.31	12.03	1.03	0.83	1.23	0.67	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	41.7	16.497	35.512	3.365	0.07						
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	50.9	16.294	35.51	2.802	0.06	15.04	0.07	0.22	1.54	1.49	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	103.8	14.167	35.327	3.28		19.95	0.02	0.11	1.13	4.44	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	394.3	8.304	34.728	1.223		32.16	0.01	0.09	2.5	15.5	
19	21	05/11/2004	18:45:30	-19.34125	11.05983	1108.4	994.9	4.002	34.555	3.078							
20	22	05/11/2004	21:58:35	-19.26707	11.39795	574.7	21.4	19.472	35.57	5.313							
20	22	05/11/2004	21:58:35	-19.26707	11.39795	574.7	51.6	16.315	35.465	3.859							
20	22	05/11/2004	21:58:35	-19.26707	11.39795	574.7	322.2	9.465	34.839	0.92							
20	22	05/11/2004	21:58:35	-19.26707	11.39795	574.7	559.8	6.443	34.586	1.522							
21	23	05/12/2004	0:43:10	-19.16532	11.61472	314.7	10.3	18.946	35.496	5.181							
21	23	05/12/2004	0:43:10	-19.16532	11.61472	314.7	60.3	17.307	35.512	4.299							
21	23	05/12/2004	0:43:10	-19.16532	11.61472	314.7	183.9	11.895	35.063	3.246							
21	23	05/12/2004	0:43:10	-19.16532	11.61472	314.7	297.3	9.873	34.899	0.662							
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	3.0	17.739	35.415	5.416	1.51	6.81	0.21	0.5	0.83	0.17	
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	10.6	17.738	35.416	5.41	1.55						
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	20.7	17.739	35.415	5.377	1.41	6.98	0.22	0.62	0.81	0.16	
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	31.6	17.471	35.434	4.722	1.93						
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	41.4	16.543	35.476	3.166	0.2						
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	50.8	16.029	35.504	2.186	0.08						
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	76.0	14.564	35.347	3.996							
22	24	05/12/2004	3:25:16	-19.08817	11.81252	297.1	151.3	12.898	35.255	0.372		32.26	0.01	0.28	2.19	9.23	
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	2.8	17.675	35.436	5.039	0.93						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	10.5	17.654	35.435	5.031	0.92						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	20.4	17.42	35.423	4.882	0.84						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	29.7	16.708	35.405	4.431	0.5						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	41.0	16.359	35.4	4.171	0.35						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	51.5	16.151	35.402	3.885	0.34						
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	83.8	14.932	35.473	0.683							
23	25	05/12/2004	5:39:36	-19.03255	11.98335	224.6	220.9	10.984	35.016	0.346							
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	3.3	16.527	35.423	4.229	2.64						
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	10.7	16.482	35.425	4.221	2.25	13.82	0.31	1.8	1.48	2.3	
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	20.6	16.481	35.425	4.188							
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	30.1	16.01	35.426	3.371		17.95	0.31	4.42	1.52	2.39	
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	40.2	15.885	35.471	2.338	0.83	25.49	2.29	0.3	1.76	3.21	
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	50.9	15.289	35.489	0.818	0.1	27.51	0.99	0.33	2	4.3	
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	76.2	14.117	35.345	0.836		10.12	0.64	0.89	2.31	19.74	
24	26	05/12/2004	7:56:07	-18.99985	12.1837	123.6	119.9	13.118	35.279	0.002		17.11	4.19	0.53	21.83	2.52	
BE01	27	05/12/2004	11:49:46	-18.41428	11.93165	48.4	4.0	14.494	35.351	1.886	1.11						
BE01	27	05/12/2004	11:49:46	-18.41428	11.93165	48.4	44.5	13.403	35.303	0.128	0.5						
BE02	28	05/12/2004	16:41:45	-18.1908	11.84132	30.5	26.6	14.275	35.352	1.506							
BE03	29	05/12/2004	20:02:43	-17.96058	11.7686	44.3	1.7	14.228	35.346	1.846							
BE03	29	05/12/2004	20:02:43	-17.96058	11.7686	44.3	41.9	13.342	35.3	0.18							

BE04	30	05/12/2004	23:31:46	-17.59967	11.69975	60.9	2.4	13.863	35.331	1.355
BE04	30	05/12/2004	23:31:46	-17.59967	11.69975	60.9	56.8	12.913	35.256	0.075
BE05	31	05/13/2004	3:07:20	-17.26342	11.68368	63.7	4.2	13.747	35.332	1.457

