ATLANTIC MERIDIONAL TRANSECT

(AMT)

CRUISE REPORT

Plymouth
Marine Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

Atlantic Meridional Transect

CRUISE REPORT
AMT-10

12th April – 8th May 2000

Montevideo (Uruguay) to Grimsby (UK)

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ABSTRACT

This report documents the scientific activities on board the Royal Research Ship James Clark Ross during the tenth Atlantic Meridional Transect (AMT-10), 12 April to 8 May 2000. There are three objectives of the AMT programme. The first is to derive an improved understanding of the links between biogeochemical processes, biogenic gas exchange, air-sea interactions, and the effects on, and responses of, oceanic ecosystems and climate change. The second is to investigate the functional roles of biological particles and processes that influence ocean colour in ecosystems dynamics. The third is the algorithm development and validation of remotely sensed observations of ocean colour. During AMT10 the ship was constrained in her ability to maintain station in any but the lightest winds, and the weather conditions were not always favourable. Nevertheless, the cruise produced a near-continuous set of surface underway data, and 23 stations during which physical, biological and chemical properties of the euphotic zone (depths 0-250m) were sampled.

ACKNOWLEDGEMENTS

AMT-10 is the tenth in a series of transects of the Atlantic ocean using the RRS James Clark Ross, Britain's Antarctic research ship operated by the British Antarctic Survey (BAS) on behalf of the Natural Environment Research Council (NERC). The AMT science team recognise, and are most grateful for the level of support which the programme has received from Prof. Chris Rapley and his staff at BAS.

The AMT programme would not be possible without the financial support of NERC, and we are indebted to them for this. We also thank Prof. Nick Owens, director of CCMS-PML, and Prof. Jim Aiken, Malcolm Woodward and colleagues at PML for their encouragement and practical support, and in particular, Dr. Peter Miller of the NERC Remote Sensing Unit at PML for help in preparation of satellite imagery.

Finally, the officers and crew of the James Clark Ross always play a significant role in the success of AMT cruises. Their contribution to the successful completion of AMT-10 has, however, been particularly important. The RRS James Clark Ross is able to deploy instruments from 3 or 4 winch/crane systems simultaneously. This has been of great utility to the AMT programme in enabling us to make the very best use of the limited science time available on these cruises. The loss of the use of the ship's bow thruster before the start of this cruise meant that station-keeping with this number of concurrent deployments was difficult in all but the lightest winds. In spite of this, the best was made of the weather conditions, and as full a scientific programme as was possible was successfully completed. The cruise produced a near-continuous set of surface underway data, and 23 stations in 24 days in weather conditions that were considerably less than favourable, and sometimes marginal, more than half of the time. That this was accomplished without loss of or significant damage to any of the systems deployed was in no small part due to the professionalism, good judgement and willing support of the officers and crew of the RRS James Clark Ross. We therefore acknowledge our debt to Captain Jerry Burgan and his officers and crew with particular thanks.

Front cover image adapted from a design by Peter Lens, ITS, BAS

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1.1 INTRODUCTION

The Atlantic Meridional Transect (AMT) programme, (Robins and Aiken, 1996; Aiken and Bale, 2000) exploits the passage of the Royal Research Ship (RRS), *James Clark Ross* (JCR) through the Atlantic Ocean latitudinally from 50°N to 50°S, between the U.K. and the Falkland Islands, a distance of over 13,500 km. In September the JCR sails south, sampling the N. Atlantic during the boreal fall and the S. Atlantic during the austral spring. The following April it returns to the UK, sampling the S. Atlantic during the austral fall and the spring conditions in the North Atlantic. The ship's track crosses a range of ecosystems and physico-chemical regimes, within which conditions vary from sub-polar to tropical and from eutrophic shelf seas and upwelling systems to oligotrophic mid-ocean gyres. The JCR provides the ideal platform to measure physical, chemical, biological and bio-optical properties and processes through the diverse ecosystems of the North and South Atlantic Ocean. The AMT programme scientific objectives are:

1. To test and refine hypotheses on the impact and the responses of oceanic circulation, marine ecosystems and the coupled marine atmosphere of the Atlantic Ocean to anthropogenically forced environmental change. This to be accomplished assessing measurements of key marine and atmospheric variables over spatially extensive scales covering seasonal and inter-annual timescales.
2. To improve our knowledge of marine biogeochemical processes, ecosystem dynamics, food webs and fisheries and characterise physical and biogeochemical provinces.
3. To develop a holistic research strategy, integrating shipboard measurements with autonomous and novel techniques, remote sensing and modelling, exploiting the time and space series provided by the AMT.
4. To provide calibration and validation of satellite sensors of ocean colour, sea surface temperature, and solar radiation from high to low latitudes over the Atlantic Ocean, 50°N to 50°S.
5. To quantify oceanic ecosystem responses to changes in abundance of radiatively and chemically active trace gases.
6. To develop coupled physical-biological models of production and ecosystem dynamics.

Taken together, the goals and objectives form a holistic research strategy to provide an improved understanding of the links between biogeochemical processes, biogenic gas exchange, air sea interactions and the effects on, and responses of, oceanic ecosystems (biogeochemical provinces) to climate change. A key element of the strategy is to provide an improved understanding of the functional roles of biological particles and processes of ecosystem dynamics which can be related to the measurement of ocean colour.

An important element of the AMT programme has been the acquisition of data for the development of remote sensing algorithms, the development of whole-water column algorithms, the interpretation of remotely sensed imagery, and the determination of phytoplankton characteristics and photosynthetic parameters by Fast Repetition Rate Fluorometry (FRRF) for productivity studies. Additional to these are the development of

climatologies of key parameters for regional and basin-scale productivity and ecosystem dynamics models, the measurement of zooplankton community structure and distribution, nutrient recycling and the exchange of atmospheric gases. To provide assistance in the development of models of global primary production, ecosystem dynamics and air-sea interaction are the ultimate objectives of the programme. The specific objectives have been to produce calibrated, quantitative satellite measurements of oceanic biological properties, parameter values and contemporaneous data for tuning models that exploit satellite data.

The dates of the 10 AMT cruises are:

AMT-1 Sept./Oct. 1995	AMT-2 April/May 1996
AMT-3 Sept./Oct. 1996	AMT-4 April/May 1997
AMT-5 Sept./Oct. 1997	AMT-6 May/June 1998
AMT-7 Sept./Oct. 1998	AMT-8 April/June 1999
AMT-9 Sept/Oct. 1999	AMT-10 April/May 2000

1.2 CRUISE STRATEGY

The concept of the AMT is similar to a ship of opportunity programme in that the scientific work is based on a regular passage between the UK and Port Stanley. Due to time limitations there is very little scope for deviation from the AMT track or from the present sampling routine. The agreement between CCMS and BAS provides the AMT community with four to six days of ship time over and above the time that would be used for the direct passage with no science. Two days are used for the course deviations and the remainder for station time. The 'standard' AMT track (described from south to north, see figure 1.1) departs Port Stanley, F.I. for Montevideo, where the ship makes a logistic port call. AMT-10 embarked at Montevideo, so missed the part of the transect between Port Stanley and Montevideo. On leaving Montevideo, and once clear of the River Plate and Uruguayan territorial waters, the track heads north-east, staying clear of Uruguayan and Brazilian waters, and makes for the first way-point at 13°N, 20°W.

From this waypoint the track turns north along 20°W which is an extension of the BOFS/PRiME transect. This route includes sampling of the edge of the Mauritanian upwelling. The track deviates slightly to avoid Madeira and Canaries territorial waters but cannot avoid *both* the Mauritanian and Cape Verde's EEZ for some 360 nautical miles. Diplomatic clearances for these waters were not obtained for AMT-10, so that this 360nm section was not sampled. The track continues to the second way-point at 20°W, 47°N, a well-documented and sampled area, forming a part of a series of international JGOFS stations. From this point the track turns north-east and takes the direct approach through the Western Approaches to the English Channel, and then on to Grimsby in the UK.

1.3 SAMPLING STRATEGY

The daily routine consists of continuous underway sampling of surface water using the uncontaminated sea water supply, interspersed by daily stations sampling the top 200-250m. Where possible the research agenda and sampling location is dictated by the analysis of recent AVHRR, SeaWiFS and TOPEX imagery received on board via email. The main instrument packages deployed on station are as follows:

1. Sea-Bird electronics (SBE) 911 plus CTD (conductivity, temperature and depth) sensor. Deployments from the dedicated mid-ships gantry, with fluorometer and photosynthetically available radiation (PAR) instruments, fast repetition rate fluorometer, and 12 x 12 litre bottle water sampler for phytoplantkton pigments, inorganic nutrients, DOC, DON, DOP, phytoplankton productivity and nutrient enrichment experiments.
2. Optical profiler deployed from the stern crane, including upward and downward facing Satlantic radiometers and an AC-9 particle absorption meter.
3. Zooplankton WP-2 net/OPC profiler deployed from the forward crane.

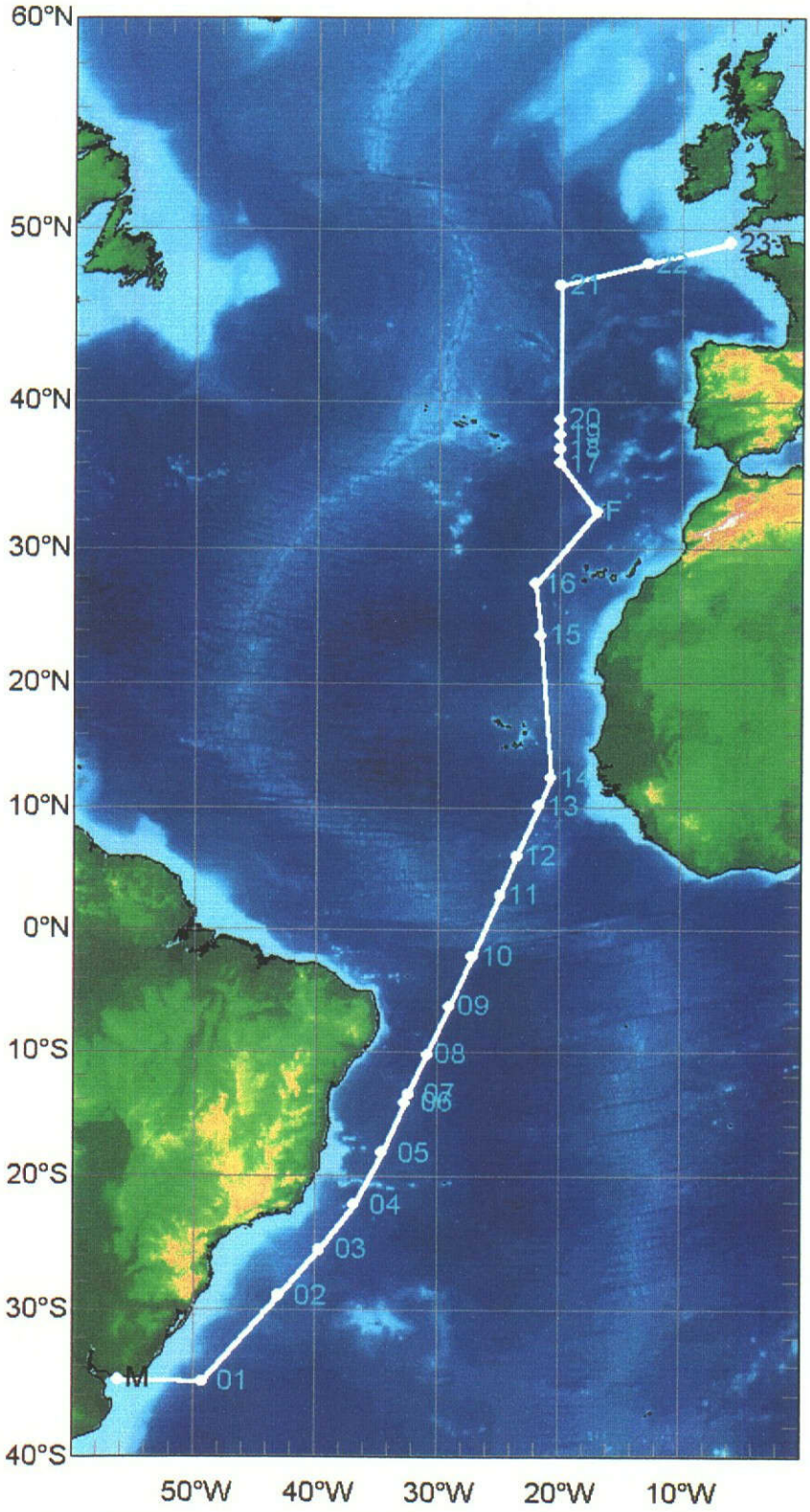

Figure 1.1. AMT 10 cruise track. Numbered symbols are station positions; M = Montevideo, Uruguay; F = Funchal, Madeira.

2.0 ITINERARY AND NARRATIVE

2.1 Itinerary

Saturday 8th April	Travel to London Heathrow, flight to Montevideo.
Sunday 9th April	Arrive Montevideo, joined ship 11:30 local time.
Monday 10th April	Commence mobilisation/installation of equipment.
Wednesday 12th April	Sail from Montevideo 09:30 local.
Thursday 13th April	Underway sampling and station work commenced.
Saturday 6th May	Last full station 10:00; underway sampling ceased.
Monday 8th May	Dock in Grimsby 09:30. Demobilisation begun. Packing complete, container ready for off-loading.
Tuesday 9th May	Container off-loaded, personnel depart ship.

2.2 Narrative

Notes: All times are local unless otherwise stated.
Bracketed figures indicate station number.

Prior to scientific personnel arriving in Montevideo to join the ship, the vessel had developed a problem with the bow thruster, which was inoperable for the remainder of the cruise. The Master advised the science party that this would mean that station-keeping in all but light winds would be difficult, and that the science programme would therefore be more than usually dependent on the weather. The science cruise was mobilised without significant problems before departure on the morning of Wednesday 12th of April. Weather was fair with winds light to fresh.

Underway sampling was commenced and the first station executed once clear of the influence of the River Plate and outside Uruguayan territorial waters, at 18:15 local time on Thursday 13th April, at 35° 05'S, 49° 18'W. After a small initial problem with the CTD deck unit, two successful casts were completed, to 150 and 200m. Problems with the OPC profiling rig and modifications to optics rig meant that the station was curtailed after just the two CTD casts. An XBT 7 was deployed on leaving the station, and every six hours thereafter whilst underway. The following morning's station, scheduled for 10:00 local, was the first victim of the weather (wind south by west, F7; Ship's leeward drift rate 2.5kts). The 15th April saw an improvement in the weather (wind SW5) and the completion of a successful full station (2) comprising 2 x CTD casts, Zooplankton nets and optics cast.

On the 16th a full station (3) was commenced at 10:00 in improving weather (wind SW4), but after a successful first CTD cast a hydraulic line blew off the CTD gantry and coated the ship with hydraulic oil. Fortunately, the CTD was below the surface for the second cast when this occurred, where it remained uncontaminated whilst the oil was cleaned up. Zooplankton net and optics casts were successfully completed. Repairs to the gantry took until 12:30, when the ship got under way again and cleaning continued. The following

day a full station (4) was completed in light airs, but on station (5) on the 18th April again only one CTD cast was completed, due to a double failure in the termination of the conductor-core cable. The fault was eventually traced to an insulation failure 40m up the cable. Full stations from 19th April (13.5° S) until 25th April (10.2° N) were completed at 10:00 local time without incident in light to moderate winds (6 to 13). A second station (7) at 15:00 on 19th April consisted of a single CTD cast to 1000m and an optics cast. During this period, as the vessel approached the equatorial system, underway XBT frequency was increased to 4-hourly deployment. Following the first station a course of 041°T was followed to 22° 05' S, then 025°T to the first waypoint at 13°N, 20°W.

Just prior to entering the Economic Exclusion Zone (EEZ) between the Cape Verde Is. and Senegal at midnight on 25th/26th April the opportunity was taken to execute the last full station possible for 36 hours (station 14; 12° 28'N, 20° 39'W). This station was successfully completed in winds backing and strengthening (NNE5), including 2 CTD casts, Zooplankton nets and optics cast (AC9 particle absorption only). The vessel cleared the EEZ at 16:36 on 27th April (19° 48.2'N, 21° 08.8'W), but weather conditions (NE6/7) did not permit a station until 14:40 on 28th April. By this time the winds had eased and backed slightly (NNE5), and a full station (15) was successfully completed, as was one the following morning (station 16) when the wind had eased and backed further to NNW4. Just before commencement of this station on 29th April, the Captain had advised the PSO that due to the need for compassionate repatriation of a member of the ship's crew, it was necessary to divert the ship to Funchal, Madeira. On completion of station 16 the ship therefore altered course for Funchal.

At Madeira on 30th April, 17:00, the boat transfer of the crew member was completed, and the ship returned to the AMT course track at 20° W. The ship was clear of Madeira waters at 16:00 local time on 1st May, and a full station (17, at 36°N, 20°W) was completed in moderate wind conditions (WxN4/5). This station was the first in a series of 4 stations over a 24-hour period. Initially a drifting station over this 24-hour period had been considered, in response to several of the participating scientists' expressed wish to examine the diurnal cycle of several biological parameters in oligotrophic waters. Given the unscheduled deviation to Funchal and weather conditions, such a station could not be completed in oligotrophic waters without backtracking, and loss of time the ship could not afford, and would certainly not be 'drifting' in the prevailing weather conditions. The 4-station 24 hour sampling series whilst continuing to steam north permitted a compromise which allowed an element of the diurnal cycle to be captured, and to increase sampling resolution in an interesting area around the Canary/Azores region. Deteriorating weather conditions also gave rise to the feeling that more stations should be completed whilst weather permitted.

Full stations were therefore completed at 16:00 and 22:00 on the 1st May (17 & 18), and at 04:00 and 10:00 on 2nd May (19 & 20). All included 2 CTD casts, Zooplankton nets and optics casts except that at 22:00, which excluded optics, and that at 04:00, when deteriorating weather conditions (NNE6/7) forced abandonment of the station after a single CTD cast and an optics cast (no attempt was made to deploy zooplankton nets in these conditions). On 3rd May, weather conditions (NE6/7) did not permit a station, but

the following morning just before dawn, a full station excepting optics was successfully completed in conditions which were marginal (NE6). This station (21) was executed at 47° North, 20° West, a long-standing sampling position for AMT, and for the BOFS and PRiME programme before it. The station was also intended to be the first of a dawn/noon/dusk cycle to examine the photoproduction of CO during the course of a full day, but noon and dusk stations were not possible due to weather conditions.

After station 21, the vessel changed course for the English Channel. Stations 22 and 23 on 5th and 6th April at 10:00 local time were completed en route including CTD, zooplankton nets and optics casts. The second of these was in 108 metres of water on the continental shelf. A final station planned for 15:00 on 6th April for optics only was abandoned due to failure of the termination of the optics profiling rig cable. Station and underway science was curtailed at this point (due south of the Lizard, in West Cornwall), and the vessel continued up the Channel and North Sea, picking up the pilot off Spurn Head at 07:00 on 8th May.

Weather conditions having been rather more significant than usual on this cruise, a plot of mean wind speed for the whole transect is presented below. This shows unusually and consistently high winds throughout the northern half of the transect, which significantly degraded the ship's station-keeping capacity.

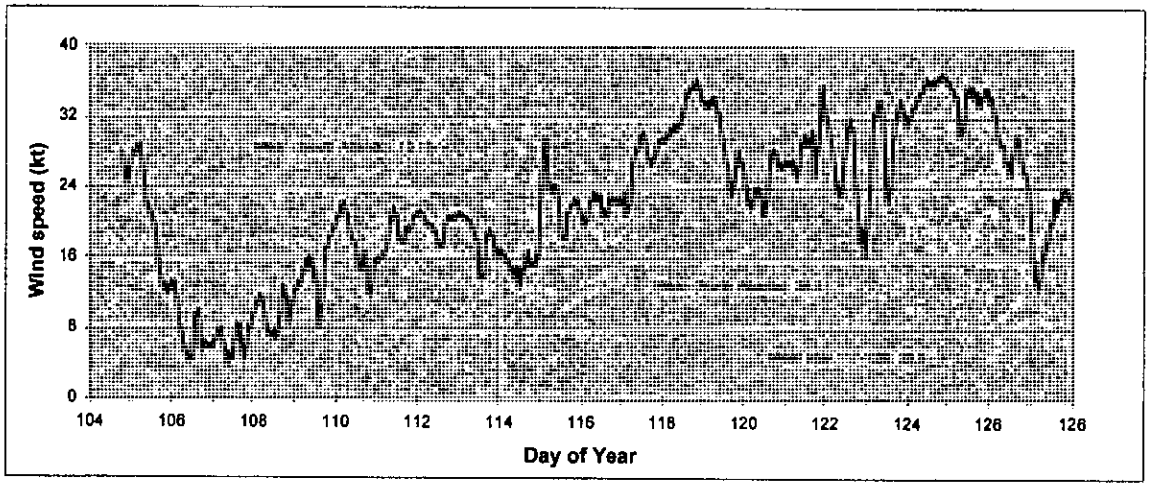

Figure 2.1 Four-hour average true wind speeds for the whole transect by day-of-year (red vertical line indicates the crossing of the equator).

2.3 Cruise Personnel

CCMS-PML	Chris Gallienne Gerald Moore Claudia Omachi D-J Gent
SOC/SOES	Alex Poulton Mark Moore Tim O'Higgins Alessandro Tagliabue
Southampton Institute	Victoria Hill
University of Newcastle	Vas Kitidis Aron Stubbins
University of Liverpool	Claire Mahaffey
BAS	Paul Woodroffe Peter Lens

3.0 SCIENTIFIC PROGRAMME AND PRELIMINARY RESULTS

3.1 UNDERWAY PHYSICAL MEASUREMENTS (*Chris Gallienne*)

Shown below are plots of sea surface temperature (fig. 3.1.1), salinity (fig. 3.1.2) and density anomaly (σ_t kg m^{-3}) (fig 3.1.3) for the whole transect. Temperature and conductivity are taken from the Ocean Logger system aboard the RRS James Clark Ross (Figure 3.1.1). Salinity is calculated from conductivity, and density anomaly is calculated from temperature and salinity using equations from Fofonoff and Miller (1983). All three plots have a gap between 30 and 36°N, due to the diversion of the ship from the AMT track to call at Funchal, Madeira. Noteworthy features include the depression of sea surface temperature in the area of the Mauretanian upwelling between 17 and 21°N and the usual significant depression in salinity (and therefore, density anomaly) at the equator, usually attributed to the increased precipitation from the ITCZ.

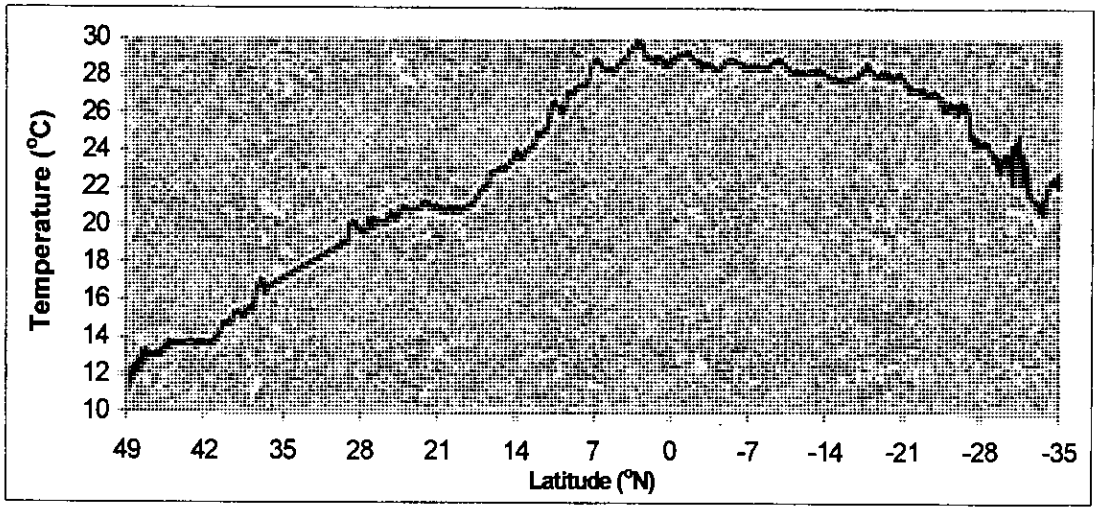

Figure 3.1.1. Continuous underway sea surface temperature for whole transect.