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs	NO3 Nitrate	NO2 Nitrite	NH4 Ammonia	PO4 Phosphate	SiO4 Silicate	Remarks
BE05	31	05/13/2004	3:07:20	-17.26342	11.68368	63.7	60.3	13.034	35.276	0.049							
BE06	32	05/13/2004	6:57:13	-17.00208	11.69527	27.8	1.9	15.244	35.384	3.151	6.1						
BE06	32	05/13/2004	6:57:13	-17.00208	11.69527	27.8	16.0	15.228	35.421	2.304	31.14						
BE06	32	05/13/2004	6:57:13	-17.00208	11.69527	27.8	23.5	14.896	35.461	0.758	15.16						
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	1.8	14.601	34.959	2.944	1.56						
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	11.0	14.262	35.368	1.758		25.11	1.67	0.77	1.57	10.05	
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	20.7	14.308	35.397	1.452	8.25	25.82	1.06	0.85	1.77	7.98	
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	40.5	14.281	35.398	1.365	2.76						
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	60.3	14.128	35.384	1.27	1.01	26.02	1.78	0.92	2	7.99	
25	33	05/13/2004	9:36:23	-17.00003	11.51748	107.4	102.2	13.593	35.35	0.43		26.26	0.52	0.86	2.44	10.66	
26	34	05/13/2004	11:41:53	-17.00153	11.45943	115.2	3.9	14.658	35.168	2.718							
26	34	05/13/2004	11:41:53	-17.00153	11.45943	115.2	60.4	14.561	35.416	1.961							
26	34	05/13/2004	11:41:53	-17.00153	11.45943	115.2	110.7	13.806	35.379	0.536							
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	2.5	16.067	35.518	4.007	1.15						
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	18.4	15.994	35.529	3.512	1.18	22.13	0.36	0.51	1.32	1.88	
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	30.2	15.882	35.542	1.828	0.4	24.11	0.31	0.72	1.57	4.66	
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	41.5	15.39	35.516	1.306							
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	60.6	15.137	35.516	0.64		27.34	0.11	0.32	1.93	7.64	
27	35	05/13/2004	13:55:18	-16.9993	11.33645	141.1	140.0	13.779	35.374	0.541	0.27	30.43	0.16	0.7	1.98	9.14	
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	2.4	16.254	35.544	3.316	1.46	21.78	0.48	1.21	0.18	3.16	
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	11.6	16.186	35.545	3.26	1.17						
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	21.0	16.091	35.539	3.345	2.1	22.3	0.5	0.45	1.4	2.74	
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	31.0	15.832	35.519	3.395	11.37	21.78	0.55	0.47	1.24	1.38	
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	51.4	15.446	35.508	1.976	7.72	24.03	0.52	0.21	1.57	2.26	
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	80.3	14.642	35.46	0.646							
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	102.2	13.606	35.356	0.661		30.61	0.29	0.23	1.85	7.23	SiO4 ???
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	297.2	10.193	34.954	0.264							
28	36	05/13/2004	19:48:06	-16.98898	11.15705	1637.4	1001.7	4.248	34.537	2.82							
29	37	05/13/2004	22:17:46	-16.99307	10.98528	2201.5	2.7	17.285	35.529	4.35							
29	37	05/13/2004	22:17:46	-16.99307	10.98528	2201.5	298.8	10.643	35.01	0.434							
29	37	05/13/2004	22:17:46	-16.99307	10.98528	2201.5	1001.3	4.087	34.563	2.968							
30	38	05/14/2004	1:46:44	-16.99882	10.58285		2.7	20.355	36.02	4.612	1.43	4.42	0.19	0.73	0.42	0.55	
30	38	05/14/2004	1:46:44	-16.99882	10.58285		10.1	20.356	36.017	4.608	2.16						
30	38	05/14/2004	1:46:44	-16.99882	10.58285		20.5	20.264	35.996	4.557	1.38	4.75	0.21	1.01	0.45	0.59	
30	38	05/14/2004	1:46:44	-16.99882	10.58285		40.9	15.635	35.54	1.157	1.41	26.03	0.42	0.55	1.67	5.48	
30	38	05/14/2004	1:46:44	-16.99882	10.58285		60.5	14.616	35.443	0.742	0.13	29.38	0.01	0.52	1.88	6.67	
30	38	05/14/2004	1:46:44	-16.99882	10.58285		100.7	13.418	35.317	0.514		31.07	0.01	0.3	2.03	8.1	
30	38	05/14/2004	1:46:44	-16.99882	10.58285		300.5	10.585	34.999	0.314							
30	38	05/14/2004	1:46:44	-16.99882	10.58285		1001.7	4.014	34.558	3.054							
31	39	05/14/2004	5:39:50	-16.9989	10.19977	3636.2	3.3	20.27	35.959	5.002							
31	39	05/14/2004	5:39:50	-16.9989	10.19977	3636.2	300.8	10.234	34.957	0.291							
31	39	05/14/2004	5:39:50	-16.9989	10.19977	3636.2	1001.7	3.958	34.568	3.104							
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	3.1	20.782	35.844	5.052							
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	21.1	20.644	35.827	5.06							
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	39.8	20.125	35.749	5.063	1.35	1.57	0.16	1.11	0.33	0.59	
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	51.2	19.732	35.74	4.544	1.81	1.31	0.16	1.37	0.29	0.59	
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	60.6	15.709	35.495	1.865	3.6	1.1	0.12	0.64	0.08	3.95	
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	101.3	13.756	35.357	0.278	2.81						
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	302.7	10.045	34.93	0.413	0.12	20.87	0.05	0.57	1.51	6.16	
32	40	05/14/2004	10:24:32	-16.99032	9.66718	188	991.7	4.029	34.551	3.037		31.23	0.02	0.24	2.1	7.14	
33	41	05/14/2004	14:33:09	-16.99547	9.15993	1581.8	2.9	20.76	35.825	5.334							
33	41	05/14/2004	14:33:09	-16.99547	9.15993	1581.8	299.7	9.935	34.917	0.312							
33	41	05/14/2004	14:33:09	-16.99547	9.15993	1581.8	1001.3	3.987	34.536	3.171							
34	42	05/14/2004	18:49:09	-16.99868	8.65883	4700	10.8	20.857	35.805	5.136							
34	42	05/14/2004	18:49:09	-16.99868	8.65883	4700	71.0	14.466	35.402	0.793							
34	42	05/14/2004	18:49:09	-16.99868	8.65883	4700	133.6	13.096	35.265	0.356							
34	42	05/14/2004	18:49:09	-16.99868	8.65883	4700	306.5	9.674	34.884	0.415							

34	42	05/14/2004	18:49:09	-16.99868	8.65883	4700	1003.1	3.996	34.548	3.099							
35	43	05/14/2004	23:32:58	-16.99993	7.99757	4915	2.2	20.705	35.746	5.128							
35	43	05/14/2004	23:32:58	-16.99993	7.99757	4915	201.1	12.202	35.166	0.293							
35	43	05/14/2004	23:32:58	-16.99993	7.99757	4915	1000.5	4.079	34.555	2.966							

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs	NO3 Nitrate	NO2 Nitrite	NH4 Ammonia	PO4 Phosphate	SiO4 Silicate	Remarks
A36	44	05/15/2004	13:03:38	-14.99962	8.86782	4479	10.7	23.239	36.326	4.648		29.3	0.01	0.36	2.35	13.48	
A36	44	05/15/2004	13:03:38	-14.99962	8.86782	4479	75.4	14.883	35.481	0.661							
A36	44	05/15/2004	13:03:38	-14.99962	8.86782	4479	349.1	9.563	34.88	0.4							
A36	44	05/15/2004	13:03:38	-14.99962	8.86782	4479	1004.4	4.057	34.578	2.959							
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	2.4	21.739	36.079	4.831							
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	10.4	21.773	36.09	4.789							
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	20.3	21.773	36.086	4.776	0.74	0.53	0.08	0.6	0.2	0.4	
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	41.2	18.432	35.771	2.952	0.73						
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	50.9	16.422	35.6	1.607	0.72	0.53	0.09	0.7	0.23	0.39	
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	60.9	15.633	35.534	1.479	0.14	18.78	0.69	0.68	1.67	4.52	
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	100.0	13.594	35.289	1.795	0.16						
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	301.8	10.251	34.96	0.522	0.14	20.97	0.41	0.42	1.79	4.78	
A37	45	05/15/2004	18:17:58	-15.00017	9.55072	4095	999.6	4.149	34.564	2.844		19	0.04	0.43	1.66	6.38	
A38	46	05/15/2004	22:47:43	-14.99303	10.00202	3841	2.9	22.284	36.057	4.851							
A38	46	05/15/2004	22:47:43	-14.99303	10.00202	3841	100.7	13.081	35.203	2.926							
A38	46	05/15/2004	22:47:43	-14.99303	10.00202	3841	302.2	10.066	34.933	0.342							
A38	46	05/15/2004	22:47:43	-14.99303	10.00202	3841	994.6	4.133	34.555	2.893							
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	2.4	21.514	36.036	4.941	1.85	0.24	0.01		0.21	1	
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	10.6	21.502	36.032	4.941	2.06						
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	20.8	21.512	36.03	4.933	1.99	0.23	0.03		0.25	1.17	
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	30.5	21.123	35.966	4.878	2.24						
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	59.9	15.597	35.56	0.852	0.16	21.56	0.39		1.75	0.62	
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	300.6	10.591	34.996	0.408							
A39	47	05/16/2004	2:17:21	-14.99965	10.39907	3566	1001.8	4.12	34.562	2.896							
A40	48	05/16/2004	6:09:01	-15.0005	10.7664	3240.7	1.6	22.054	36.006	4.792							
A40	48	05/16/2004	6:09:01	-15.0005	10.7664	3240.7	76.8	14.776	35.472	0.416							