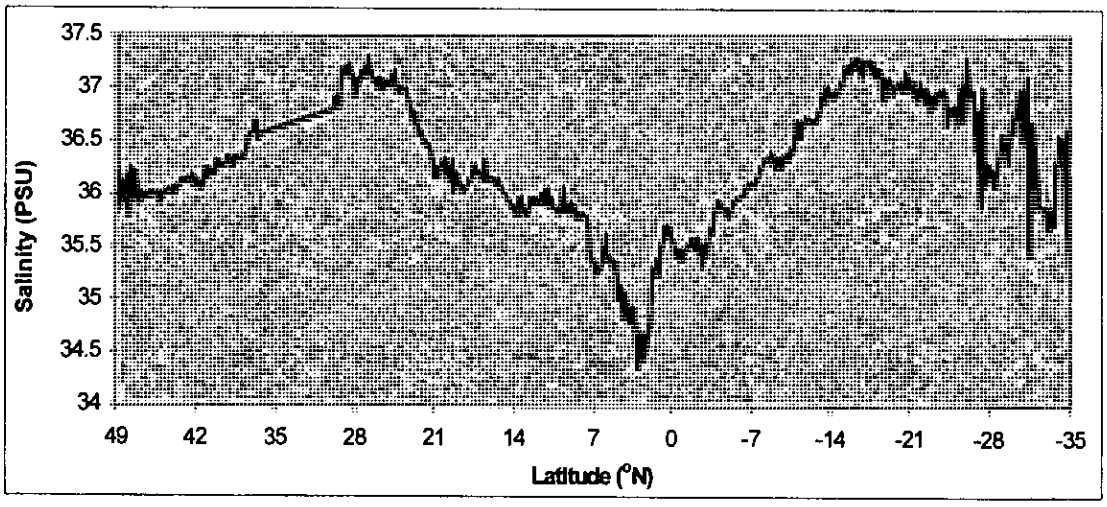

Figure 3.1.2. Continuous underway salinity for whole transect.

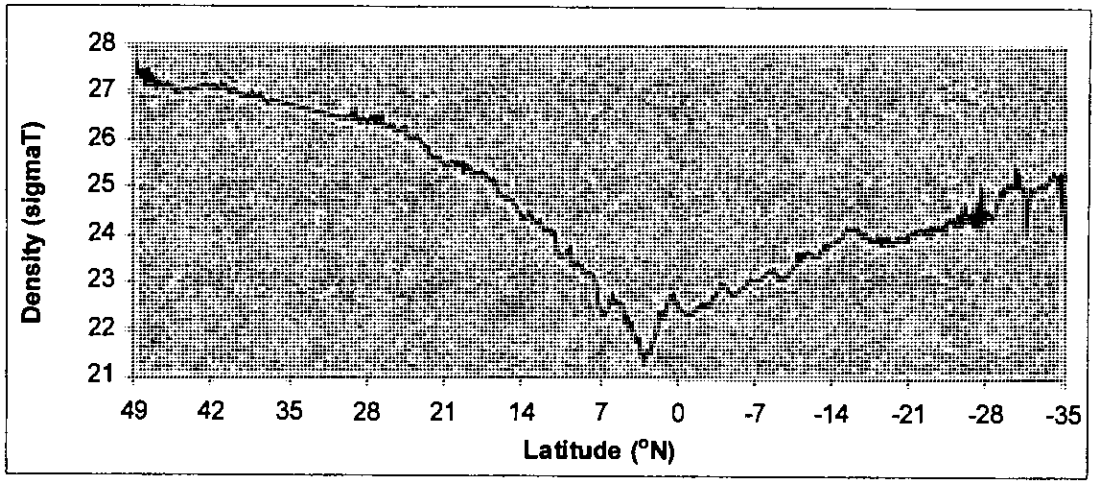

Figure 3.1.3. Continuous underway density anomaly for whole transect.

Another feature in these plots worthy of note is the area of high physical variability between 34 and 27°S. On previous AMT cruises the area between Montevideo and the Falkland Islands has always proved to be one of considerable physical variability, due to the confluence of the warm, tropical waters of the Brazil Current, and the cold, sub-Antarctic waters of the Falkland Current. The physical variability and mixing due to this confluence is usually reflected in the biology (see, e.g. Gallienne & Robins, 1998). AMT 10 did not sample south of Montevideo, but fig. 3.1.1 and 3.1.2 indicate that this source of variablity may extend north of Montevideo, as far as 27°S.

Satellite images of sea surface temperature and sea surface height anomaly (figure 3.1.4) further illustrate this physical variability. Figure 3.1.4(A) shows a tongue of warm water (22-23°C) extending southward past the River Plate. A tongue of colder water (18-19°C) extends northward inshore of this, and a pool of colder water (19°C) lies further offshore. At the confluence, both water masses are pushed offshore, evidence of which can just be seen at the bottom of fig. 3.1.4(A). The confluence is an area of considerable eddy activity (see Longhurst, 1998), particularly south of Montevideo, but fig. 3.1.4(B) shows that some of this eddy activity also extends north of Montevideo along the offshore edge of the tongue of warm water from the Brazil Current. It is this physical activity which shows in the trace of temperature and salinity in figs. 3.1.1 and 3.1.2.

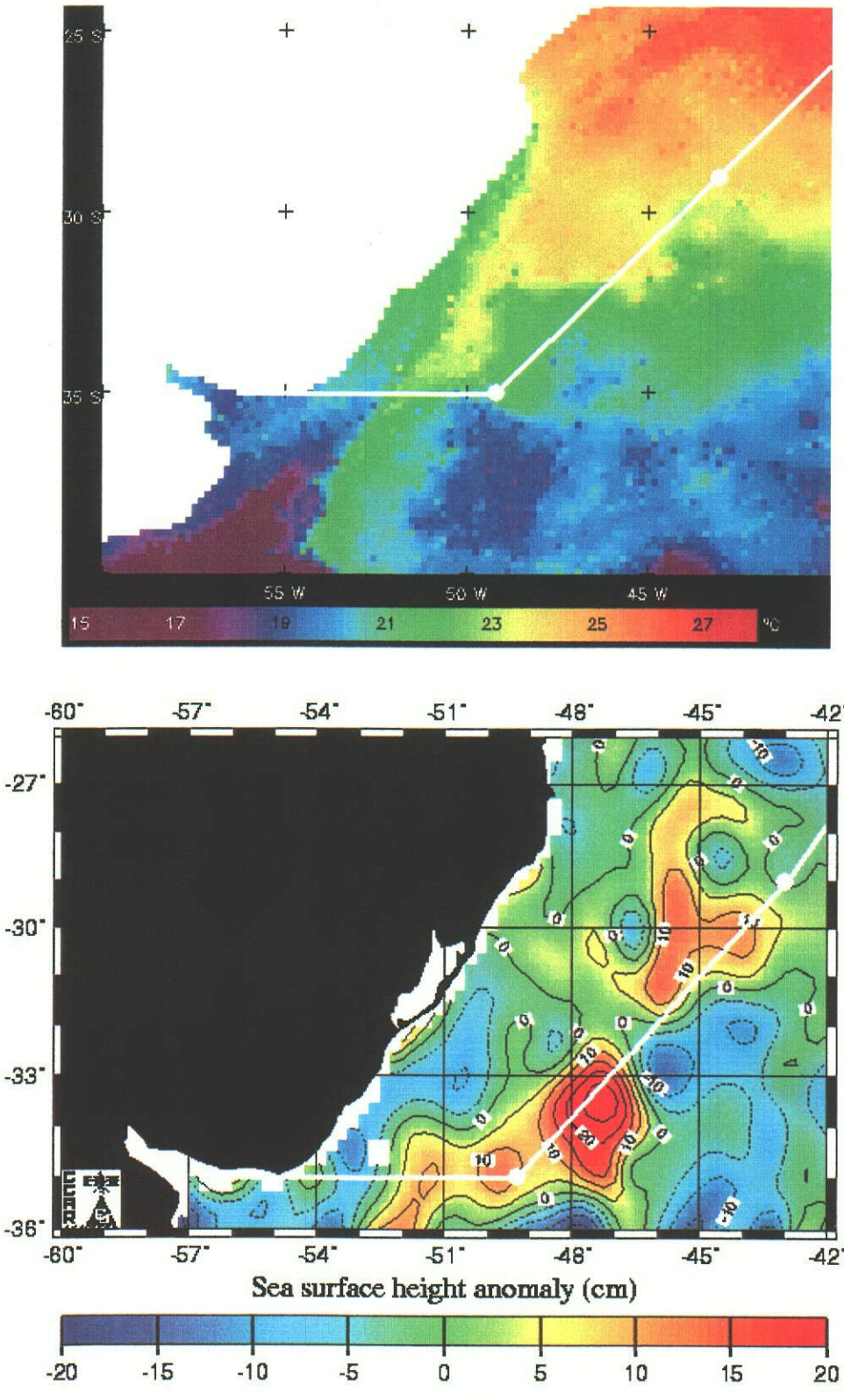

Figure 3.1.4 (**A**) AVHRR composite of sea surface temperature for AMT 10 cruise track off Uruguay/Brazil shelf (8-day average to 19/04/00). (**B**) TOPEX sea surface height anomaly for the same area (10-day average to 15/04/00).

Expendable Bathythermograph (XBT) Data

A total of 128 Sippican Mark 7 XBTs were launched during AMT10, initially at six-hourly intervals in the southern, oligotrophic region of the South Atlantic. At 12° South, approaching the equatorial region, the frequency was increased to four-hourly intervals, remaining so for the rest of the cruise. These XBTs yield a trace of temperature against depth from the surface to 760m, giving additional background information on the physical structure at greater depths than the CTD and underway sampling. Figure 3.1.5, below, is a contour plot summarising the XBT data for the whole cruise. Data points are approximately 0.75° of latitude and 2.6 metres of depth apart.

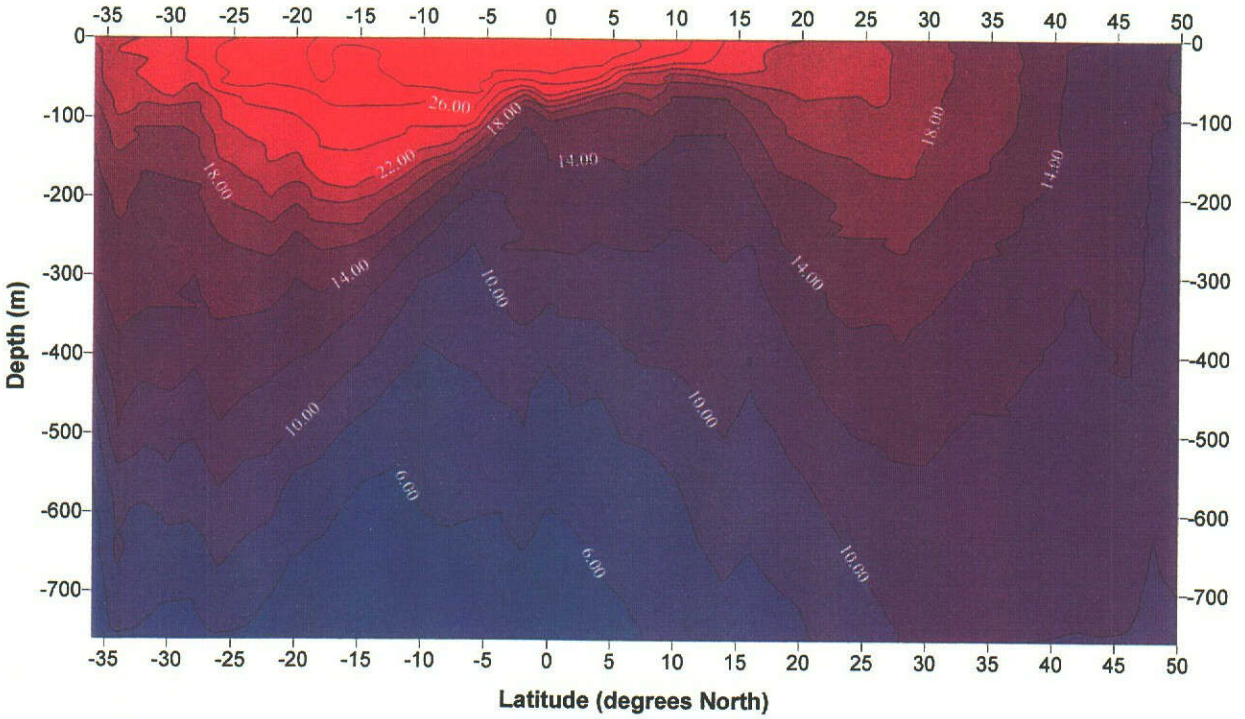

Figure 3.1.5. Contour plot of XBT temperature profiles across whole Atlantic transect.

The data plotted in figure 3.1.5 show that the warmest surface waters lie between 19°S and 7°N (>28°C). Rising contours between 5°S and 15°N appear around the upwelling associated with the equatorial current systems and the influence of the West African coastal upwelling. From about 25°N to 46°N the top 100m is near-isothermal, whereas some post-spring stratification in this area might have been expected. This may be evidence that strong mixing from the passage of storms has broken down any early stratification in these waters. Figure 3.1.6 shows a comparison between four profiles taken over a four-year period at approximately the same positions between 26°N and 46°N on 20°W. The 1996 profiles (AMT2) and the 1997 profiles (AMT4) all show seasonal stratification in the top 50m. The profiles for AMT10 do not. Figure 3.1.7 shows continuous sea surface temperature from the Ocean Logger system for all boreal spring AMT cruises for this part of the transect. Sea surface temperature was significantly lower throughout this section on AMT10 than other spring cruises.

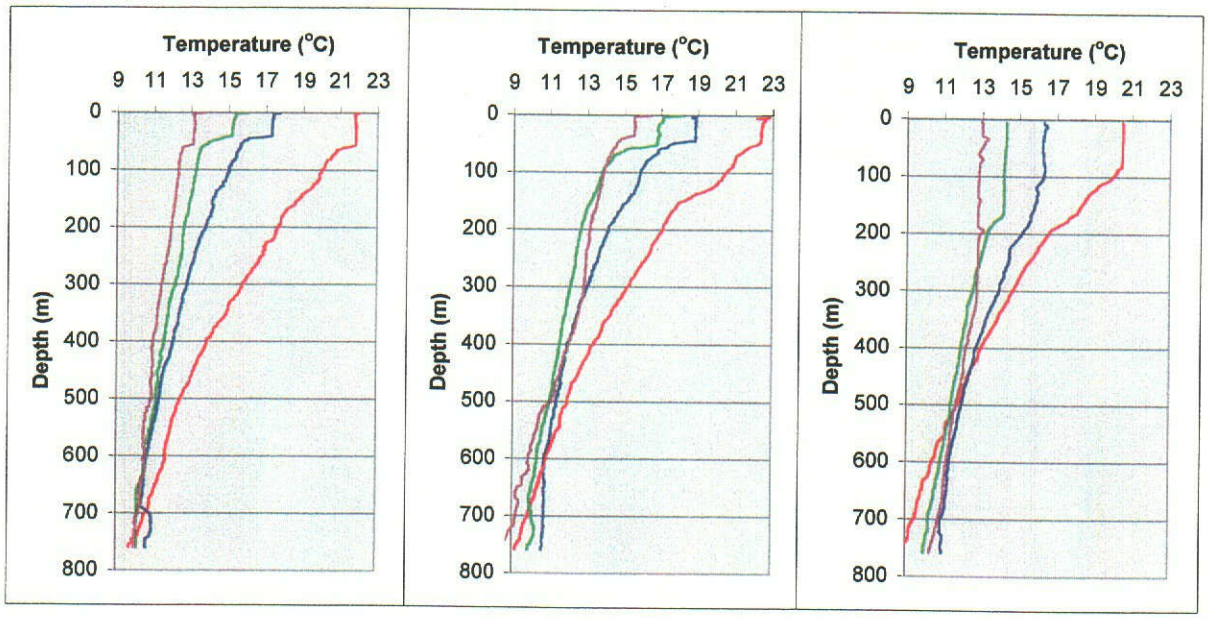

Figure 3.1.6. XBT Temperature profiles at approximately 26°N 20°W (Green), 36°N 20°W (Blue), 41°N 20°W (Red) and 46°N 20°W (Brown) for (**A**) AMT2, 17th May 1996; (**B**) AMT4, 19th May 1997; (**C**) AMT10, 1st May, 2000.

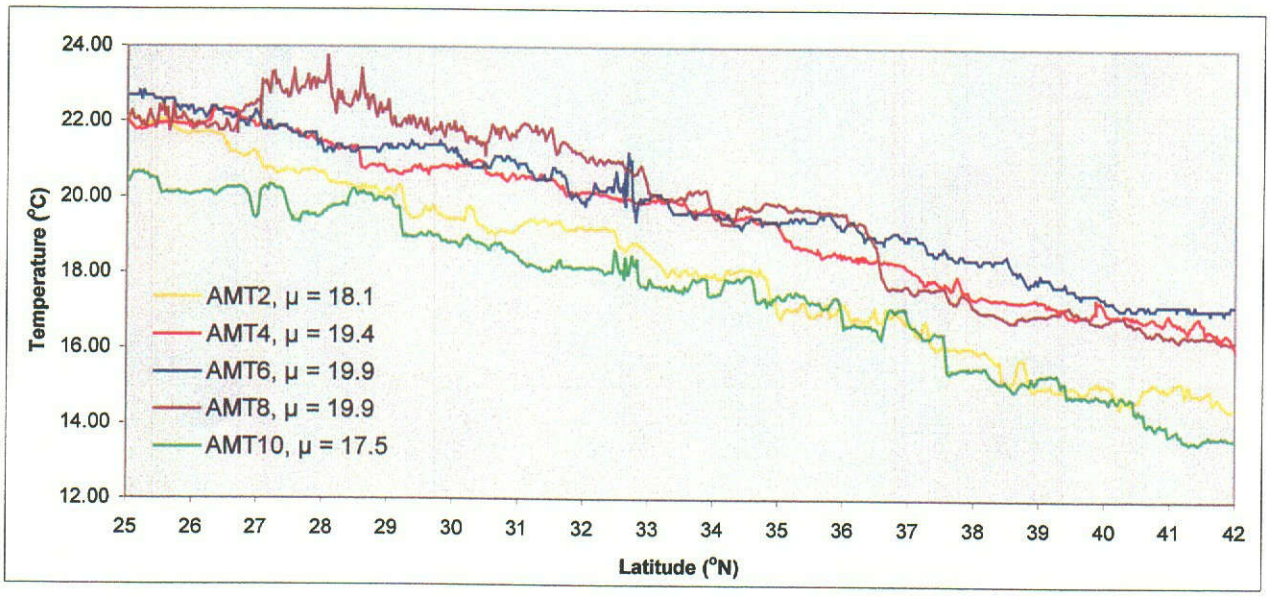

Figure 3.1.7. Comparison of sea surface temperature for five AMT cruises in April/May, between latitudes 25°N and 42°N along the 20°W meridion.

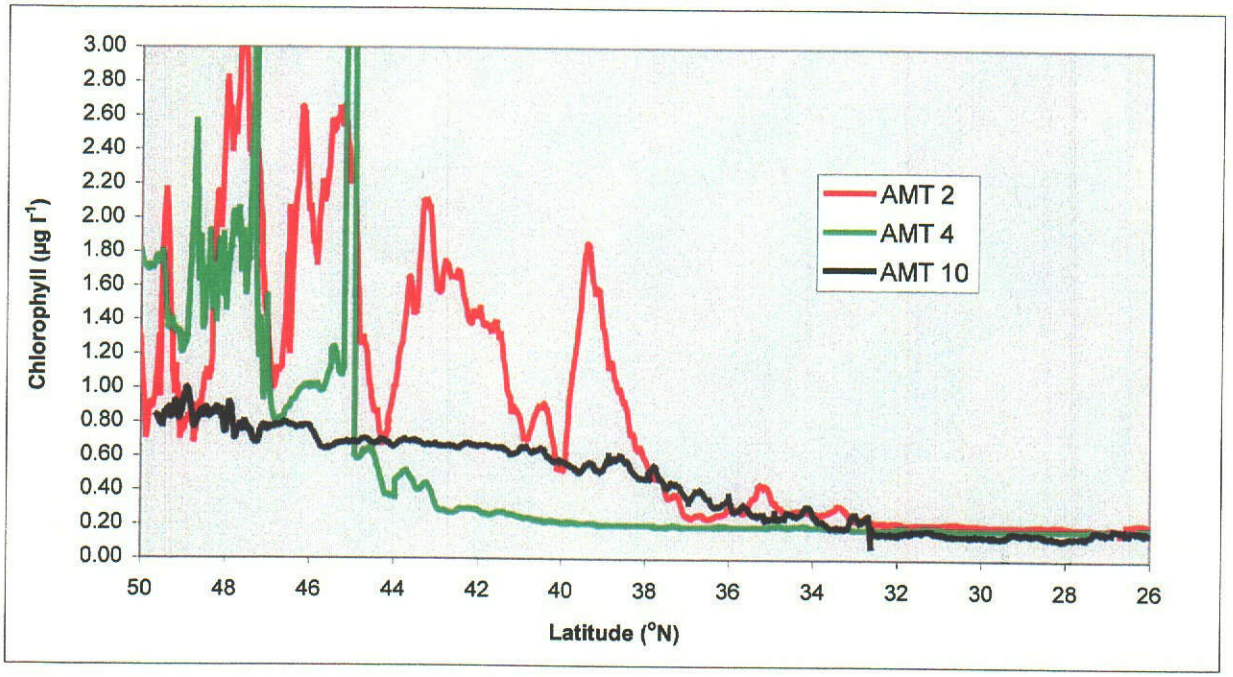

Figure 3.1.8. Comparison of surface fluorescence-derived chlorophyll for AMTs 2, 4, and 10 between 26 and 50°N.

Although surface temperatures were also low on AMT2, stratification was present, and average wind speeds for the transect between 10-45°N were 19.5kt, compared to 29.5 kt for AMT10. This seems to indicate that lower surface temperatures and absence of seasonal stratification on AMT-10 were due to wind-driven mixing, whilst low temperatures on AMT-2 might have been due to late progression northward of the spring bloom with associated surface warming and stratification – see figure 3.1.8, above. The trace for AMT-2 in fig. 3.1.8 appears to correspond to the early stages of the North Atlantic spring bloom (Longhurst, 1998), and that for AMT-4 to the post-bloom onset of oligotrophy south of 45°N.

3.4 DISSOLVED GASES – CO (*Aron Stubbins*)

3.4.1 Introduction

DOM is composed of a diverse suite of organic compounds, 50-90% of which are humics [Amador et al., 1990; Abbt-Braun *et al.*, 1989; Mantoura and Woodward, 1983]. This humic fraction forms the bulk of the chromophoric fraction of dissolved organic matter (CDOM) which is of interest due to its optical characteristics and photochemical reactivity.