A40	48	05/16/2004	6:09:01	-15.0005	10.7664	3240.7	315.6	10.453	34.98	0.399							
A40	48	05/16/2004	6:09:01	-15.0005	10.7664	3240.7	999.2	4.075	34.568	2.979							
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	2.0	19.952	35.878	5.253	4.03	1.76	0.15	2.73	0.34	0.17	
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	10.2	19.936	35.876	5.232	4.06						
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	19.9	19.697	35.837	5.088	4.04	2.23	0.16	1.51	0.36	0.33	
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	29.8	17.579	35.671	2.111	0.42						
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	41.1	15.918	35.588	0.711	0.24	21.36	0.17	1.77	1.81	6.67	
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	50.9	15.36	35.54	0.665	0.15						
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	102.0	14.199	35.416	0.783		24.35	0.03	1.62	1.89	7.86	
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	321.0	9.985	34.93	0.459							
A41	49	05/16/2004	9:01:08	-15.00052	10.99867	3079.3	1001.6	4.071	34.562	2.969							
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	2.1	20.036	35.877	4.877	2.4	0.49	0.17	2.41	0.29	0.31	
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	10.5	19.934	35.872	4.783	2.97						
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	20.7	19.151	35.807	4.089	3.14	6.1	0.21	2.6	0.74	0.95	
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	30.6	17.429	35.684	1.606	2.6						
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	40.4	16.245	35.61	0.86	0.45	17.49	0.39	1.86	1.72	6.17	
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	50.7	15.759	35.58	0.708	0.18						
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	61.0	15.453	35.551	0.69		22.94	0.04	1.94	1.85	7.12	
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	99.7	14.521	35.452	0.82		23.71	0.02	1.3	1.87	7.4	
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	350.1	9.791	34.911	0.36							
A42	50	05/16/2004	13:24:00	-14.99753	11.29082	2782.7	1000.2	4.186	34.578	2.822							
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	1.8	20.253	35.916	4.843	2.39	3.43	0.21	1.49	0.34	0.67	
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	8.3	20.2	35.91	4.779	2.83	3.66	0.19	1.32	0.42	0.47	
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	20.6	17.941	35.719	2.874	2.22						
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	30.5	17.415	35.695	1.559	2.61	15.86	0.38	2.6	1.53	4.61	
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	41.9	16.531	35.65	0.767	0.5						
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	50.5	15.839	35.587	0.723	0.23	21.2	0.04	1.06	1.81	6.93	
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	101.3	14.406	35.438	0.74		24.25	0.01	0.91	1.88	7.71	
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	350.2	9.787	34.907	0.398							
A43	51	05/16/2004	18:20:27	-14.99725	11.65023	1943.2	1001.8	4.225	34.57	2.797							

Station Name	Station Number	Date	Time h:m:s	Latitude [deg_N]	Longitude [deg_E]	Bot. Depth [m]	Depth [m]	Temperature [C]	Salinity [ppt]	Oxygen [ml/l]	Chl JGOFs	NO3 Nitrate	NO2 Nitrite	NH4 Ammonia	PO4 Phosphate	SiO4 Silicate	Remarks
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	2.1	19.474	35.846	4.264	2.81	0.63	0.01	1.3	0.92	1.71	
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	10.1	18.865	35.796	3.51	3.18	10.24	0.01	1.13	1.55	2.73	
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	20.4	17.561	35.744	1.281	1.05						
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	29.8	17.187	35.721	1.113	0.19	20.38	0.02	1.11	1.56	6.9	
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	40.5	16.856	35.694	1.016	0.24						
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	49.9	16.676	35.677	0.959	0.1	19.32	0.01	0.85	1.62	7.24	
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	100.7	15.364	35.541	0.726		23.22	0.01	0.81	1.82	7.29	
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	350.1	10.245	34.958	0.449							
A44	52	05/16/2004	21:59:34	-14.9986	11.81747	1405.4	1003.1	4.168	34.603	2.879							
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	2.1	17.993	35.646	4.516	3.79	12.14	0.11	0.96	0.61	0.93	