The absorbance of sunlight by humic substances makes them the primary initiators of photochemical reactions in marine and freshwater environments. A number of photochemical reactions have been observed in natural waters including the oxidation of humic substances (Zafiriou et al., 1990), cleavage of humic substances (Geller, 1986; Lindell, Granéli and Tranvik, 1995), photobleaching of absorbance and fluorescence (Stewart and Wetzel, 1981; Kieber et al, 1990; Kouassi, Zika and Plane, 1990; Lindell et al., 1995), loss of dissolved oxygen (Miles and Brezonik, 1981; Lindell and Rai, 1994; Amon and Benner, 1996), and production of relatively stable LMW species such as hydrogen peroxide (Cooper et al., 1989; Miller, 1994), organic acids (Kieber and Mopper, 1987; Wetzel, Hatcher and Bianchi, 1995, Bertilsson and Tranvik 1998), carbonyl compounds (Kieber et al., 1990; Mopper et al., 1991; Kieber et al., 1997) and carbon dioxide (Anesio et al. 1999a; Miles and Brezonik, 1981; Salonen and Vähätalo; 1994; Miller and Zepp, 1995; Granéli, Lindell and Tranvik, 1996). The photodegradation of aquatic humics is also an important global source of carbon monoxide (CO) (Valentine and Zepp, 1993; Zuo and Jones, 1995).

CO plays an important role in atmospheric chemistry and climatic regulation. It is a relatively reactive gas and its oxidation is the primary determinant of the tropospheric concentration of hydroxyl radicals (OH), [Thompson and Cicerone, 1986], which in turn control the oxidising capacity of the atmosphere [Graedel and Crutzen, 1993; Thompson et al., 1989]. Increased levels of CO lead to decreased OH concentrations, thus reducing the capacity of the atmosphere to oxidise radiatively active trace gases such as nitrous oxide (N_2O) and methane (CH_4), and enabling elevated levels of halocarbons to reach the stratosphere where they affect the rate of ozone depletion [Solomon, 1990]. Additionally, CO regulates the levels of tropospheric ozone, another greenhouse gas, in conjunction with NOx [Graedel and Crutzen, 1993; Dignon and Hameed, 1985].

Sources of CO are only loosely constrained, the overall size of its global source is uncertain by at least 30% [Taylor et al., 1996], and is predominantly thought to be dominated by fossil fuel combustion, biomass burning and hydrocarbon oxidation (Table 1) [Khalil and Rasmussen, 1990; Taylor et al., 1996]. Photoproduction from humic substances is the main source of CO in marine environments [Valentine and Zepp, 1993] and results in CO supersaturation in surface waters which directly affects CO air-sea gas exchange and, in turn, atmospheric concentration. Recent estimates suggest that marine emissions account for between 0.4-20% of the global CO flux to the atmosphere [Bates et al., 1995; Erickson, 1989; Johnson and Bates, 1996]. Further studies focusing on

wetlands, estuaries, and coastal environments suggest that the oceans' periphery could represent a significant source accounting for ~20% of the global atmospheric CO source. These areas, although geographically small, show strong production due to high levels of aquatic humics [Valentine and Zepp, 1993]. The degree of uncertainty over the size of the marine CO source (Table 3.4.1) highlights the need for further investigation into this important and ill-defined source.

TABLE 3.4.1. Global Sources and Sinks of CO.

	Tg CO yr^{-1}
SOURCES	
Technological Sources	470
Biomass Burning	270
Vegetation	50
Ocean	35
	1. 73 – 233 (Open Ocean)
	2. 300 – 400 (Coastal/Shelf Waters)
CH_4 Oxidation	750
Nonmethane Hydrocarbon Oxidation	270
Production by Soils	10
TOTAL SOURCES	**1855**
1. + 2.	**2193 - 2453**
SINKS	
Oxidation by OH	1385
Removal by Soils	360
Flux to the Stratosphere	110
TOTAL SINKS	**1855**
NET BALANCE (SOURCES-SINKS)	**0**
1. + 2.	**338 - 598**

Note: Data are from Taylor et al. [1996]. Additional data for Ocean source is from; **1.** Erickson and Taylor, [1992], and **2.** Valentine and Zepp [1993].

3.4.2 Aims and objectives

1) To determine whether there are any significant differences in the spectral properties of humics from different oceanic regions and depths, and how these relate to their photoreactivity and source.

2) To examine how CO varies over both temporal and spatial scales within the ocean region studied. The field data should provide insight into the photochemical production mechanisms operating in the surface ocean and help determine the major source and sink terms for CO in these regions and will be backed up by additional irradiation and incubation experiments to look at the major processes (photoproduction, bacterial degradation, and air-sea gas exchange) in a controlled environment.

3.4.3 Experimental

Determination of Absorbance.
Absorbance spectra of seawater samples were obtained with a Uvicon 923 UV-Visible, double-beam spectrophotometer (Konitron) and 10-cm quartz cuvettes. Wavelengths from 225 to 800 nm were measured for underway, CTD and irradiation experiment samples.

Determination of CO.
CO was measured using a Reduction Gas Detector (RGD2) (Trace Analytical, Menlo Park, USA). Zero grade air (BOC) was used as the carrier gas, any CO present was removed using a 200 ml scrubber filled with Hopcalite (Western Laboratory Services). The Gas Chromatograph (GC) unit consisted of aluminium oven (Jones chromatography), Valco rotary valves, a pre-column and the main separation column. A 10 ml glass tube filled with magnesium perchlorate was used as a drier and was situated just before the first valve. The chromatographic column was a coiled 4 ft $1/8^{th}$ stainless steel tubing filled with molecular sieve 13x (mesh 60-80). Discrete samples were collected in glass vials from the CTD sampling bottles and from quartz flasks during irradiation experiments. These were overfilled to ensure proper flushing, and sealed using Teflon coated butyl rubber septa and aluminium crimp caps. CO scrubbed, zero grade air was used to create a headspace in the vials and was injected using a glass syringe. The vials were then shaken vigorously using a wrist action shaker for 30 minutes to equilibrate CO between water and headspace. A minimum of 15 ml of gas was extracted from the vials using a glass syringe. Constant volume and pressure was maintained by simultaneous injection of water using a second syringe. After extraction from the vial the headspace was immediately injected onto the magnesium perchlorate drier and sample loop. The sensitivity for the RGD2 is quoted as be 1ppbv CO with greater than 98% reproducibility.

Irradiation and Incubation Experiments.
Irradiation experiments were carried out in gas tight, quartz flasks. These were filled with samples direct from the underway supply and CTD, further experiments were spiked with differing levels of Aldrich Humic (Sigma-Aldrich). Quartz flasks were then placed in an irradiation tank in direct sunlight. CO and absorbance levels in the initial, dark and irradiated samples were measured. Following irradiation some samples were collected in duplicate, the first was analysed straight away and the second was left in the dark for a period of time. CO was then measured again to determine if it was being utilised by bacteria. Absorbance was also re-determined to see if any of the bleaching was reversed.

3.4.4 Preliminary Results.

Diurnal Patterns.
Clear diurnal cycles of CO photoproduction in the day and consumption and/or gas exchange at night were observed throughout the cruise, see for example fig. 3.4.1.

CTD data.
Depth profiles of CO from CTD casts show high levels in the surface with levels dropping rapidly with increasing depth. This is again indicative of the photochemical source of this trace gas, e.g. fig. 3.4.2.

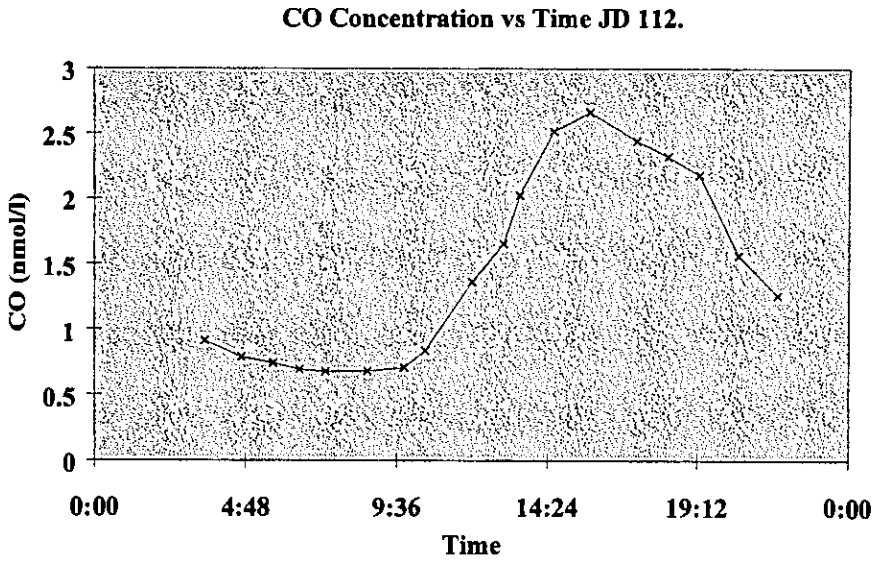

Figure 3.4.1. A sample diurnal pattern of CO concentration in the surface ocean (underway supply).

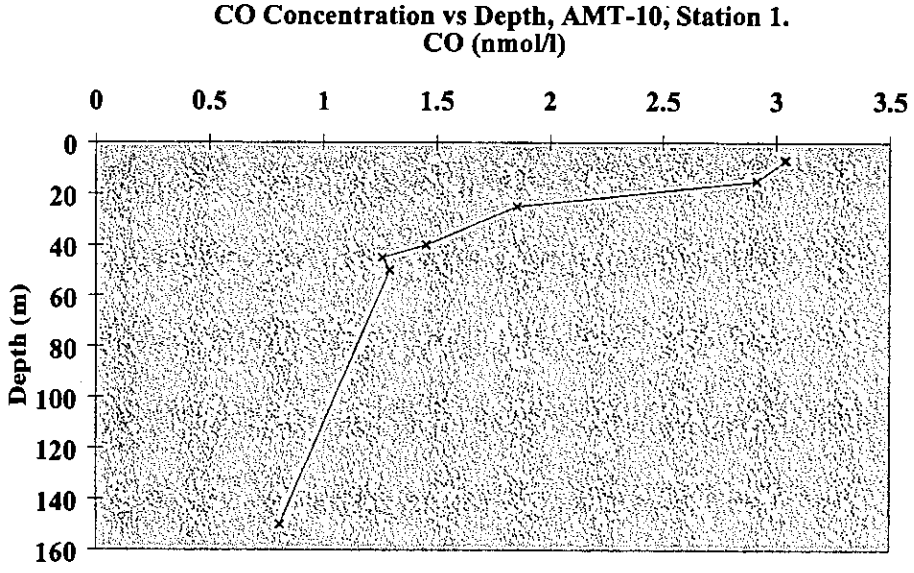

Figure 3.4.2. CO against depth from CTD Station 1.

3.5 INORGANIC NUTRIENTS (*Vas Kitidis*)

3.5.1 Scientific rationale

Samples were collected daily from vertical CTD casts and analysed for the concentrations of plant macro-nutrients nitrate(NO_3^-), nitrite(NO_2^-), phosphate(PO_4^{3-}) ions and silicate (SiO_2). These macro-nutrients are essential for phytoplankton growth and usually depleted in the mixed layer in oceanic environments, due to their uptake by primary producers. A sharp increase in the macro-nutrient concentrations is found below the mixed layer. As phytoplankton growth is nutrient limited in the upper mixed layer (UML), and light limited below, primary producers concentrate near the pycnocline that separates the UML from the water below. This ensures optimal growth due to the nutrients vs. light availability trade-off. Biological activity acts as a source of organic matter (particulate and dissolved), while the pycnocline forms a physical barrier for organics which are aggregated and thereby support local bacterial populations below the pycnocline. The re-mineralisation of organic matter is evident from the nitrite profiles which reveal high concentrations below the pycnocline and chlorophyll maximum. Nitrite is produced as an intermediate product of nitrification, by nitrifying bacteria. The purpose of this work is to study the concentration dynamics of macro-nutrients in the top 250 metres along the cruise transect as it crosses distinct, contrasting biogeographical regions. These data add to the AMT time series and form part of the core research programmes of PML/CCMS. Figure 1 shows the distribution of nutrients at one station on the edge of the south Atlantic gyre. The nutrient deplete surface layer is distinctly separated from nutrient-rich bottom waters by a nutricline. The nitrite peak at 200m indicates high nitrification at that depth.

Depth profiles of chromophoric dissolved organic matter (CDOM) are of importance to ocean optics and remote sensing. CDOM absorption spectra provide some information on the source of the material, allowing to distinguish 'old' material from deeper waters, 'fresh' material from the chlorophyll maximum and photodegraded material from surface waters. As with macro-nutrients, distribution of CDOM along the cruise transect is of particular interest between the different provinces. CDOM vertical profiles were also collected on AMT 9 and therefore cover two contrasting seasons.

Photoproduction of nitrite from CDOM has been reported for fresh- and coastal-waters. Production in oceanic environments is very low due to the low CDOM concentrations. To establish photo-lability of CDOM, deck incubations of water from various depths were carried out. The loss of CDOM to photochemical products is followed by the absorbance loss (bleaching) of CDOM. The process is important, as it provides a source of bioavailable nitrogen from refractory DOM.

Primary production enhancements by nutrient enrichment were carried out by scientists from Southampton Oceanography Centre. For further details refer to section 3.12.1. This author's involvement in the deck incubation experiments consisted of measurement of pre- and post-experimental nutrient concentrations in the various treatments.

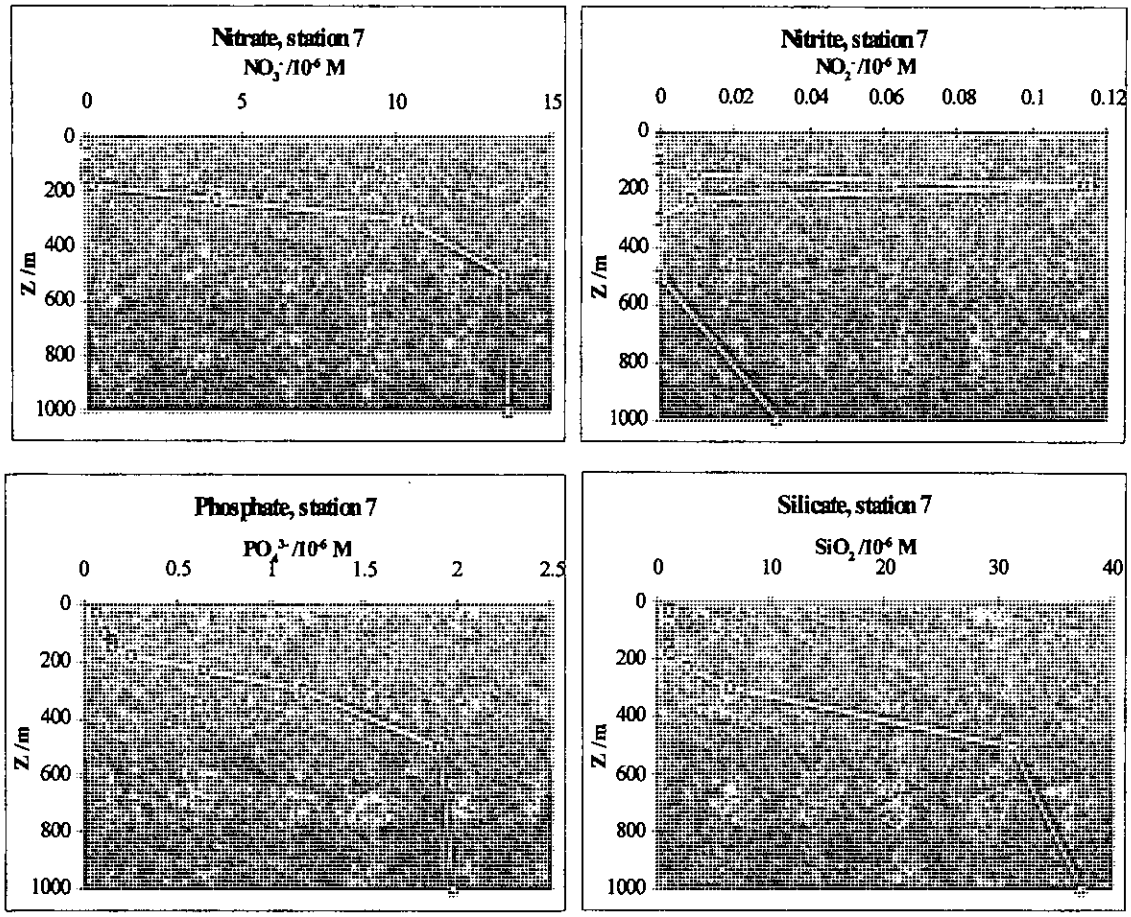

Figure 3.5.1. Distribution of nitrate, nitrite, silicate and phosphate (clockwise from top left), with depth. Samples were taken on the 19th of April 2000, at station 7, 13.514° S, 32.234° W , on the AMT 10 cruise track. The presence of a nutricline is evident between 200 and 400m. The nitrite spike associated with this feature is the product of nitrification, bacterial conversion of ammonium ion into nitrate via the nitrite ion.

3.5.2 Analytical

Macro-nutrient analysis was carried out using air-segmented-flow, colorimetric techniques, with a Technicon Autoanalyzer II. Samples for nutrient analysis were collected in 60 ml HDPE (Nalgene) bottles and analysed as soon as possible, but no later than three hours after collection. Samples for spectrophotometric analysis were collected in 200 ml analytical grade glass, volumetric flasks. Absorption spectra were taken with a Uvikon 923 double beam UV/visible spectrophotometer, using 10 cm pathlength optically paired cuvettes. Samples were also pressure filtered through 0.2 μm filters (Millipore, GTTP), but filtering introduced precision errors and was therefore abandoned. The absorption coefficient at 350 nm and spectral slope of the decay between 290 and 350 nm are used as measures of concentration and origin respectively.

3.6 PIGMENT ANALYSIS – Chlorophyll 'a' (*Tim O'Higgins*)

3.6.1 Methods

Chlorophyll & HPLC

Water from the underway non toxic seawater supply (7m) was sampled initially on a four hourly basis and subsequently every two hours. The water was filtered for HPLC analysis and chlorophyll quantification by fluorometry using Whatmann GF/F filters (0.7μm pore size). 2.1l-4.2l were filtered for HPLC, 250ml were filtered for chlorophyll florometry. Chlorophyll samples were prepared for analysis on board by acetone extraction according to the technique of Welschmyer (Oceanography and Limnology, 1994); filters extracted in 90% acetone for 24hrs in the dark, removed and defrosted in the dark for 30-40 minutes and analysed using a Turner designs AU10 fluorometer. The samples for HPLC were placed in cryovials and flash frozen using a liquid Nitrogen dry shipper for later analysis (by Victoria Hill). Samples were processed in the same fashion from the daily CTD casts, these samples came from different depths including the deep chlorophyll maximum and the 10% and 1% PAR levels (where possible at least two replicates were taken).

Picoplankton (Mike Zubkov, CCMS-PML)

Small volume (3ml) picoplankton subsamples for analysis with flow cytometry were preserved in plastic vials with 0.2 ml of 25% glutaraldehyde . The samples were first placed in 4°C cold storage for 12 hours and then removed to the -80°C freezer. These picoplankton samples were taken from underway and station samples. All sample collection was carried out with separate 'bulb' pipettes to avoid contamination. Initial and end samples were taken from the nutrient enrichment experiments (see section 3.12)

Phytoplankton taxonomy

Two initial and end phytoplankton samples were taken from each treatment of 8 nutrient enrichment experiments (see cruise report of A. Tagliabue and T. Tyrrell). 100ml was preserved with 4ml 2% acidic Lugol's solution and 100ml preserved with 5ml 4% phosphate-buffered formaldehyde. Phytoplankton samples were taken by vertical net hauls from depths of 20m to surface using a 40μm mesh phytoplankton net and were preserved in Lugol's iodine for qualitative analysis.

3.6.2 Preliminary results

Though most of the samples will be analysed on return to the U.K. some initial data on chlorophyll levels can be supplied. Figure 3.6.2 shows an example of a chlorophyll profile with depth from station 10, and figure 4.2.2 is a Surfer contour plot of the CTD (station) chlorophyll data to date.

Figure 3.6.1 shows the chlorophyll data from the underway samples plotted against latitude. Low chlorophyll levels are associated with the Southern Atlantic Subtropical Gyre (≈30°S to 15°S), while higher levels are found in the Southern Equatorial Current (≈15°S to 5°S). Notable are the peaks to >0.4 mg m^{-3} at 3°S and at 14 and 18-20°N (West African upwelling), and the rise to >0.9 mg m^{-3} from 33°N. During AMT 2, for example,

chlorophyll levels in the North Atlantic surface waters did not rise above 0.4 mg m^{-3} until north of 45°N. This latter area of enhanced phytoplankton biomass may be another indicator of recent mixing due to the passage of storms in this area.

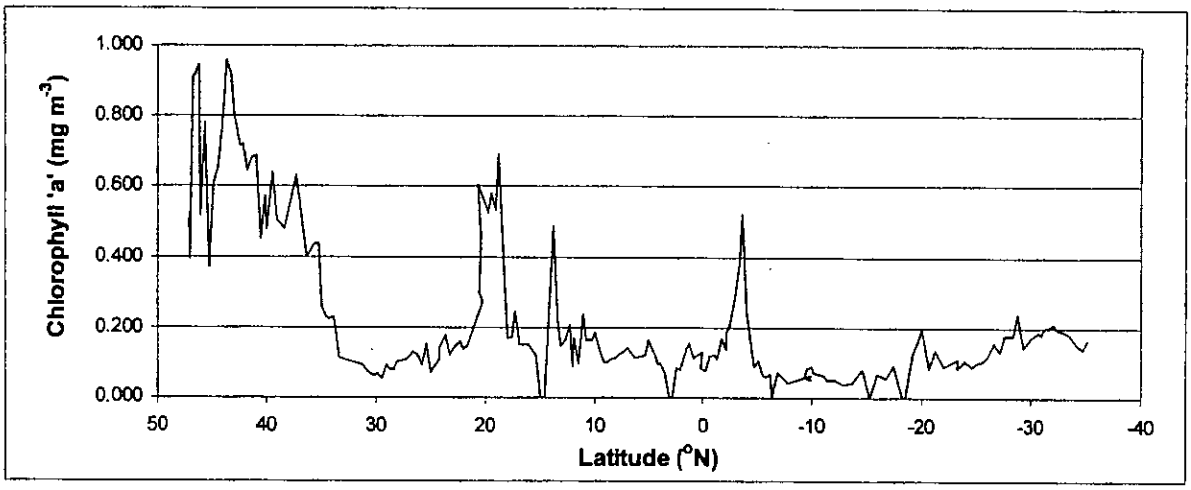

Figure 3.6.1. Surface underway chlorophyll 'a' concentration along whole transect.

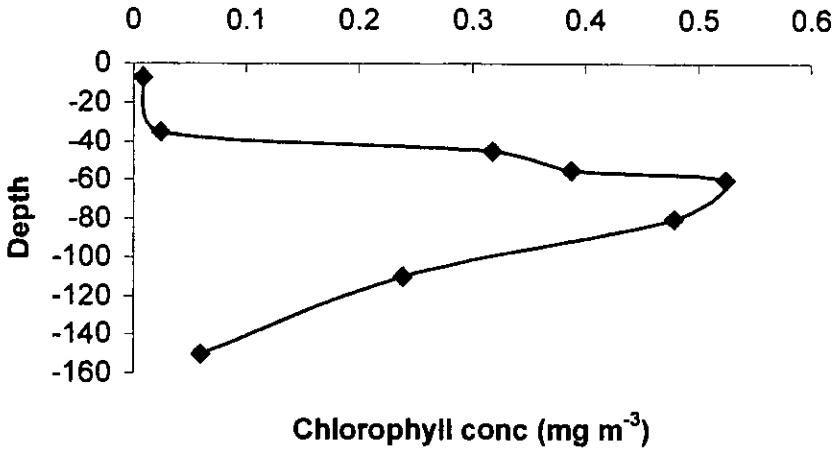

Figure 3.6.2. Chlorophyll profile at station 11

3.7 PIGMENT ANALYSIS – HPLC (*Victoria Hill*)

3.7.1 Introduction

The absorption spectrum of seawater contains information on the absorbing constituents of the sample. Within total absorption spectra are four main absorbing materials. These are water, gilvin, non-pigmented particulate matter and pigmented particulate matter (phytoplankton). The absorption due to phytoplankton is the principal subject of this investigation. Total phytoplankton absorption is the cumulative total of all the individual absorbing properties of each pigment present in the cells. Each pigment has an exclusive absorption spectrum, and as a result the pigments can be identified by these distinctive curves. In this study the phytoplankton taxa will be identified by analysis of the total phytoplankton absorption spectra. Fourth derivative analysis (FDA) is used to identify the pigments by resolving the individual absorption peaks for each pigment from the total spectra. This process is complete for biomarker pigments (those that are present in only one taxon or several species within a taxa), i.e. for major chlorophylls and 19' hexanoloxyfucoxanthin in cultured samples. The other carotenoids are still under study for identifying absorption peaks. This primary analysis of the major biomarker pigments allows preliminary identification of phytoplankton taxa. The spectra of the known pigments identified using FDA are then input to a curve fitting programme. This models total phytoplankton absorption spectra by optimising the curve parameters for each pigment until summation of all curves fits as closely as possible the observed absorption spectra. A satisfactory fit can be impossible for several reasons, particle absorption leading to overestimation of observed spectra or missing pigments because they were not identified on the fourth derivative analysis. Due to the clear linear relationship between pigment concentration and absorption peak height the pigment concentration of each pigment will be estimated from the optimised curves for each pigment from the curve fitting programme. From these concentrations the pigment ratios are calculated, which allow the proportion of each biomarker pigment to the total pigment load to be calculated. This sequence of analysis will enable first, identification of the major pigments present in a sample; secondly the accuracy of this analysis in the reconstruction using the curve fitting programme; and lastly the calculation of each of the pigment ratios leading to estimation of each pigment relative to chlorophyll a total biomass. HPLC results are used to check the analysis, as well as using the photodiode array (PDA) results to look at the specific absorption curves of pigments, and further pigment ratios.

3.7.2 Methods

Water samples from surface, 10% PAR and 1% PAR levels are collected and 4.2L filtered on to GF/F filters for HPLC analysis. The same volume is filtered for particle absorption analysis, using the filter pad technique. Optical data are gathered for each station (up- and dow-welling irradiance, downwelling radiance and AC9 (9 channel absorption) data. The total in-water absorption is compared with the in-vivo absorption. HPLC analysis is undertaken with a PDA to isolate individual absorption of pigments. Filter pad absorption is measured and then the filter is bleached to remove all pigmented material. Absorption is measured again, resulting in absorption for all non-pigmented material. Subtraction from total absorption gives phytoplankton absorption. Gilvin absorption will also be available, which will be used to increase accuracy of phytoplankton absorption spectra.

3.8 DISSOLVED ORGANIC MATTER – DOC, DON, DOP (*Claire Mahaffey*)

3.8.1 Introduction and rationale

For many years, the supply of nitrogen to subtropical gyres was considered to be primarily from diffusion of nitrate from nutrient rich deep waters into the euphotic zone. This process is both slow and highly variable spatially and temporally, hence nitrogen limitation over vast areas of the open ocean. However, a recent study discovered an imbalance in the nitrogen budget in that export production from the subtropical gyres is greater than can be accounted for by the nutrients in the water column. This suggests that an alternative nitrogen source may be fuelling primary production in oligotrophic areas of the ocean. Three alternative sources of nutrients to the subtropical gyres of the Atlantic Ocean have been identified: dinitrogen (N_2) fixation by cyanobacteria, dissolved organic nitrogen (DON) advection from surrounding productive waters and eddy induced diffusion of nitrate (NO_3^-) at the thermocline. Although such nutrient sources have been previously documented, their relative contribution to the primary productivity in the sub-tropical gyres of the Atlantic Ocean is unknown.

The present study aims to investigate the supply of nitrogen to sub-tropical gyres using naturally abundant stable isotopes ($\delta^{15}N$). The isotopic composition of phytoplankton is dependent on 2 factors, the isotopic composition of the nutrient source and the isotopic fractionation process during uptake and assimilation of the nutrient. By assessing the isotopic composition of the nutrient source for each of the potential supply pathways (as mentioned above) and phytoplankton (acting as a sink), a biogeochemical map will be constructed to assess the dominant supply pathway. This approach should be informative because measurements of naturally abundant isotope ratios are a well-established technique for identifying sources and evaluating transformations of materials within the environment. The isotopic composition of bulk particulate organic matter (POM) is widely cited and ranges from ~0.2 ‰ in areas of predominant nitrogen fixation, to 16 ‰ in denitrification zones. However, bulk POM incorporates detrital biomass, bacteria and possibly organisms of higher trophic levels. Therefore, in this study, we will also attempt to isolate and determine the $\delta^{15}N$ of the chlorophyll *a*, which will provide the autotrophic isotopic signature. In order to back up this novel approach, other parameters will also be measured for samples collected on AMT 10. Latitudinal variation of DON and its isotopic composition will allow us to examine our theory on DON advection from surrounding productive oceanic regions being a source of N to sub-tropical gyres. Indeed, Micheals *et al* 1996 supports such a transport mechanism, his findings suggesting that the semi-labile fractions are transported further into N-depleted regions than nitrate.

Many studies suggest that an increase (possibly 4 times that of Redfield ratios) in N:P ratio and DON:DOP ratio indicates cyanobacterial nitrogen fixation and uncoupling of N and P dynamics. Latitudinal variation in DON: DOP ratio may help to identify areas of nitrogen fixation in the Atlantic. In addition to molar ratios, a shift in the phosphate pool, i.e. a decrease in soluble reactive phosphate (SRP, mostly orthophosphate) and an increase in the soluble non-reactive phosphate pool (SNP, mostly DOP) measured using the MAGIC method (Karl and Tien, 1992), is an indicator for N_2 fixation.

3.8.2 Methods

Samples collected for isotopic analysis - Isotopic composition of Chlorophyll
Seawater from the uncontaminated supply (7 m below surface) was filtered through pre-combusted (450°C for 12 hours) GF/F filters using a large volume filtration system at a pressure of ~ 2.5 bar. Based on an average chlorophyll concentration of ~0.2 mg m^{-3} (from previous AMT cruise data), it was calculated that 1000 L was required in order to reach detection limits for the isotopic analysis of chlorophyll N, a method recently developed by Sachs *et al* (1999). Filters were wrapped in muffled foil and frozen at –80°C. Analyses will be performed at University of Liverpool (extraction and HPLC) and University of Bristol (NERC isotope facility).

An experiment was performed to investigate the *in-situ* degradation of chlorophyll, that is, degradation whilst the filter was in the filtration apparatus. This indicated 60% degradation over a period of 12 hours. It was therefore decided that 200 L should be filtered through one filter and the filter placed into the freezer immediately to prevent such degradation. During analysis, the chlorophyll extracts can be added together to meet concentrations required.

Samples collected for isotopic analysis - Isotopic composition of DON
Filtrate (2 L) from the large volume filtration system was collected on each station and stored at –20°C immediately. Isotopic analysis of DON (δ^{15}DON) will be performed at Liverpool University using a method by Feurstein *et al.* (1997). At present, few field measurements have been performed on δ^{15}DON in the marine environment (Benner *et al.* 1997).

Samples collected for analysis of dissolved organic matter - DON, DOC & DOP
Seawater samples from each depth of the CTD cast were collected in 250mL glass flasks with glass stoppers. Flasks were rinsed 3 times with sample seawater before sample collection. Samples were filtered through pre-combusted (450°C for 12 hours) GF/F filters. After discarding the first ~100mL, ~100mL of seawater was collected in 150mL flat amber medicine bottles with PTFE lined polycarbonate caps and stored at –80°C. Samples will be analysed for dissolved organic phosphorus (DOP) using the MAGIC method (Karl and Tien, 1992) at Plymouth Marine Laboratory (PML).

From the same filtrate, duplicate 8mL samples were collected in pre-combusted (500°C for >4 hours) glass ampoules. Samples were preserved with 30µL orthophosphoric acid, ampoules were sealed and stored at 0°C. Samples will be analysed for dissolved organic carbon (DOC) and dissolved organic nitrogen (DON) at PML using the High Temperature Catalytic Oxidation method (HTCO). At stations 12,18 and 23, samples from 200m were spiked with DOC/TDN standard of potassium hydrogen phthalate (9.375×10^{-3} M) and glycine (12.3×10^{-3} M). Differing volumes of standard (50, 100 and 150 µL) were added to individual filtered seawater samples.

3.9 SIZE-FRACTIONATED CHLOROPHYLL (*Alex Poulton*)

3.9.1 Introduction

Tropical phytoplankton communities are often considered as solely consisting of small picophytoplankton (e.g. *Prochlorococcus marina*). Although picoplankton dominate the biomass (~10mg C m^{-3}) and are the dominant chlorophyll containing cells (typically 70-80%) many other phytoplankton populations co-exist. Such a situation may be compared with a tropical rainforest where trees dominate the biomass, but the community consists of a high diversity of other autotrophic and hetertrophic organisms. Community studies should consider the full community as opposed to only the dominant members due to the likelihood of inter- and intra-species interactions in the community dynamics. The measurements outlined below aim to gain an understanding of the structure and dynamics of the phytoplankton communities of the tropical Atlantic Ocean. As part of this both material for species identification is collected as well as measurements of community chlorophyll partitioning.

Experiments and measurements with the FRRF are also included to investigate some of the (photo-) physiological characteristics of the phytoplankton communities (data not shown here). Previous taxonomic studies in the tropical Pacific have highlighted the existence of a 'sun' and 'shade' flora; which are specialised in terms of physiology, life cycle history and possibly morphology to living either in the sun-lit nutrient poor surface waters or the deep shaded nutrient rich waters below the upper mixed layer. Species lists from the tropical Pacific will be compared with species lists from the AMT data and community statistical analysis will investigate the depth segregation of different phytoplankton species. Similar phytoplankton community analysis will also look at species biogeography and relationships between diversity and biogeochemical provinces.

3.9.2 Methods

Size-fractionated chlorophyll 'a'

Size fractionated chlorophyll *a* measurements give a rough estimation of the phytoplankton community structure. Size-fractionated chlorophyll *a* measurements were collected routinely from 3-7 depths from each CTD cast. Samples were successively passed through 20µm, 2µm and 0.2µm polycarbonate filters and placed in test-tubes with 10ml of 90% acetone. Chlorophyll *a* concentrations (mg m^{-3}/µg l^{-1}) were determined within 2-3 hrs of each station by a rapid sample processing technique; filters sonicated for 30 secs and centrifuged at 3000rpm for 10mins. Chlorophyll *a* concentrations were calculated from fluorescence measurements using a Turner A-10 Fluorometer equipped with Welschmeyer filters (Welschmeyer, 1994). Total size fractionated chlorophyll was compared with chlorophyll *a* measurements determined after 24hrs at 20°C in the dark (see section 3.6). Comparisons between the two showed good correlation (R^2=0.7, see figure 3.9.1.)

Permanent phytoplankton slides

The collection and preservation of large volume water samples in a suitable condition for microscopic examination should give extra taxonomic and morphometric information. Water samples (~1 litre) were filtered gently onto 0.45μm cellulose nitrate Millipore filters, fixed with gluteraldehyde (25%), inverted and placed face down on glass coverslips. A few drops of hydroxythyl-methacrylate resin placed on the back of the filter causes the filter to become transparent within a few minutes. The glass cover slip is inverted and using glass-glue attached to a glass slide. Slides are permanent and stored in a cool, dark environment until examination. During AMT-10 this technique was used extensively to preserve both surface and DCM samples (12 stations), as well as some tow-net samples (4 stations; for full details see appendix 9). Preliminary examination during the cruise revealed that the technique works extremely well and should provide a exemplary set of data and morphometric data (e.g. number of liths on coccosphere). [This technique follow the methodology of Crumpton (1983) with recommendations from Dr. K. Embleton (SAHFOS, MBA).]

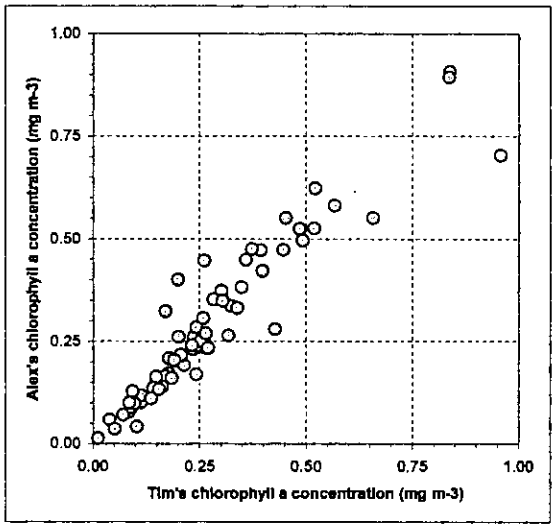

Figure 3.9.1. Comparison between chlorophyll concentrations using two different sample preparation techniques (chlorophyll concentration determined following Welschmeyer, 1994).

Standard AMT phytoplankton biogeography

Throughout the AMT program samples for phytoplankton species identification have been collected and a large taxonomic database has been amassed. During this cruise the standard phytoplankton samples were collected from the surface (7m) and the DCM from 17 stations (see appendix 9). At each depth 100ml of seawater is preserved with 4ml of acidic Lugols solution (for diatoms, dinoflagellates, flagellates) and another 100ml preserved with 5ml of Formalin (for coccolithophores). Due to the questionable accuracy of such small volumes in low nutrient environments, large volume "population" samples were collected. These samples consisted of 2.5L samples from the surface and DCM preserved with acidic Lugols solution. Cell counts of these "population" samples will consider the replication of 100ml samples and a "population" count. Alongside cell counts, species identification will examine trends in diversity from different sized "sub-population" samples and from a whole "population" sample. From these results critical sample size, critical count volume and replication errors will be determined and applied to the AMT dataset. [Sample analysis and statistical considerations follow the criteria and recommendations of the UNESCO Phytoplankton Manual (1978).]

Effects of temperature and light on chlorophyll concentrations (deck incubations)
During AMT-10 experiments were carried out to examine trends in the response of surface and deep phytoplankton populations to changes in the ambient temperature and irradiance environments. Samples from the surface and DCM were collected and placed in 2 litre polycarbonate bottles. Different light levels were simulated using shading material and the chlorophyll concentration was recorded with time. Chlorophyll concentration was determined by filtering *ca.*200ml onto a 47mm GF/F filter, adding 10ml of acetone, sonicating for 30 seconds and centrifuging at 3000rpm for 10 minutes. Several combinations of high light/low light/dark bottles were used as well as incubating some (dark) samples in a cool environment (air-conditioned room).

3.9.3. Preliminary results

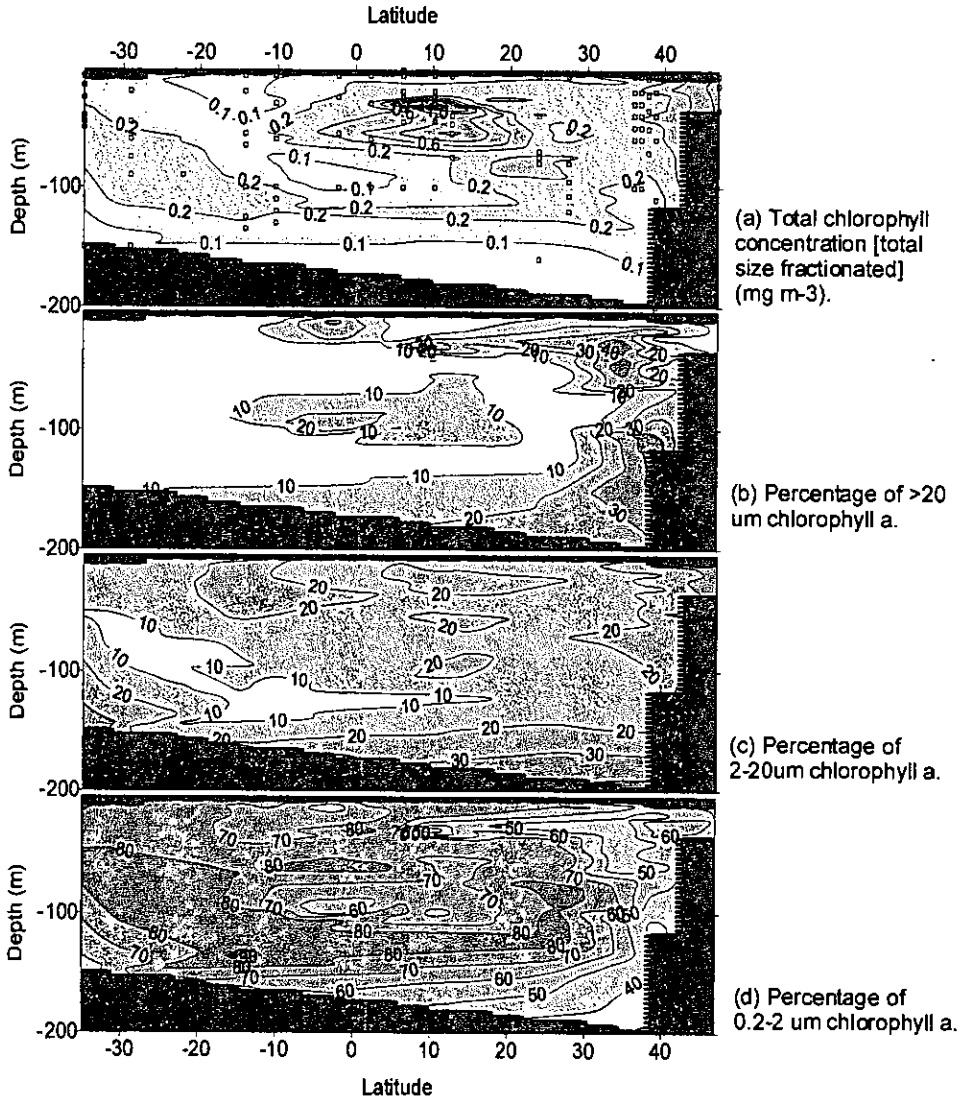

Figure 3.9.2. Contour plot of size fractionated chlorophyll *a* results; (a) total chlorophyll *a* concentration, (b-d) size fractions as a percentage of total chlorophyll *a*. [Blank squares on Fig.1a are the sampling depths; grey areas are a result of the gridding method used to plot the discrete chlorophyll data (Triangulation with linear interpolation).]

Size fractionated chlorophyll a

Size fractionated chlorophyll *a* results are presented in Figure 3.9.2 as a contour plot along the AMT cruise track. Size fractionated chlorophyll *a* data has been collected on several AMT cruises (e.g. AMT-02) allowing temporal (interannual and seasonal) trends in community structure to be identified and verified.

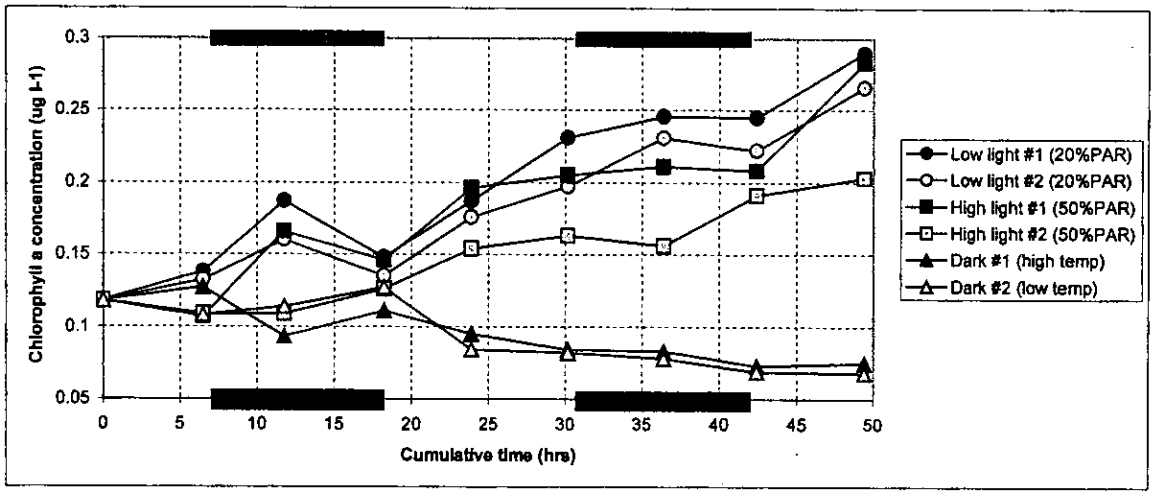

Figure 3.9.3 Chlorophyll *a* trends in deck incubations of surface water at several light levels. [Dark bars indicate night time periods during the experiment. Low light bottles experienced 20% of the incidental irradiance and high light bottles experienced 40% of the incidental irradiance.]

Temperature/Irradiance Deck Incubations

Preliminary results from the deck incubations have shown interesting trends in the response of both surface and deep populations to being removed from their insitu light and temperature environments. Figure 3.9.3. shows the results from an experiment (Experiment #. 5, 28/04/00) where a surface oligotrophic population (~23°N, 21°W) was incubated for 50hrs in surface water temperatures (~20.8°C) and a combination of high light (~40% incidental), low light (~20% incidental) and dark bottles (no light). Samples were collected at the start and end of the experiment for cell counts and to look at trends in carbon to chlorophyll ratios. Increases in chlorophyll concentration could be due to several reasons including growth and/or chlorophyll synthesis (photoacclimation).

3.10 PRIMARY PRODUCTIVITY – ^{14}C (*Claudia Omachi*)

3.10.1 Primary Production versus Irradiance (P v. E) Experiment

One of the most important inputs for primary productivity models is the physiological parameter of phytoplankton assemblages that can vary depending on the region. These physiological parameters can be obtained from the primary production versus irradiance (P v. E) experiment. Taking into account that the AMT cruises pass by several oceanic provinces, this experiment was carried out to analyse these physiological parameters in several oceanic provinces of the Atlantic Ocean.

3.10.2 Methodology

At the CTD stations, three depths were sampled for the P v. E experiment: 7 m, 10% PAR and deep chlorophyll maximum depths. Each depth was sub-sampled into 10 80ml-polycarbonate bottles spiked with 10 μCi $NaH^{14}CO_3$ except in the very oligotrophic regions, where the inoculated radioactivity was doubled. The exact radioactivity, added to each sample, was controlled using CarboSorb[7]. The incubation was carried out during 3 to 3.5 hours under a 35W halotone lamp that provided 10 light intensities between 3 and 2500 $\mu E\ s^{-1}\ m^{-2}$. The sample bottles were cooled with the uncontaminated seawater supply. At the end of the incubation, the samples were filtered through 47mm diameter 0.22 micron Poretics polycarbonate filters. The filters were exposed to HCl fumes for a few minutes to remove inorganic ^{14}C. Unfortunately, the on board scintillation counter could not be satisfactorily calibrated. Therefore, all the samples will be taken to CCMS-PML and analysed after the cruise.