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	11.2	17.511	35.391	2.977	3.65	16.9	0.14	0.98	1.12	4.43	
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	20.6	16.822	35.498	1.292	2.41						
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	30.6	16.706	35.613	1.095	1.42	21.35	0.09	0.91	1.28	6.26	
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	40.4	16.445	35.481	0.932	0.83						
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	50.5	16.306	35.431	0.869	0.67	21.08	0.04	0.91	1.42	6.88	
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	100.3	15.189	35.398	0.721		24.93	0.02	0.91	1.48	7	
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	350.4	8.878	34.776	0.536							
A45	53	05/17/2004	1:46:24	-14.99743	11.99273	886.3	871.9	4.54	34.564	2.606							
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		2.1	17.421	35.595	2.744	1.37						
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		10.0	17.271	35.502	2.677	1.38	18.29	0.15	1.09	1.1	4.64	
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		20.2	17.353	35.395	2.209	1.41						
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		30.6	17.003	35.511	1.951	1.72	19.41	0.12	1.17	1.21	5.02	
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		39.7	16.764	35.565	0.933	0.42						
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		48.6	16.394	35.448	0.864	0.57	22.47	0.12	0.94	1.34	6.1	
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		101.0	15.632	35.451	0.748		24.55	0.02	0.86	1.5	7.33	
A46	54	05/17/2004	5:42:24	-15.0016	12.07815		320.9	11.005	35.159	0.602							
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	2.0	17.131	35.674	2.334	1.51	18.33	0.25	0.48	1.37	3.92	
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	10.2	17.105	35.673	2.342	1.91	19.14	0.22	0.14	1.56	5.48	
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	20.7	16.996	35.668	2.19	2.24						
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	30.1	16.857	35.664	1.966	2.15	18.96	0.21	0.24	1.49	5.47	
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	40.0	16.682	35.66	1.496	0.59						
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	50.5	16.255	35.635	0.974	0.41	20.78	0.14	0.14	1.75	7.07	
A47	55	05/17/2004	8:14:48	-14.99912	12.12958	107.8	104.3	15.757	35.588	0.793		21.99	0.12	0.24	1.73	7.69	
BE14	56	05/17/2004	10:39:13	-15.12913	12.10863	82.4	2.6	16.904	35.642	2.464							
BE14	56	05/17/2004	10:39:13	-15.12913	12.10863	82.4	79.8	16.014	35.607	0.943							
BE15	57	05/17/2004	12:14:57	-15.18073	12.08212	37.9	2.5	16.633	35.644	1.725							
BE15	57	05/17/2004	12:14:57	-15.18073	12.08212	37.9	35.1	16.236	35.631	0.902							
BE16	58	05/17/2004	14:56:22	-15.29255	12.0005	67.1	2.4	18.682	35.739	3.923							
BE16	58	05/17/2004	14:56:22	-15.29255	12.0005	67.1	62.9	15.928	35.605	0.818							

Appendix 2: Location of metadata, data and samples from Leg 8

Parameters collected	German contact	Local contact	Samples / data
Physical Ocng - T,S, ADCP Chemical Ocng - Oxygen, nutrients	Stefan Weinreben IOW, Warnemuende Bodo von Bodungen IOW, Warnemuende	Fernando Gombo (Namibe) Francisco de Almeida (Luanda)	*CD was provided and put onto . the Angolan databank*
Remote sensing data	Herbert Siegel? IOW, Warnemuende	n/a	n/a
Ships meteorological data	Bodo von Bodungen	n/a	n/a
Chl *a* / pigment samples	Bodo von Bodungen	Domingos da Silva (Luanda)	
Phytoplankton samples	Bodo von Bodungen	Domingos da Silva (Luanda) / J. Muai, S. Silva and I. Rangel	Samples from 28 stations
Zooplankton samples	H.C. John, Sven Hoffmann Senckenberg Univ. Hamburg	Alice Chicunga (Namibe) Duplicate set to Domingas Paim (Luanda)	6 stations from Namibe M.L. Identification to finish July 06
Ichthyoplankton samples	H.C. John, Sven Hoffmann Data flagged until published . Samples, data available freely soon.	Wasaso Domingos (Luanda) Anja Kreiner, NatMIRC Namibia	6 stations from Namibe M.L. Identification to finish July 06
Sediment samples Benthos samples	Michael Zettler IOW, Warnemuende	Duplicate set given to Lia Neto Catherine Isibor, GCLME Nigeria	Occasional samples taken No local replicate set in Angola