3.11 FRRF DERIVED PHYTOPLANKTON PHYSIOLOGY (*Mark Moore*)

3.11.1 Introduction

Phytoplankton productivity is controlled by the availability of two basic substrates, nutrients and light. The rate of supply of these substrates is in turn strongly governed by physical processes. Variability in the vertical mixing rates of cells within the exponential light gradient will have a large influence on the mean daily irradiance experienced. At the same time the supply rate of nitrate through the thermocline imposes an upper limit on the amount of new production which can occur.

One of the principal problems with the quantification of primary production is the question of scale. Physical processes such as periodic upwelling, eddy activity and storm events will all cause variations in the nutrient and light regime experienced by phytoplankton. However adequate sampling of such processes from the biological perspective is difficult and time consuming, as the principal method for the investigation of phytoplankton physiology and growth has been via the uptake of ^{14}C in incubation experiments. Active fluorescence techniques such as Fast Repetition Rate Fluorometery (FRRF) have the potential to increase the resolution with which we can observe the biological aspects of the marine system and thus such techniques may ultimately be used to overcome the previous under-sampling problem.

3.11.2 Methods

Fig. 3.10.1 *In-situ* Fast Repetition Rate Fluorometer (FRRF) - Chelsea Instruments' '**Fast**$^{\text{Tracka}}$'.

The FRRF technique relies on the close relationship between the amount of variable chlorophyll a fluorescence and light absorption and utilisation within the photosynthetic apparatus of phytoplankton. Biophysical models have been developed relating the shape of the fluorescence induction curve (Fig 3.10.2) to a variety of parameters (Kolber *et al*, 1998), including the photochemical efficiency (F_V/F_M) and the functional absorption cross section of photosystem II (σ_{PSII}, in effect the photosynthetic target size). These physiological parameters can be utilised in further models to estimate photosynthetic electron transport rates and ultimately production rates (Kolber and Falkowski, 1993). The AMT time-series presents a unique opportunity to observe the temporal and spatial variability of phytoplankton physiology across two major ocean basins. Such data should increase our understanding of how variability in environmental factors affects phytoplankton productivity.

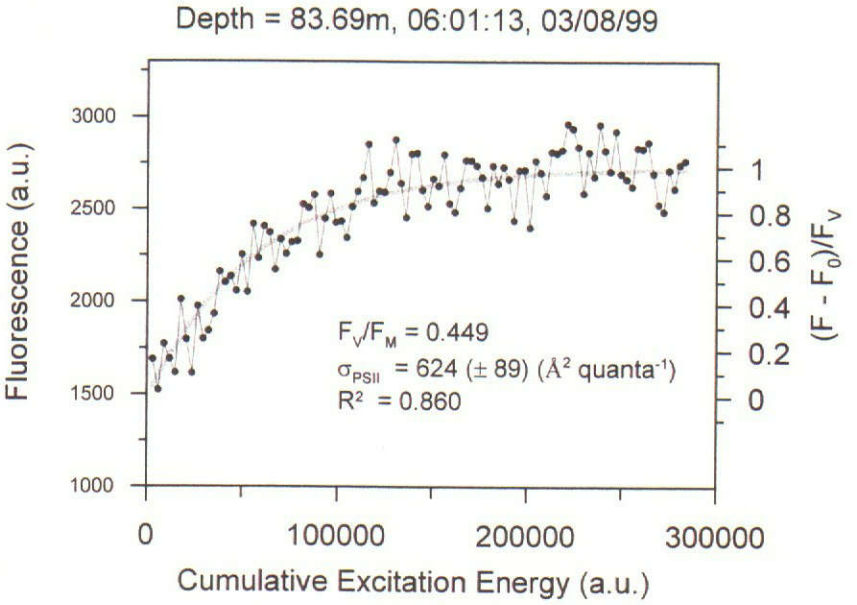

Figure 3.11.2. An *in situ* fluorescence induction curve measured at a depth of 87m at a mixed site on the NW European shelf using a submersible FRRF. The increase in fluorescence (F_V) from an initial value (F_0) to a maximal value (F_m) can be fitted to a biophysical model using a least squares technique (thick grey line), to give the value of σ_{PSII}.

Part of the work undertaken during the cruise will be to add to the database of vertical profiles that have been collected during previous AMT cruises (see Figs. 3.1.3 & 3.1.4). In addition it is intended that a series of experiments designed to investigate variations in phytoplankton physiology in response to changes in light or nutrients will be performed. Samples collected from different depths within the water column will be incubated under various conditions, with the magnitude and time-scales of the physiological responses being measured by passing sub-samples through the FRRF. It is hoped that data of this kind will eventually be used in order to develop mechanistic models of phytoplankton physiology and growth.

3.11.3 Preliminary results

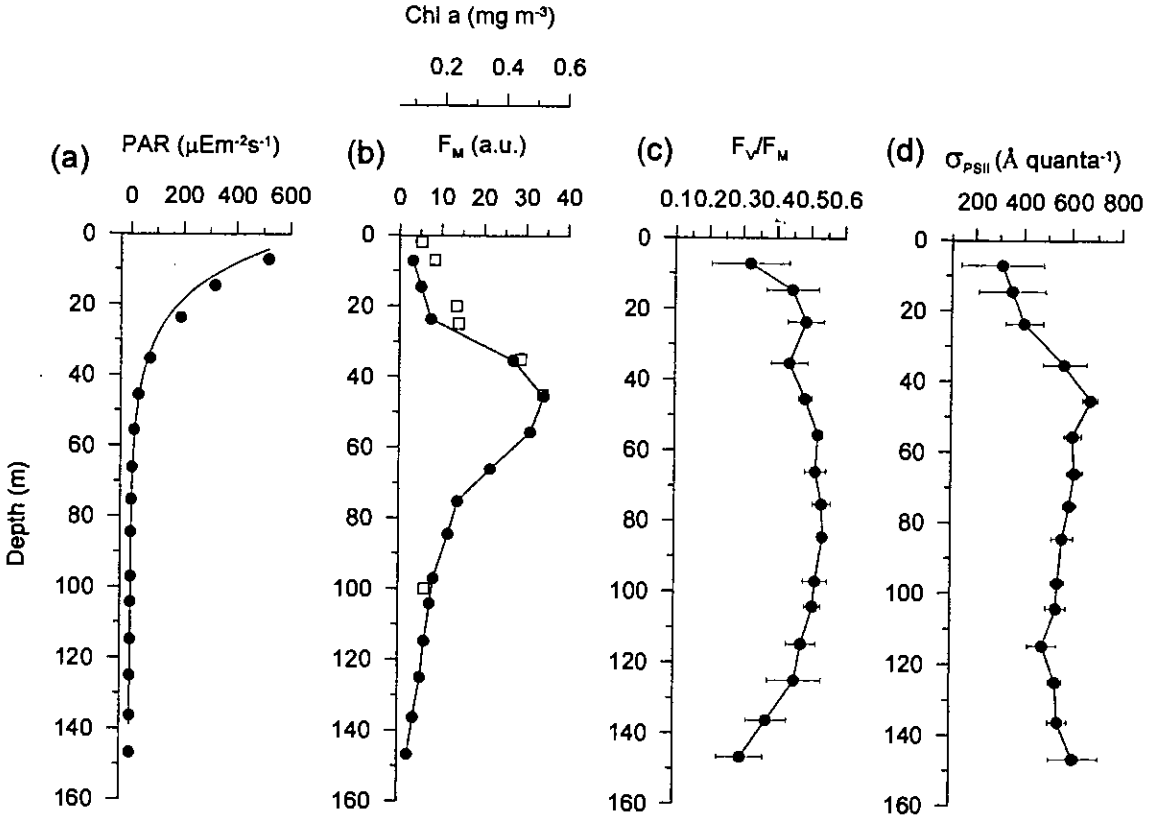

Figure 3.11.3. Example FRRF profile collected at 11:30 GMT on 24th April 2000. (a) PAR and exponential fit, (b) F_M (circles), the maximal fluorescence and Chlorophyll a (open squares) as measured using the Welshmeyer technique, (c) F_V/F_M as measured in the dark chamber of the FRRF, (d) σ_{PSII}, the functional absorption cross section of photosystem II. The relationship of the maximal fluorescence, which is a parameter similar to that measured by a more traditional fluorometer, to the chlorophyll concentration is clear. The photochemical efficiency (F_V/F_M) is decreased in the surface due to nutrient limitation and also declines at depth indicating senescence of the population. The decrease in the functional absorption cross section towards the surface is likely to be due to high light adaptation of the near surface populations.

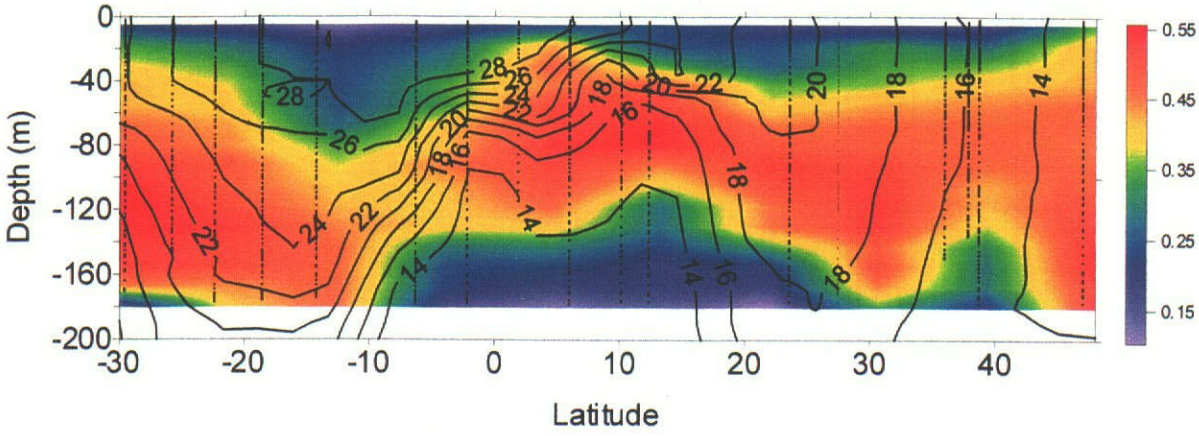

Figure 3.11.4. Plot of F_V/F_M and temperature for the whole AMT-10 transect. Colours indicate the photochemical efficiency as measured *in situ* during CTD casts, black lines are temperature contoured using the CTD data, black circles indicate FRRF data points. Higher values of F_V/F_M are associated with the thermocline.

3.12 NUTRIENT ENRICHMENT (*Alessadro Tagliabue & Toby Tyrrell*)

3.12.1 Rationale (*Toby Tyrrell, SOC*)

It is generally thought that the nutrient that is immediately most limiting to primary production (the proximate limiting nutrient) in the oceans is nitrogen (dominated by nitrate). Numerous nutrient enrichment experiments in coastal waters support this conclusion. However, the same experiments have only been carried out rather infrequently in open ocean waters far from land. A recent paper [Downing et al, 1999] reviewing these nutrient enrichment experiments concluded that proximate nutrient limitation in the open ocean was most usually by phosphate rather than nitrate! However, on a recent cruise between Morocco and Nova Scotia, Graziano et al [1996] carried out nutrient enrichment experiments and found proximate nutrient limitation predominantly by nitrate along this transect in the northern Atlantic.

We are carrying out nutrient enrichment experiments along the longer AMT transect, both within the southern and northern hemispheres. Although we are not using trace metal techniques and are not testing for any possible impacts of trace metal enrichments (this may happen inadvertently, but is likely to be the same for all bottles) yet we are testing for differences in response of incubated cultures to nitrate and phosphate additions. This work will help confirm or deny the assumed picture of proximate nitrate limitation throughout the open Atlantic Ocean.

3.12.2. Methods (*Alessandro Tagliabue*)

To examine the effects of nutrient enrichment experiments stations were sampled during the Atlantic Meridonal Transect (AMT) between April and May 2000. The treatments were Nitrate, Phosphate, Silicate, a combination of all three and a control of deionised water (DIW). At each station a 10litre carboy was filled from the ship's non-toxic

underway supply. 600 ml was then decanted into 15 polycarbonate bottles (3 replicates for each of the 5 treatments), these were filled in cycles of the 5 treatments to account for possible settling effects in the carboy. The bottles were previously cleaned overnight in a 5% HCl acid bath. The 3 nitrate bottles were then enriched with 500 µL of nitrate solution (5 mM), the 3 phosphate bottles were enriched with 500 µL of phosphate solution (0.5 mM), the 3 silicate bottles were enriched with 500 µL of silicate solution (10mM). The 3 All nutrient bottles were enriched with 500 µL of nitrate, 500 µL of phosphate and 500 µL of silicate. The 3 control bottles were enriched with 500 µL of DIW.

The samples were then incubated for approximately 40 hours, or at least over 2 nights (to try and allow at least 2 night divisions) in a rack constructed of Perspex and string, cooled by seawater flowing from the underway supply and shaded by screening materials on all sides. Exposure of samples to surface irradiance was avoided during all steps. Samples were removed from incubation at around 10:00 GMT each day.

Samples of 250 ml were then filtered from each bottle onto Whatman GF/F filter paper and extracted for 24 hours in 10 ml of 90% acetone. Chlorophyll was then determined using a fluorometer (see equation below) set up for the Welschmeyer technique (welschmeyer, 1994). Initial chlorophyll concentrations were determined in the same way using 250 ml samples from the underway supply whilst on station. From this the 'response' of the chlorophyll to each treatment could be determined (Initial - final chlorophyll concentration) and thus the nutrient most limiting (in terms of chlorophyll increase) could be determined.

3.12.3. Ancillary measurements

Nutrients

A standard incubation was set up for each treatment and 50 ml samples taken for analysis with an Autoanalyser (for details of analysis see section 3.5). Hence initial nutrient concentrations were determined which were fixed for all incubations. At varying intervals during the cruise further 50 ml samples were taken from all 15 bottles of the incubation and analysed in the same way. Thus, an indication of nutrient usage was available.

Growth Responses

Once in each oceanographic regime (~8 times in total) samples were taken pre and post incubation and preserved for cell counts on shore (for details see section 3.6).

3.12.4. Preliminary Results

Experiments were carried successfully although some samples were blown out of the screened area during rough weather.

Figure 3.12.1 shows a characteristic result from the oligotrophic ocean, the phytoplankton appear to be slightly Nitrate limited, but when Phosphate is added as well a larger response is observed. Silica appeared to have no role. Figure 3.12.2, from the North Atlantic drift, indicates that Nitrate is seen to be limiting more strongly and Silica also has a larger influence. Both observations are likely to be due to the recent passing of the spring bloom, leaving nitrate and silica deficient waters.

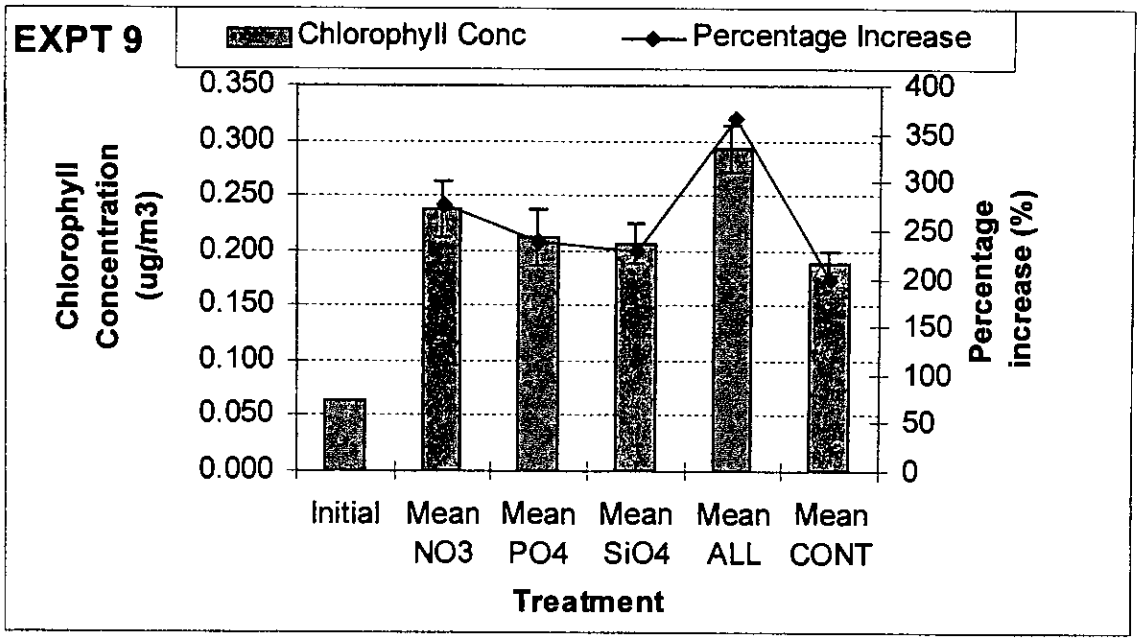

Figure 3.12.1. Experiment 9.227°S 27.105°W. Graph shows chlorophyll concentration (µg/l) for all five enrichment treatments (post incubation) and the initial chlorophyll concentration (pre incubation) also shown is the percentage growth observed for each treatment (relative to initial).

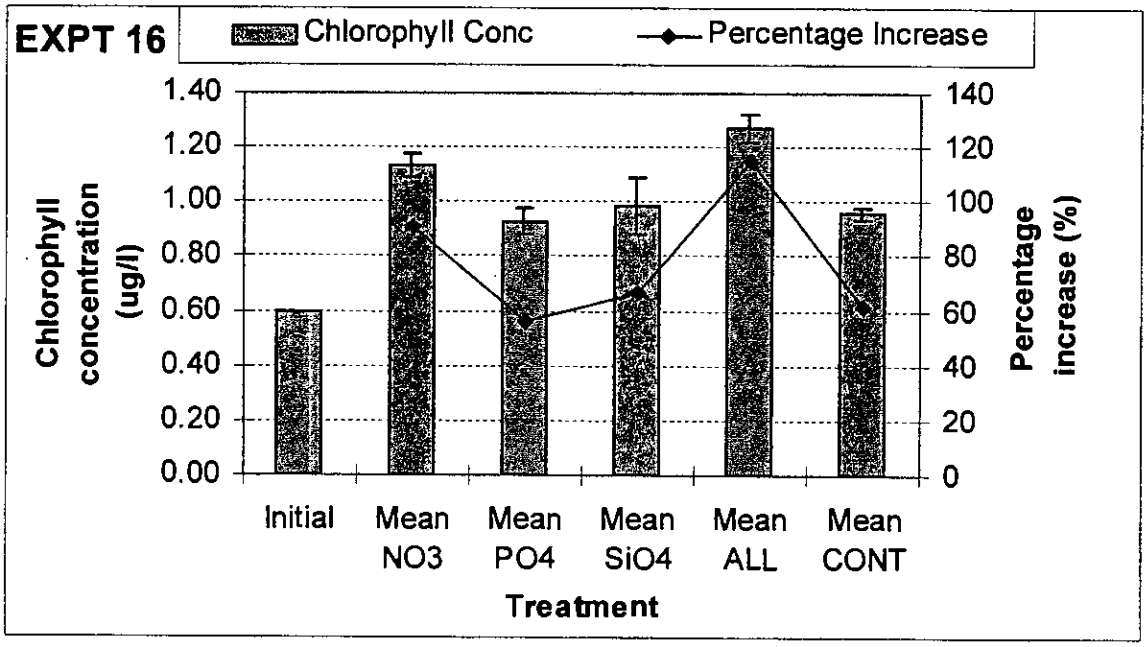

Figure 3.12.2. Experiment16, 38.886°N 20.041°W. Graph shows chlorophyll concentration (µg/l) for all five enrichment treatments (post incubation) and the initial chlorophyll concentration (pre incubation) also shown is the percentage growth observed for each treatment (relative to initial).

3.13 ZOOPLANKTON COMMUNITY SIZE STRUCTURE (*Chris Gallienne*)

3.13.1 Introduction

The primary aim of the present work on AMT cruises is twofold and derived from the need (i) to characterise zooplankton in terms of taxonomy and carbon from traditional integrated net hauls and (ii) to compare these to optical characterisation in terms of biovolume and size. The work is also intended to provide a continuous, semi-autonomous description of the surface zooplankton between 50° N and 50° S.

The optical characterisation of mesozooplankton was carried out using the laboratory Optical Plankton Counter (OPC; Herman, 1992) in two modes: (i) in continuous flow through mode using the ship's uncontaminated supply, drawn from approximately 7 metres below the surface; (ii) in pump through mode using samples collected from WP-2 net casts integrated over 0-200m depth at daily sampling stations. The data from (i) and (ii) above were used to generate near real time estimates of size structure and carbon content.

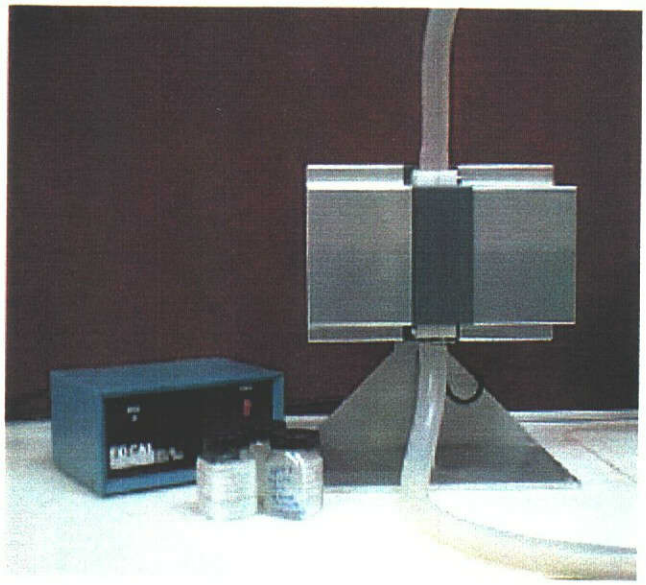

Fig 3.13.1 Laboratory OPC and Deck Unit for use in pump-through mode for continuous underway or discrete net samples.

The OPC is capable of large-scale, rapid and continuous characterisation of zooplankton. It can produce reliable abundance and size distribution indicators for zooplankton between 0.25 and 16mm in equivalent spherical diameter (ESD, Herman, 1992) in up to 4096 size classes, and at data rates up to 200 events sec^{-1}. It is important to note that this size range does not cover the whole of the zooplankton size spectrum. The size range of 200μm to 20mm is often given as the range for mesozooplankton, to which the OPC is well suited. Although the OPC produces data every 0.5 seconds, the data presented here are integrated over 60-minute intervals in order to produce sufficient counts for a reasonable description of size structure in all waters. The OPC measures cross sectional area as digital size, which is converted to equivalent spherical diameter (ESD) using a semi-empirical formula. This is the diameter of a sphere that would present the same cross sectional area as the particle being measured. We calculate volume from the cross sectional area to give further information about the particles being analysed. This is presented in the results as biovolume concentration in $mm^3\ m^{-3}$ (equivalent to $mg\ m^{-3}$).

3.13.2. Methods

The underway and station zooplankton sampling commenced as soon as the vessel was clear of the influence of the River Plate and of Uruguayan territorial waters, and continued to the final station on the UK shelf south of the Lizard, in West Cornwall.

Vertical net samples for size fractionated biomass and OPC-1L discrete samples

Mesozooplankton samples were taken at each of the stations for taxonomic identification and for determining size fractionated biomass. Double WP-2 nets with 200µm mesh and 0.57m diameter opening were used to take vertically integrated samples (200m to surface). One net sample was passed through the OPC followed by preservation in 4% borax buffered formaldehyde. The OPC data were processed immediately at sea in spreadsheet form to produce size distributions in up to 16 size classes which are $\log_2$ intervals of volume between 250µm and 16mm ESD. Figure 3.13.2 shows an example for a net sample taken at station 22 on 5th May 2000.

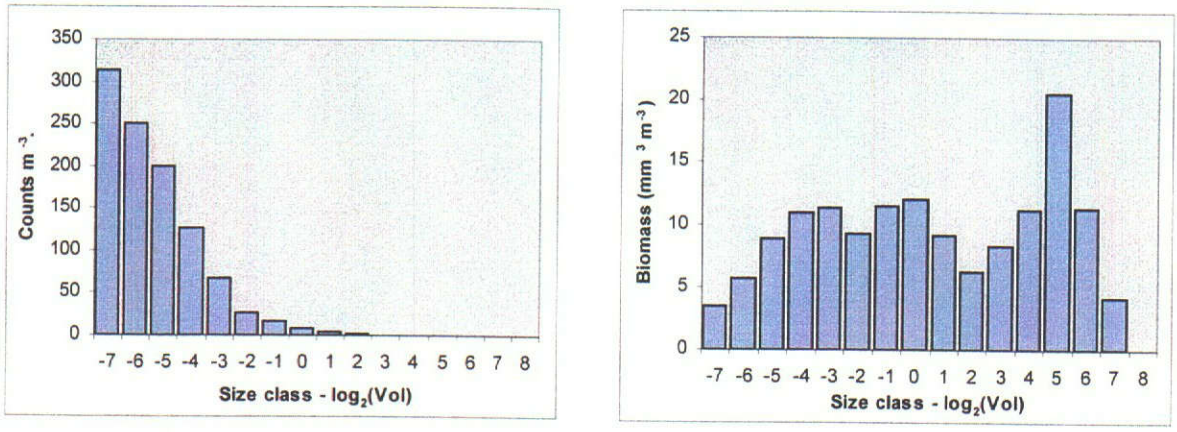

Figure 3.13.2. OPC counts and biovolume in each of 16 size classes for WP-2 net sample from station 22 on 5th May 2000. Latitude 48° 12'N, 12° 50'W.

The second net sample was size fractionated using 200µm, 500µm, 1000µm and 2000µm sieves, producing biomass samples in the classes: 200-500µm, 500-1000µm, 1000-2000µm and >2000µm following the Joint Global Ocean Flux Study (JGOFS) mesozooplankton protocol. Sub-samples of each size fraction were filtered in triplicate on pre-ashed glass-fibre filters (Whatman GF/C) and stored at -20°C. These were then dried at 60°C prior to analysis on a Carlo Erba NA1500 elemental analyser to determine total carbon and nitrogen content for each zooplankton size class. This remainder of the sample was preseved for microscopic analysis on return to the laboratory for total counts and identification of major taxonomic groups. OPC data from net samples are summarised for the whole transect in figures 3.13.5 and 3.13.6.

The OPC-1L in surface underway mode

The OPC was operated in continuous underway mode throughout the transect from 36° S to 50° N, sampling surface water from the ship's uncontaminated sea water supply, apart from stops on station (usually once a day). Seawater is pumped from beneath the bow of the ship through a 6mm steel mesh filter, and distributed to the laboratories. The OPC was connected to this supply, continuously sampling surface (7m) seawater at ~24 litres min^{-1}

via a de-bubbling device to prevent spurious counts. The OPC-1L has a 20mm square section glass flow cell, through which water containing the sample was pumped. An in-line flow meter was installed to give a record of volume of water passing through the OPC. The data are presented in one of two ways. First, as a simple count (figure 3.13.3), and second as biovolume (figure 3.13.4). Both may be presented as a single total value in up to 4096 size classes. It is convenient to present these data in a reduced number of size classes over the size range, as shown in figure 3.13.5 and 3.13.6.

Validation of OPC data

Laboratory calibration against spherical glass beads of known size provides the initial calibration. Size calibration exercises were performed during the cruise using calibration beads of 501 ± 10, 1004 ± 20, and 2022 ± 40μm ESD (Duke Scientific Corporation, Inc.). These were each mixed with filtered seawater and recirculated through the system. Continuous OPC underway counts are compared to microscope counts of zooplankton from in-line samples taken from the outlet of the OPC once a day. There is good agreement between the microscope and real time OPC continuous underway counts, and between OPC biovolume and carbon analysis of preserved samples (Gallienne & Robins, 1998; Gallienne *et al.*, in press). It should be acknowledged that avoidance of the pump intake might result in under-sampling of some of the larger organisms within the size range of the system.

3.13.3 Preliminary results

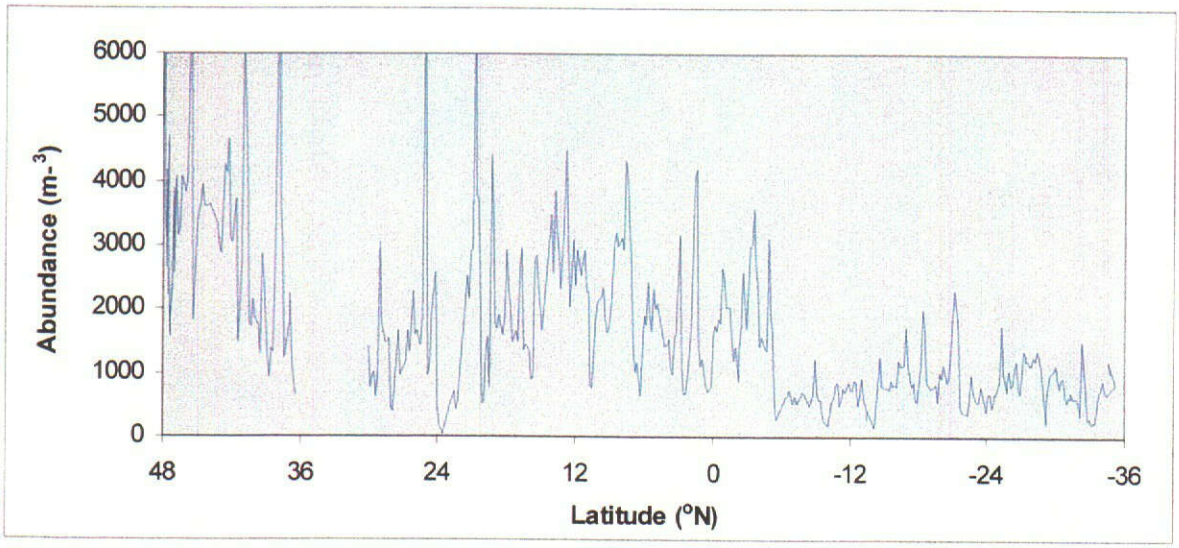

Figure 3.13.3. Total OPC counts for continuous underway surface sampling from uncontaminated sea water supply (depth ~7m). Data for whole transect 36°S to 50°N.

Continuous surface OPC zooplankton abundance for the whole transect is shown in figure 3.13.3. Visible features include low abundances south of 5°S (mean 809 m^{-3}); enhanced abundance through the equatorial and West African upwelling zones, 5°S - 22°N (mean

2095 m^{-3}); lower abundance between 22°N and 30°N (mean 1313 m^{-3}); and much higher values north of 36°N on to the shelf edge (mean 4182 m^{-3}).

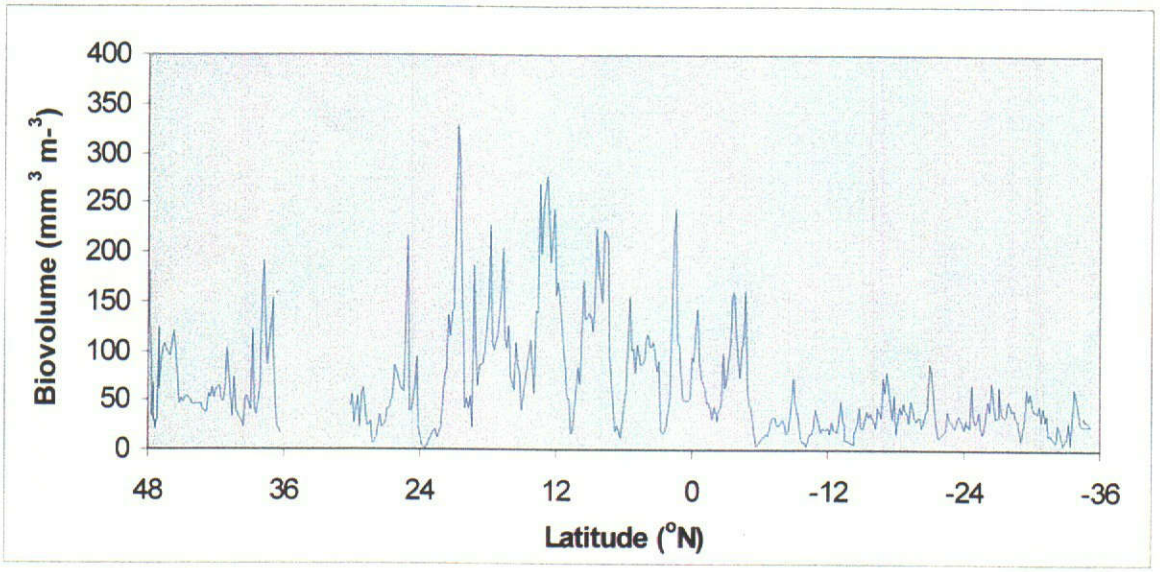

Figure 3.13.4. OPC zooplankton biovolume from continuous underway surface sampling from uncontaminated sea water supply. Data for whole transect 36°S to 50°N. Biovolume shown in each of four JGOFS size fractions.

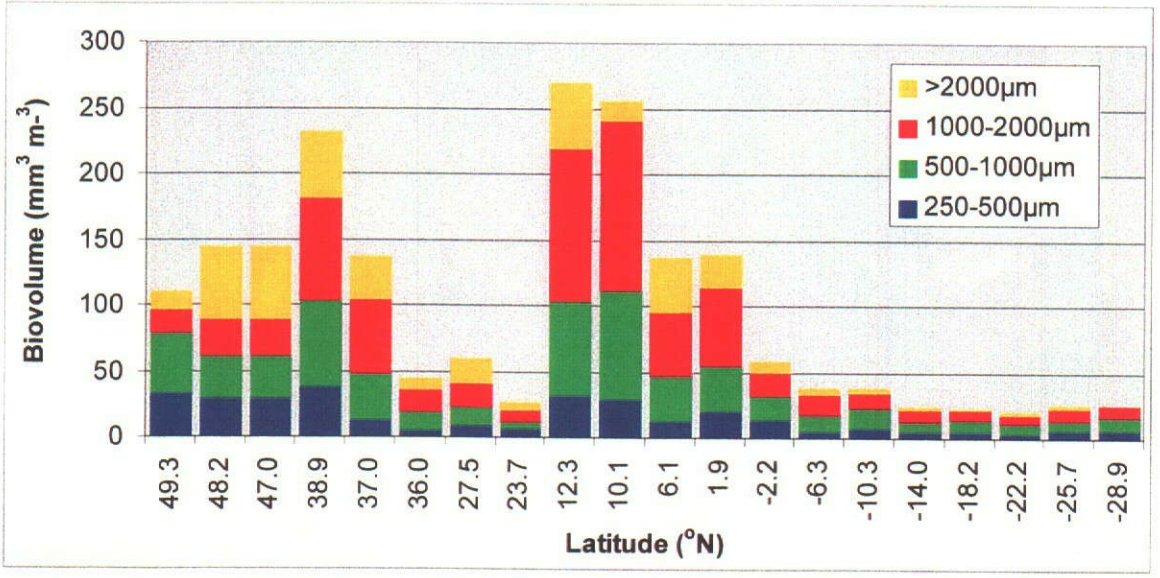

Figure 3.13.5. OPC zooplankton biovolume from 0-200m WP-2 net casts for stations 1-23. Biovolume shown in each of four JGOFS size fractions.

Fig. 3.13.4 shows the same data in terms of biovolume (mm^3 m^{-3}, equivalent to mg m^{-3}). Mean biovolumes for the same four regions are 32.3 mm^3 m^{-3}, 105.7 mm^3 m^{-3}, 42.5 mm^3

m^{-3}, 110.7 mm^3 m^{-3}. OPC biovolume data for WP-2 net samples from each station are shown in figure 3.13.5. The data are presented in four size fractions corresponding to JGOFS size fractionation protocols. The four size fractions are presented as percentages of total biovolume in figure 3.13.6, illustrating the changing size structure at different points along the transect. Finally, figure 3.13.7 shows OPC counts for WP-2 net samples from each station, together with mean particle size.

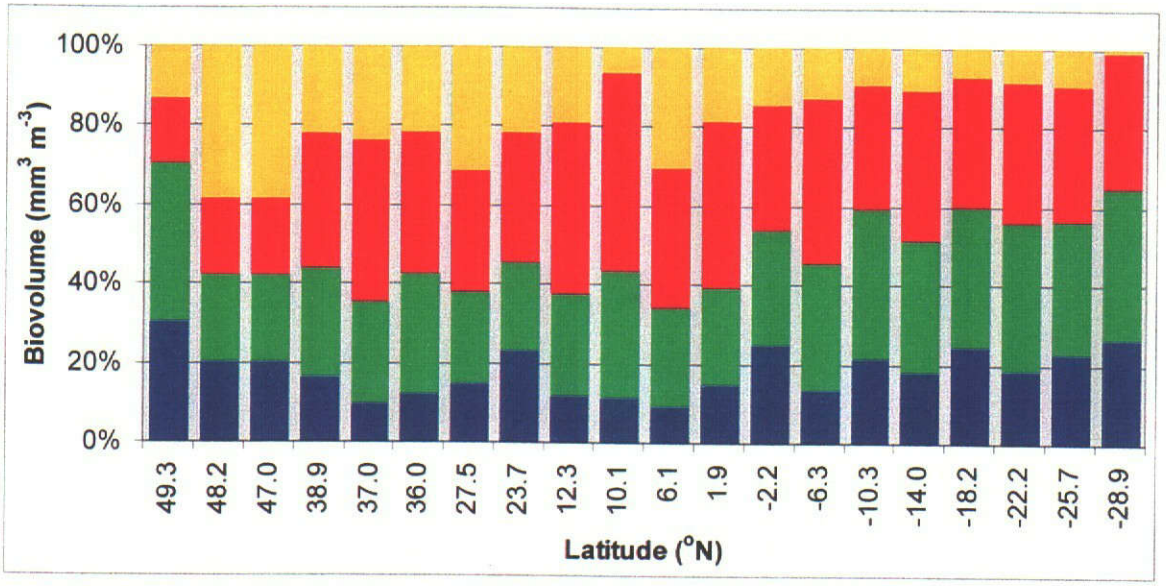

Figure 3.13.6. Data as above, but as percentage of total biovolume in each size fraction.

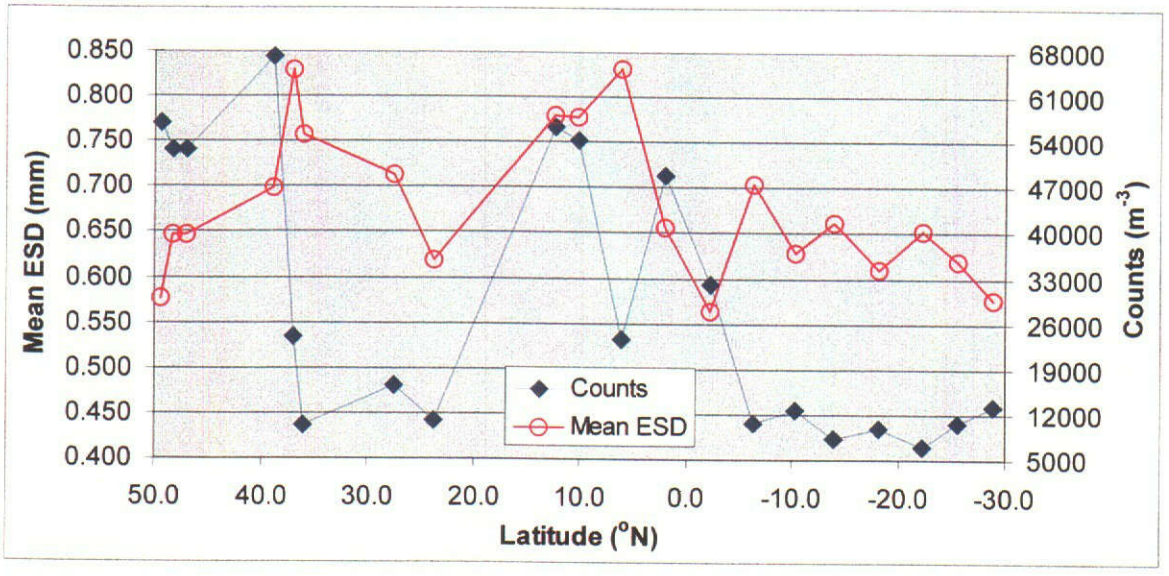

Figure 3.13.7. Total OPC counts from 0-200m WP-2 net casts for stations 1-23, and mean Equivalent Spherical Diameter for each net cast.

4.0 Cruise Synopsis

4.1 TEMPERATURE, SALINITY AND DENSITY

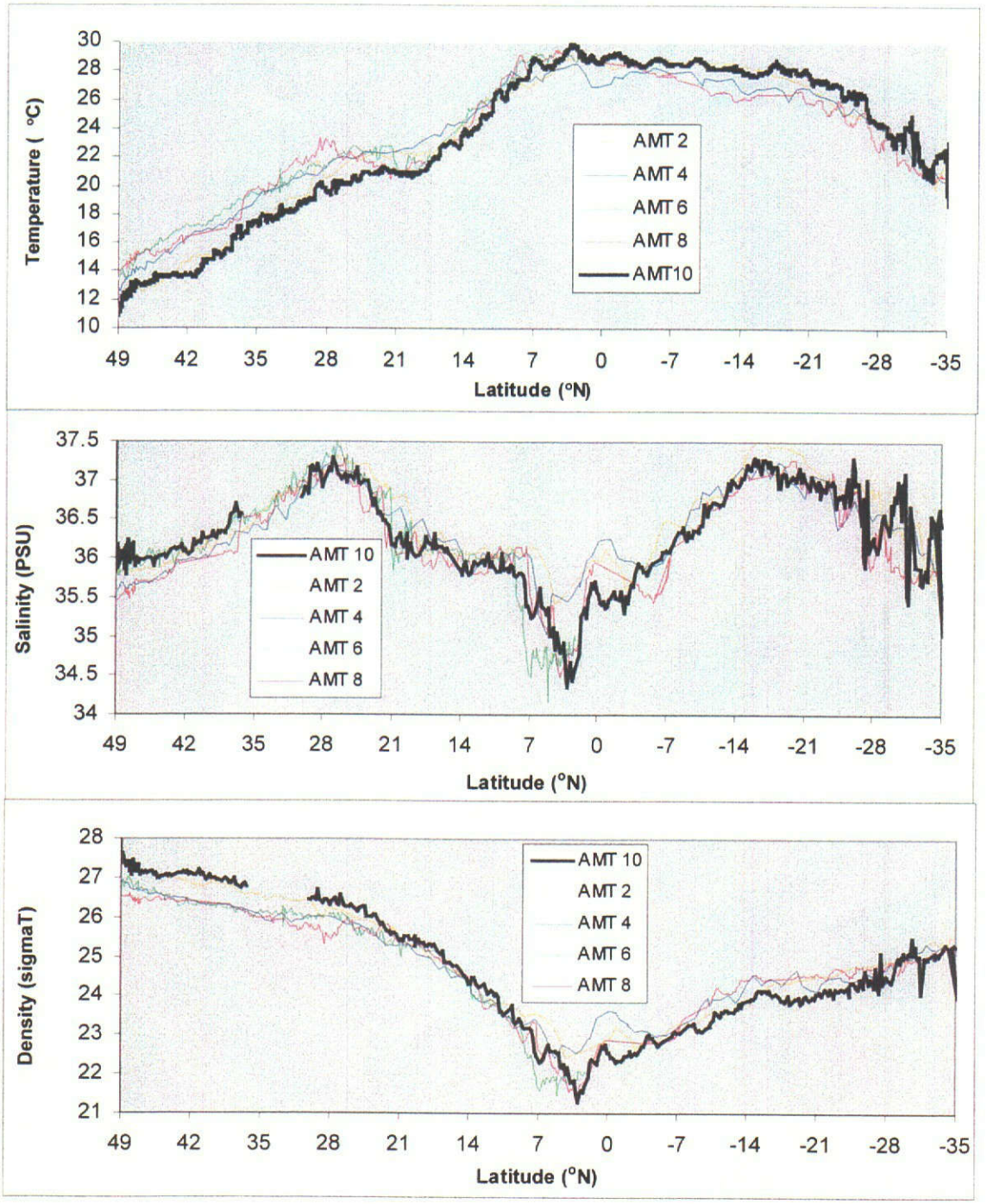

Figure 4.1.1. Continuous underway measurement of sea surface temperature, salinity and chlorophyll for AMT 10 (black), compared to other April/May AMT cruises.

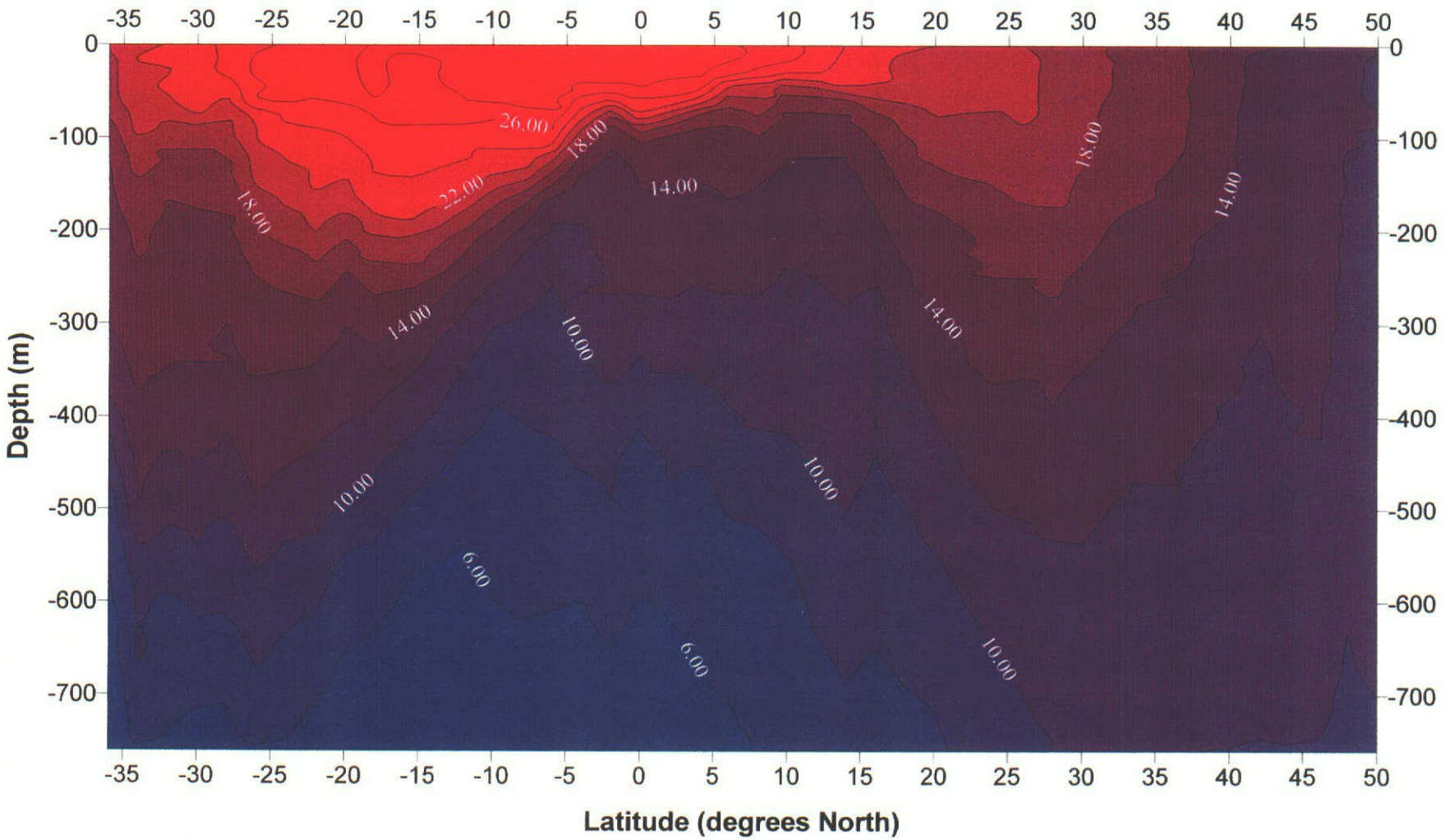

Figure 4.1.2. Contour plot of XBT temperature profiles along whole transect.

4.2 CHLOROPHYLL

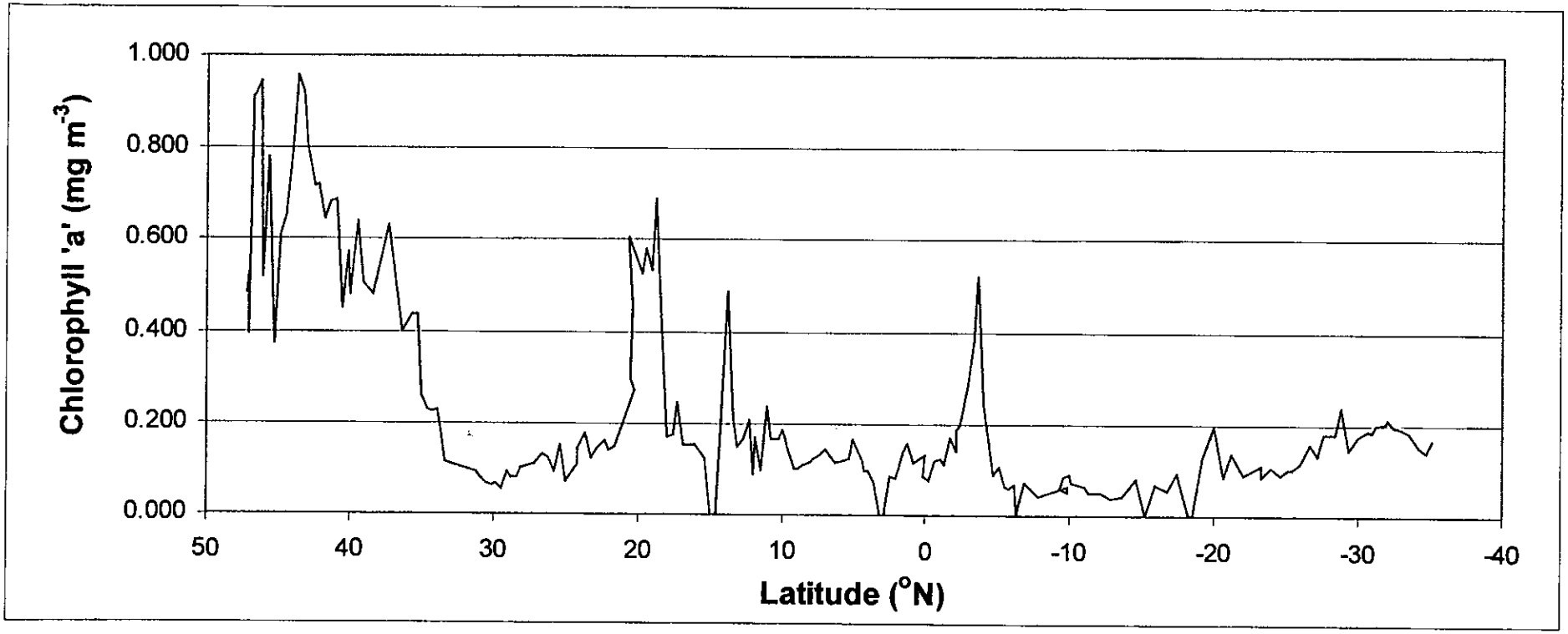

Figure 4.2.1. Surface underway chlorophyll 'a' concentration along the whole AMT10 transect.

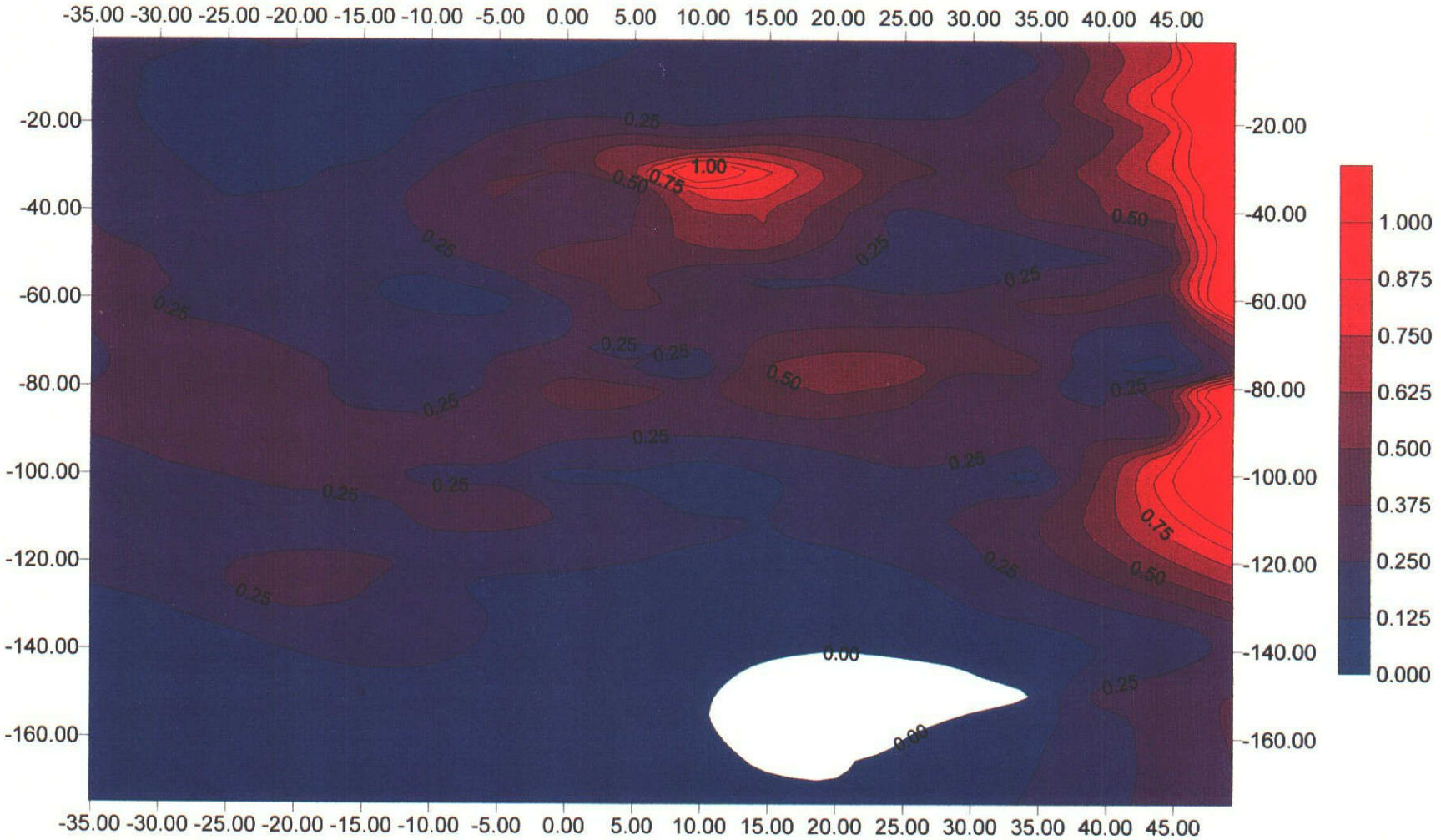

Figure 4.2.2. Station chlorophyll 'a' concentration (mg m^{-3}) from CTD fluorometer along the whole AMT10 transect.

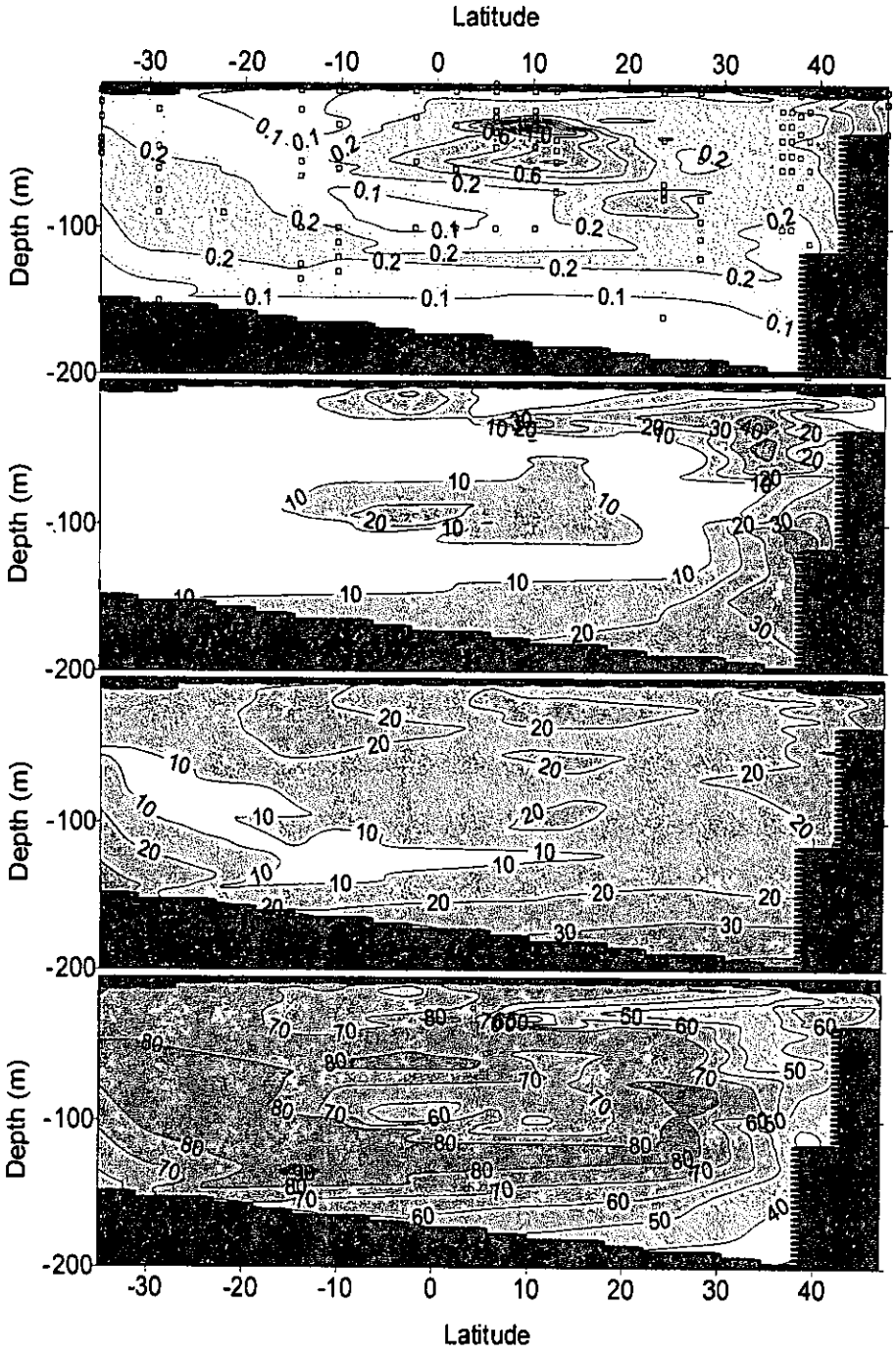

Figure 4.2.3. Contour plot of size fractionated chlorophyll *a* results; (a) total chlorophyll *a* concentration, (b-d) size fractions as a percentage of total chlorophyll *a*. [Blank squares on Fig.4.2.3a are the sampling depths; grey areas are a result of the gridding method used to plot the discrete chlorophyll data (Triangulation with linear interpolation).]

4.4 PRIMARY PRODUCTION

Due to the lack of analytical facilities on board, ^{14}C primary productivity data must await sample analysis in the laboratory. Figure 4.4.1, below, shows FRRF data for all stations along the transect, in terms of FV/FM. This parameter indicates photosynthetic efficiency.

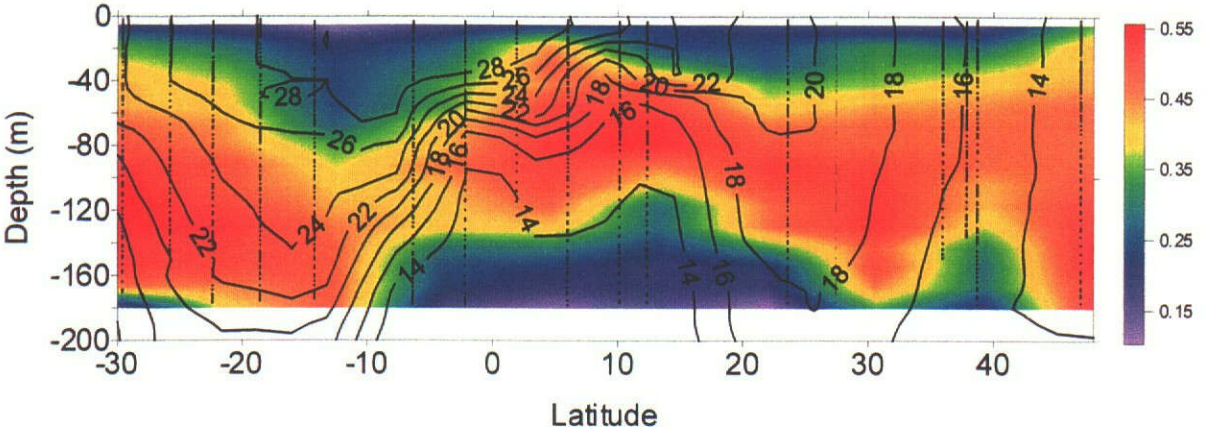

Figure 4.4.1. Plot of F_V/F_M and temperature for the whole AMT-10 transect. Colours indicate the photochemical efficiency as measured *in situ* during CTD casts, black lines are temperature contoured using the CTD data, black circles indicate FRRF data points. Higher values of F_V/F_M are associated with the thermocline.

4.5 ZOOPLANKTON

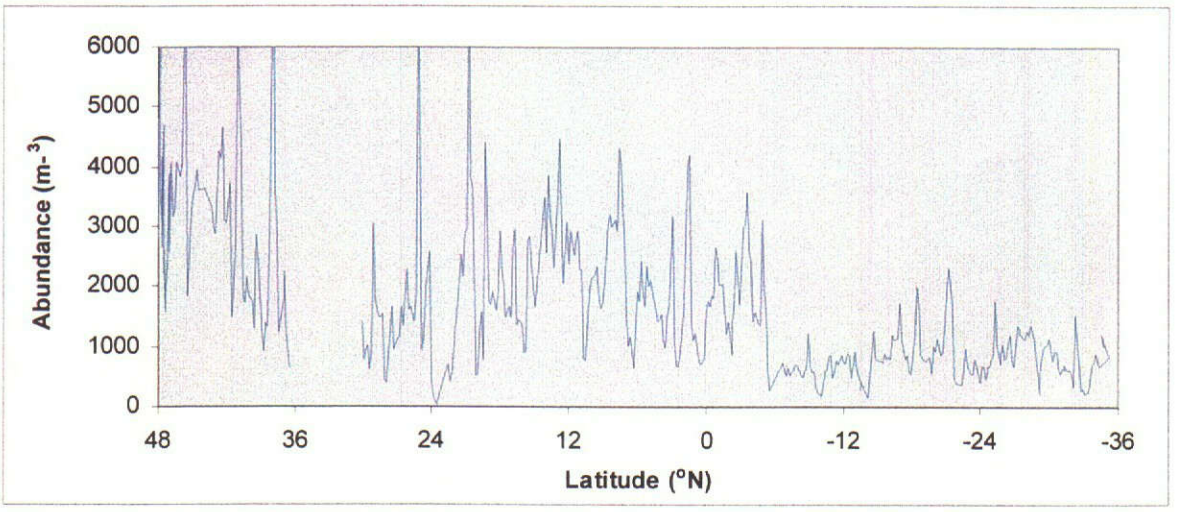

Figure 4.5.1. Total OPC counts for continuous underway surface sampling from uncontaminated sea water supply (depth ~7m). Data for whole transect 36°S to 50°N.

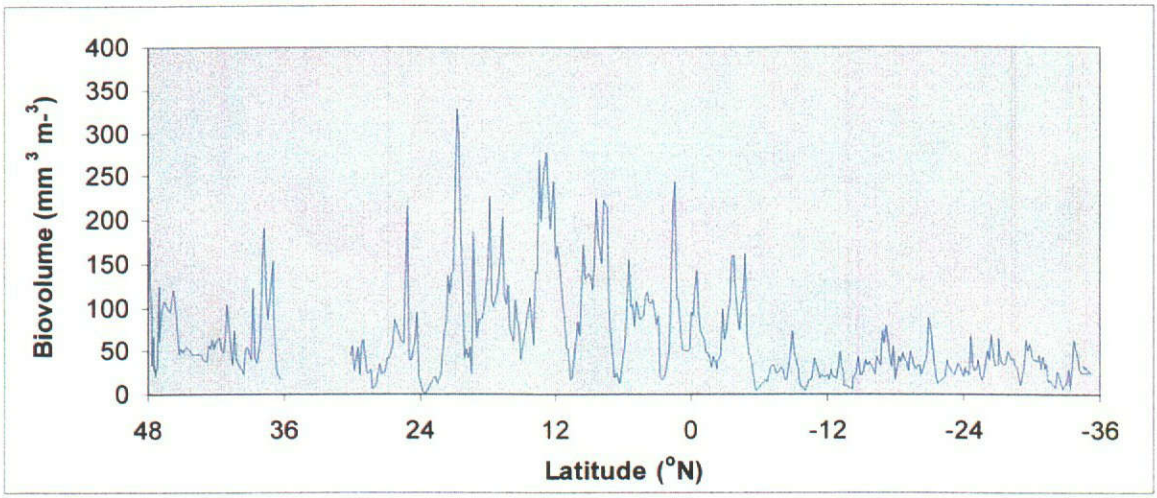

Figure 4.5.2. OPC zooplankton biovolume from continuous underway surface sampling from uncontaminated sea water supply. Data for whole transect 36°S to 50°N. Biovolume shown in each of four JGOFS size fractions.

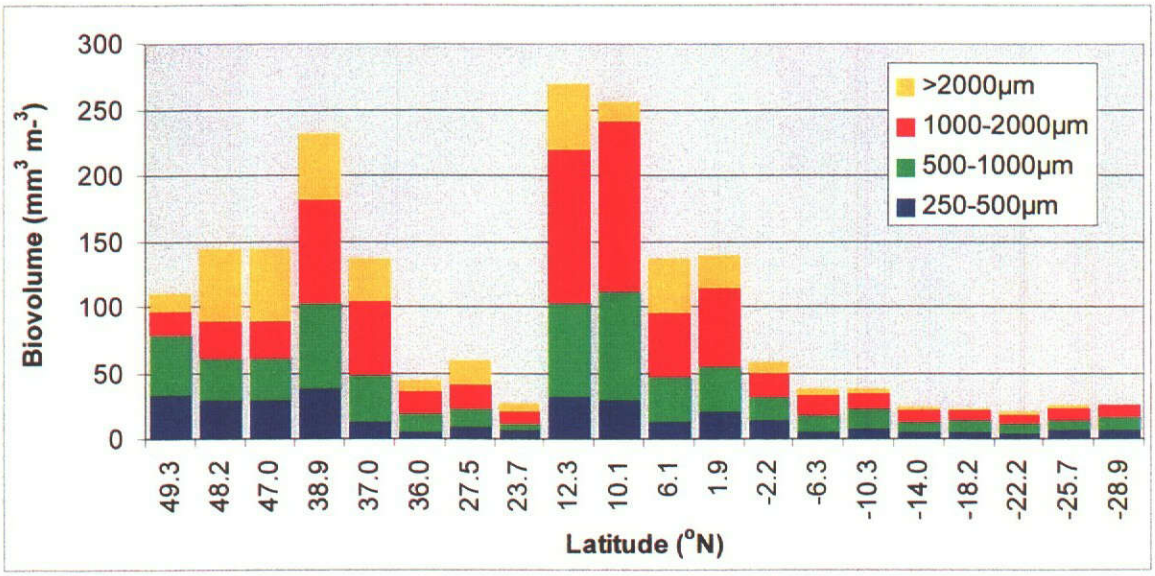

Figure 4.5.3. OPC zooplankton biovolume from 0-200m WP-2 net casts for stations 1-23. Biovolume shown in each of four JGOFS size fractions.

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APPENDICES

1. Scientific Bridge Log
2. Navigation Log
3. CTD Log
4. XBT Log
5. HPLC Station Log
6. HPLC Underway Log
7. Chlorophyll Station log
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9. Size-Fractionated Chlorophyll & Taxonomy Log
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APPENDIX 1: Scientific Bridge Log

APPENDIX 1 SCIENTIFIC BRIDGE LOG

Cruise JR49 – AMT 10				
Date	Time	Sta.	Event	Remarks
12-04-00	21:50			Lat 35 05.6S Long 54 18.2W Uncontaminated sea water supply on.
13-04-00	18:16	1		Slow for station.
	18:25			Ready for deployment. Lat 35 05.4S Long 49 17.7W
	18:30		1	CTD deployed – develops problems with deck unit.
	18:45			Commence lowering to 150m.
	18:48			CTD @ 150m
	18:58		2	XBT deployed.
	19:00			CTD recovered. Lat 35 05.4S Long 49 18.0W
	19:18		3	CTD deployed. Lat 35 05.3S Long 49 18.2W
	19:26			CTD @ 200m.
	19:41			CTD recovered.
	19:45			Gantry secure, vessel under way.
	19:54			Vessel on course & passage speed.
	22:12			Sea water probe down.
14-04-00	02:12		4	XBT deployed. Lat 34 08.2S Long 48 17.4W
	07:10		5	XBT deployed. Lat 33 22.3S Long 47 32.7W
	11:57			Slow for station.
	12:10			Abandon station & under way.
	13:26		6	XBT deployed. Lat 32 32.5S Long 46 37.3W
	19:36		7	XBT deployed. Lat 31 33.8S Long 45 35.1W
15-04-00	01:10		8	XBT deployed. Lat 30 43.4S Long 44 44.5W
	07:02		9	XBT deployed. Lat 29 48.9S Long 43 48.1W
	11:55			Slow for station.
	12:09	2		Ready for deployment. Lat 29 03.3S Long 43 01.8W
	12:12		10	Deploy plankton nets to 20m
	12:14		11	CTD deployed. Lat 29 03.3S Long 43 01.7W
	12:16			Plankton nets recovered.
	12:17		12	Plankton nets deployed.
	12:20			CTD @ 150m.
	12:22		13	Deploy optics rig to 100m.
	12:32			CTD recovered.
	12:33			Plankton nets recovered.
	12:36		14	Deploy plankton nets.
	12:47		15	CTD deployed. Lat 29 02.8S Long 43 01.4W
	12:51			Optics rig recovered.
	12:52			Plankton nets recovered.
	12:53			CTD @ 200m.
	13:08			CTD recovered.
	13:17			Gantry secure.
	13:22			Vessel under way @ passage speed 11.8kts.
	13:22		16	XBT deployed. Lat 29 02.3S Long 43 00.5W
	19:15		17	XBT deployed. Lat 28 09.8S Long 42 08.4W
16-04-00	01:00		18	XBT deployed. Lat 27 18.2S Long 41 17.1W
	07:00		19	XBT deployed. Lat 26 24.8S Long 40 24.4W
	11:50			Slow for station.
	11:57	3		Ready for deployment. Lat 25 40.5S Long 39 41.5W
	12:00		20	Plankton nets deployed to 20m.
	12:02		21	CTD deployed. Lat 25 40.5S Long 39 41.4W
	12:04		22	Deploy optics rig to 100m.

Date	Time	Sta.	Event	Remarks
16-04-00	12:05	3		Plankton nets recovered.
	12:06		23	Deploy plankton nets to 200m.
	12:07			CTD @ 150m.
	12:21			CTD recovered.
	12:21			Plankton nets recovered.
	12:34			Optics rig recovered.
	12:34		24	CTD deployed. Lat 25 40.1S Long 39 41.3W
	12:36			Hydraulic leak – CTD in water.
	13:02		25	XBT deployed. Lat 25 33.6S Long 39 34.6W
	14:16			Gantry repaired & CTD recovered.
	14:18			CTD craned aft for oil clear-up.
	14:24			Vessel under way.
	14:27			Vessel on course 041° & passage speed 12kts.
	20:22		26	XBT deployed. Lat 24 45.4S Long 38 48.0W
17-04-00	01:00		27	XBT deployed. Lat 24 03.6S Long 38 07.4W
	06:55		28	XBT deployed. Lat 23 05.1S Long 37 24.7W
	11:50			Slow for station.
	11:57	4		Ready for deployment. Lat 22 15.0S Long 36 50.5W
	12:00		29	Deploy plankton nets to 20m.
	12:02		30	CTD deployed. Lat 22 15.0S Long 36 50.5W
	12:04		31	Deploy optics rig to 100m.
	12:04			Plankton nets recovered.
	12:07			CTD @ 150m.
	12:09		32	Deploy plankton nets to 200m.
	12:22			CTD recovered.
	12:27			Plankton nets recovered.
	12:32			Optics rig recovered.
	12:32		33	Deploy phyto drift net.
	12:34		34	CTD deployed. Lat 22 14.8S Long 36 50.4W
	12:41			CTD @ 250m.
	12:57			Recovered CTD.
	13:00			Phyto net recovered.
	13:06			Vessel under way at passage speed 11.8kts.
	13:10		35	XBT deployed. Lat 22 13.8S Long 36 49.7W
	19:28		36	XBT deployed. Lat 21 07.5S Long 36 05.1W
18-04-00	01:12		37	XBT deployed. Lat 20 07.7S Long 35 29.0W
	05:10			Failed XBT.
	05:20			Failed XBT.
	05:42			Failed XBT.
	06:12			Failed XBT.
	09:30		38	XBT deployed. Lat 18 36.1S Long 34 44.4W
	11:50			Slow for station.
	11:57	5		Ready for deployment. Lat 18 09.7S Long 34 32.2W
	12:00		39	Deploy plankton nets to 20m.
	12:01		40	Deploy optics rig to 100m.
	12:02		41	CTD deployed. Lat 18 09.7S Long 34 32.2W
	12:03			Plankton nets recovered.
	12:06		42	Plankton nets deployed to 200m.
	12:08			CTD @ 175m.
	12:21			Plankton nets recovered.
	12:24			CTD recovered.
	12:28		43	Phyto net deployed.

Date	Time	Sta.	Event	Remarks
18-04-00	12:34	5		Optics rig recovered.
	12:46			Phyto net recovered.
	12:47			Problem with CTD, investigating.
	14:08			Vessel under way & passage speed.
	14:30		??	XBT deployed. Lat 18 04.8S Long 34 29.9W
	23:02		44	XBT deployed. Lat 16 31.4S Long 33 44.8W
19-04-00	00:20		45	XBT deployed. Lat 16 17.5S Long 33 38.3W
	08:06		46	XBT deployed. Lat 14 52.9S Long 32 57.9W
	11:50			Slow for station.
	11:57	6		Ready for deployment. Lat 14 11.3S Long 32 38.8W
	12:00		47	Plankton nets deployed to 20m.
	12:01		48	CTD deployed. Lat 14 11.3S Long 32 38.8W
	12:03		49	Optics rig deployed to 100m.
	12:04			Plankton nets recovered.
	12:06		50	Deploy plankton nets to 200m.
	12:07			CTD @ 175m.
	12:16		51	Deploy single Nansen bottle.
	12:18			Nansen bottle recovered.
	12:21			Plankton nets recovered.
	12:23			CTD recovered.
	12:27		52	Phyto net deployed.
	12:29			Optics rig recovered.
	12:34		53	CTD deployed. Lat 14 11.0S Long 32 39.1W
	12:43			CTD @ 250m.
	12:44			Phyto net recovered.
	12:58			CTD recovered.
	13:05			Gantry secure.
	13:08			Vessel under way @ passage speed 025°, 11.8kts.
	13:15		54	XBT deployed. Lat 14 09.3S Long 32 38.6W
	16:50			Slow for station.
	17:00	7		Ready for deployment. Lat 13 30.8S Long 32 19.6W
	17:05		55	CTD deployed. Lat 13 30.8S Long 32 19.6W
	17:07		56	Optics rig deployed to 100m.
	17:18			Deploy single Nansen bottle.
	17:24			CTD @ 1000m.
	17:44			Optics rig recovered.
	17:44			Nansen bottle recovered.
	17:53			CTD recovered.
	18:08			Vessel under way @ passage speed 025°, 11.8kts.
	21:03		57	XBT deployed. Lat 14 09.3S Long 32 38.6W
20-04-00	01:03		58	XBT deployed. Lat 14 09.3S Long 32 38.6W
	05:13		59	XBT deployed. Lat 14 09.3S Long 32 38.6W
	09:31		60	XBT deployed. Lat 14 09.3S Long 32 38.6W
	11:50			Slow for station.
	11:57	8		Ready for deployment. Lat 10 17.1S Long 30 49.2W
	11:58		61	Plankton nets deployed to 200m.
	12:00		62	Deploy optics rig to 100m.
	12:01		63	CTD deployed. Lat 10 17.1S Long 30 49.2W
	12:08			CTD @ 150m.
	12:15			Plankton nets recovered.
	12:19		64	Nansen bottle deployed.
	12:23			CTD recovered.

Date	Time	Sta.	Event	Remarks
20-04-00	12:26	8	65	Deploy phyto net.
	12:27			Optics rig recovered.
	12:37		66	CTD deployed. Lat 10 17.1S Long 30 49.9W
	12:45			CTD @ 250m.
	12:47			Phyto net recovered.
	12:47			Nansen bottle recovered.
	13:01			CTD recovered.
	13:07			Gantry secure.
	13:09			Vessel under way @ passage speed, 025° 11.8kts.
	13:10		67	XBT deployed. Lat 10 16.5S Long 30 50.0W
	17:24		67	XBT deployed. Lat 9 31.6S Long 30 27.6W
	21:05		68	XBT deployed. Lat 8 51.0S Long 30 08.8W
21-04-00	01:49		69	XBT deployed. Lat 7 59.7S Long 29 45.1W
	04:20		70	XBT deployed. Lat 7 32.4S Long 29 32.6W
	09:08		71	XBT deployed. Lat 6 39.4S Long 29 08.2W
	10:50			Slow for station.
	10:57	9		Ready for deployment. Lat 6 20.7S Long 28 59.2W
	10:59		72	Plankton nets deployed to 20m.
	11:00		73	CTD deployed. Lat 6 20.7S Long 28 59.2W
	11:01		74	Optics rig deployed to 100m.
	11:02			Plankton nets recovered.
	11:04		75	Deploy plankton nets to 200m.
	11:07			CTD @ 175m.
	11:08		76	Deploy Nansen bottle.
	11:20			Plankton nets recovered.
	11:21			CTD recovered.
	11:27		77	Phyto net deployed.
	11:30			Optics rig recovered.
	11:33		78	CTD deployed. Lat 6 20.4S Long 28 59.7W
	11:41			CTD @ 250m.
	11:56			CTD recovered. Nansen bottle recovered.
	11:57			Phyto net recovered.
	12:02			Gantry secure.
	12:06			Vessel under way @ passage speed, 025° 11.8kts.
	12:11		79	XBT deployed. Lat 6 18.7S Long 28 59.2W
	16:05		80	XBT deployed. Lat 5 36.1S Long 28 39.1W
	20:15		81	XBT deployed. Lat 4 51.0S Long 28 18.2W
22-04-00	00:05		82	XBT deployed. Lat 4 09.0S Long 27 59.0W
	04:25		83	XBT deployed. Lat 3 22.6S Long 27 37.6W
	08:40		84	XBT deployed. Lat 2 37.0S Long 27 16.6W
	10:50			Slow for station.
	10:57	10		Ready for deployment. Lat 2 13.4S Long 27 05.6W
	10:58		85	Deploy optics rig to 100m.
	11:00		86	CTD deployed. Lat 2 13.4S Long 27 05.7W
	11:01		87	Deploy plankton nets to 20m.
	11:02			Plankton nets recovered.
	11:06			CTD @ 150m.
	11:07		88	Deploy plankton nets to 200m.
	11:10		89	Nansen bottle deployed.
	11:20			CTD recovered.
	11:22			Plankton nets recovered.
	11:26			Optics rig recovered.

Date	Time	Sta.	Event	Remarks
22-04-00	11:29	10	90	Phyto net deployed.
	11:31		91	CTD deployed. Lat 2 13.5S Long 27 06.0W
	11:39			CTD @ 250m. Nansen bottle recovered.
	11:45			Phyto net recovered.
	11:55			CTD recovered.
	12:00			Gantry secure.
	12:03			Vessel under way @ passage speed, 025° 11.8kts.
	12:11		92	XBT deployed. Lat 2 11.9S Long 27 05.4W
	16:51		93	XBT deployed. Lat 1 21.6S Long 26 42.4W
	19:48		94	XBT deployed. Lat 0 45.8S Long 26 29.0W
23-04-00	00:06		95	XBT deployed. Lat 0 01.8S Long 27 06.0W
	03:00		96	XBT deployed. Lat 0 40.3N Long 25 47.7W
	08:36		97	XBT deployed. Lat 1 30.9N Long 25 25.8W
	10:50			Slow for station.
	10:57	11		Ready for deployment. Lat 01 56.1N Long 25 15.1W
	11:00		98	Plankton nets deployed to 200m.
	11:01		99	Optics rig deployed.
	11:02		100	CTD deployed. Lat 1 56.2N Long 25 15.1W
	11:18			Plankton nets recovered.
	11:20			CTD recovered.
	11:30		101	Deploy phyto net.
	11:32			Optics rig recovered.
	11:33		102	CTD deployed. Lat 1 56.5N Long 25 15.6W
	11:39			CTD @ 200m.
	11:46			Phyto net recovered.
	11:54			CTD recovered.
	12:00			Gantry secure.
	12:03			Vessel under way @ passage speed, 023° 11.8kts.
	12:12		103	XBT deployed. Lat 1 59.3N Long 25 14.9W
	16:19		104	XBT deployed. Lat 2 43.8N Long 24 54.4W
	20:00		105	XBT deployed. Lat 3 23.9N Long 24 36.9W
24-04-00	00:05		106	XBT deployed. Lat 4 08.7N Long 24 17.6W
	04:22		??	XBT deployed. Lat 4 54.9N Long 23 57.6W
	08:44		107	XBT deployed. Lat 5 42.9N Long 23 36.7W
	10:50			Slow for station.
	10:57	12		Ready for deployment. Lat 06 06.0N Long 23 26.7W
	11:00		108	Deploy optics rig to 100m.
	11:01		109	CTD deployed. Lat 6 06.0N Long 23 26.7W
	11:02		110	Deploy plankton nets to 200m.
	11:07			CTD @ 150m.
	11:14		111	Deploy Nansen bottle.
	11:17			Plankton nets recovered.
	11:20			CTD recovered.
	11:24		112	Phyto net deployed.
	11:30			Optics rig recovered.
	11:31			Nansen bottle recovered.
	11:32		113	CTD deployed. Lat 6 05.9N Long 23 27.0W
	11:39			CTD @ 200m.
	11:45			Phyto net recovered.
	11:53			CTD recovered.
	12:00			Gantry secure.
	12:03			Vessel under way @ passage speed, 023° 11.8kts.

Date	Time	Sta.	Event	Remarks
24-04-00	12:12		114	XBT deployed. Lat 6 08.3N Long 23 26.1W
	20:32		115	XBT deployed. Lat 7 39.4N Long 22 46.1W
25-04-00	00:12		116	XBT deployed. Lat 8 18.0N Long 22 28.8W
	04:00		117	XBT deployed. Lat 8 59.0N Long 22 11.5W
	08:01		118	XBT deployed. Lat 9 42.2N Long 21 52.5W
	10:50			Slow for station.
	10:57	13		Ready for deployment. Lat 10 12.5N Long 21 39.0W
	11:00		119	Deploy plankton nets to 200m.
	11:01		120	Deploy optics rig to 100m.
	11:02		121	CTD deployed. Lat 10 12.5N Long 21 39.0W
	11:07			CTD @ 100m.
	11:08		122	Deploy Nansen bottle.
	11:16			Plankton nets recovered.
	11:22			Optics rig recovered.
	11:23			CTD recovered.
	11:27		123	Deploy phyto net.
	11:34		124	CTD deployed. Lat 10 12.2N Long 21 39.3W
	11:40			CTD @ 200m.
	11:46			Phyto net recovered. Nansen bottle recovered.
	11:54			CTD recovered.
	12:03			Vessel under way @ passage speed, 023° 11.5kts.
	12:06		125	XBT deployed. Lat 10 13.0N Long 21 39.3W
	16:45		126	XBT deployed. Lat 11 02.3N Long 21 17.5W
	20:04		127	XBT deployed. Lat 11 36.9N Long 21 02.0W
26-04-00	00:49			Slow for station.
	00:57	14		Ready for deployment. Lat 12 28.2N Long 20 39.5W
	01:02		128	CTD deployed. Lat 12 28.1N Long 20 39.4W
	01:10			CTD @ 200m.
	01:25			CTD recovered.
	01:30		129	Deploy plankton nets to 200m.
	01:30		130	Deploy optics rig to 100m.
	01:45			Plankton nets recovered.
	01:52			Optics rig recovered.
	02:08			Vessel under way @ passage speed, 023° 11.5kts.
	02:30			Vessel enters EEZ
	06:08		131	XBT deployed. Lat 13 11.1N Long 20 28.6W
	10:15		132	XBT deployed. Lat 13 57.7N Long 20 33.3W
	13:53		133	XBT deployed. Lat 14 40.7N Long 20 37.5W
	18:30		134	XBT deployed. Lat 15 33.3N Long 20 42.9W
	22:08		135	XBT deployed. Lat 16 15.7N Long 20 47.0W
27-04-00	05:38		136	XBT deployed. Lat 17 40.2N Long 20 55.8W
	10:00		137	XBT deployed. Lat 18 30.7N Long 21 01.0W
	14:00		138	XBT deployed. Lat 19 14.1N Long 21 05.2W
	15:00		139	XBT deployed. Lat 19 36.5N Long 21 07.9W
	17:36			Vessel departs EEZ, Lat 19° 48.2'N Long 21° 08.8'W.
	19:20		140	XBT deployed. Lat 20 06.3N Long 21 10.6W
	23:35		141	XBT deployed. Lat 20 51.1N Long 21 15.4W
	03:40		142	XBT deployed. Lat 21 34.0N Long 21 19.8W
	07:40		143	XBT deployed. Lat 22 19.3N Long 21 24.4W
	11:20		144	XBT deployed. Lat 23 02.7N Long 21 29.2W
	14:40			Slow for station.
	14:53	15	145	CTD deployed. Lat 23 41.7N Long 21 33.5W

Date	Time	Sta.	Event	Remarks
27-04-00	14:53	15	146	Optics rig deployed to 100m.
	14:56		147	Nansen bottle deployed
	14:59			CTD @ 175m.
	15:00		148	Plankton nets deployed
	15:12			CTD recovered. Plankton nets recovered.
	15:18		149	Phyto net deployed.
	15:20		150	Optics rig at surface & re-deployed to 100m.
	15:25		151	CTD deployed. Lat 23 40.9N Long 21 33.8W
	15:33			Optics rig recovered.
	15:35			Phyto net recovered.
	15:50			CTD recovered.
	15:50			Head to swell @ 3kts, deep XBT deployed.
	16:07			XBT failure, @ passage speed, 12kts.
	16:15			Speed to 12.5kts, probe to mid position.
	16:26		152	XBT deployed. Lat 23 46.1N Long 21 33.8W
	20:56		153	XBT deployed. Lat 24 43.4N Long 21 39.5W
	23:51		154	XBT deployed. Lat 25 21.0N Long 21 43.7W
29-04-00	05:00		155	XBT deployed. Lat 26 27.8N Long 21 51.2W
	08:08		156	XBT deployed. Lat 27 08.7N Long 21 55.3W
	09:52			Slow for station.
	10:02	16	157	Deploy optics rig to 100m.
	10:03		158	CTD deployed. Lat 27 32.2N Long 21 58.3W
	10:09		159	Deploy plankton nets to 200m.
	10:09			CTD @ 175m.
	10:09		160	Deploy Nansen bottle.
	10:19			Plankton nets recovered.
	10:23			CTD recovered.
	10:28		161	Phyto net deployed.
	10:30			Nansen bottle recovered.
	10:32			Optics rig recovered.
	10:34		162	CTD deployed. Lat 27 32.0N Long 21 57.7W
	10:40			CTD @ 250m.
	10:46			Phyto net recovered.
	10:55			CTD recovered.
	11:02			Gantry secure.
	11:02			Vessel under way @ 6kts for deep XBT deployment.
	11:04		163	XBT deployed. Lat 27 32.3N Long 21 57.0W
	11:09			Passage speed, 041° 13.5kts for Madeira.
	15:45		164	XBT deployed. Lat 28 20.6N Long 21 11.0W
	19:32		165	XBT deployed. Lat 29 00.3N Long 20 31.9W
	23:57		166	XBT deployed. Lat 29 47.1N Long 19 45.8W
30-04-00	04:54		167	XBT deployed. Lat 30 39.0N Long 18 54.0W
	08:21		168	XBT deployed. Lat 31 14.7N Long 18 18.1W
	09:55		169	XBT deployed. Lat 31 30.5N Long 18 02.6W
	17:00			Boat transfer @ Madeira
	23:22		170	XBT deployed. Lat 33 17.0N Long 17 48.9W
01-05-00	03:12		171	XBT deployed. Lat 33 49.0N Long 18 14.4W
	08:21		172	XBT deployed. Lat 34 39.0N Long 18 53.8W
	13:13		173	XBT deployed. Lat 35 30.8N Long 19 36.1W
	15:50			Slow for station.
	16:04	17	174	CTD deployed. Lat 35 59.9N Long 20 00.1W
	16:04		175	Optics rig deployed.

Date	Time	Sta.	Event	Remarks
01-05-00	16:09	17	176	Plankton nets deployed to 200m.
	16;09			CTD @ 150m.
	16:10		177	Nansen bottle deployed.
	16:22			CTD recovered.
	16:26			Plankton nets recovered.
	16:30			Nansen bottle recovered.
	16:31			Optics rig recovered.
	16:33		178	Phyto net deployed.
	16:35		179	CTD deployed. Lat 36 00.0N Long 19 59.7W
	16:41			CTD @ 200m.
	16:45			Sea water probe down.
	16:47			Phyto net recovered.
	16:56			CTD recovered.
	16:58			Gantry secure.
	17:05		180	Vessel u/way @ 7kts, XBT deployed Lat 36 00.30N Long 19 59.7W
	17:17			Passage speed 12kts.
	21:50			Slow for station.
	22:02		181	CTD deployed. Lat 36 57.6N Long 19 59.6W
	22:04		182	Nansen bottle deployed.
	22:06		183	Plankton nets deployed.
	22:07			CTD @ 150m.
	22:20			CTD recovered.
	22:23			Plankton nets recovered.
	22:29			Nansen bottle recovered.
	22:31		184	CTD deployed. Lat 36 57.3N Long 19 59.1W
	22:32		185	Phyto net deployed.
	22:38			CTD @ 200m.
	22:41			Phyto net recovered.
	22:51			CTD recovered.
	22:56			Gantry secure.
	23:02			Vessel under way, passage speed, 000°, 12kts.
	23:06		186	XBT deployed Lat 36 58.7N Long 19 59.0W
02-05-00	01:38		187	XBT deployed Lat 37 29.0N Long 20 00.2W
	03:50			Slow for station.
	04:00	19	188	CTD deployed. Lat 37 55.0N Long 20 00.2W
	04:12		189	Optics rig deployed to 100m.
	04:14		190	Nansen bottle deployed.
	04:24			Nansen bottle recovered.
	04:30			CTD recovered.
	04:34			Optics rig recovered.
	04:34			Wind increasing 28-30kts, station aborted.
	04:42			Gantry secure.
	04:58			Vessel under way @ passage speed, 000° 12kts.
	05:12		191	XBT deployed Lat 37 56.9N Long 20 00.3W
	08:14		192	XBT deployed Lat 38 33.4N Long 20 00.1W
	09:50			Slow for station.
	10:04	20	193	Plankton nets deployed to 200m.
	10:06		194	CTD deployed. Lat 38 52.5N Long 20 00.0W
	10:10			CTD @ 150m.
	10:12		195	Deploy optics rig to 100m.
	10:18		196	Nansen bottle deployed.
	10:20			Plankton nets recovered.

Date	Time	Sta.	Event	Remarks
02-05-00	10:23	20		CTD recovered.
	10:26		197	Phyto net deployed.
	10:33			Optics rig recovered.
	10:34		198	CTD deployed. Lat 38 52.0N Long 20 00.2W
	10:36			Nansen bottle recovered.
	10:40			CTD @ 200m.
	10:49			Phyto net recovered.
	10:55			CTD recovered.
	11:01			Gantry secure.
	11:05			Vessel under way @ 6kts for deep XBT.
	11:12		199	XBT deployed Lat 38 52.5N Long 20 00.5W
	11:18			Passage speed, 000° 11.8kts.
	15:52		200	XBT deployed Lat 39 44.5N Long 20 00.0W
	19:55		201	XBT deployed Lat 40 32.4N Long 19 59.9W
03-05-00	01:26		202	XBT deployed Lat 39 44.5N Long 20 00.0W
	03:33		203	XBT deployed Lat 40 32.4N Long 19 59.9W
	08:04		204	XBT deployed Lat 39 44.5N Long 20 00.0W
	11:08		205	XBT deployed Lat 40 32.4N Long 19 59.9W
	14:45		206	XBT deployed Lat 39 44.5N Long 20 00.0W
	19:58		207	XBT deployed Lat 40 32.4N Long 19 59.9W
04-05-00	00:44		208	XBT deployed Lat 39 44.5N Long 20 00.0W
	02:50		209	XBT deployed Lat 40 32.4N Long 19 59.9W
	04:50			Slow for station – assessing wind conditions.
	05:20	21	210	CTD deployed. Lat 46 59.8N Long 20 00.9W
	05:23		211	Deploy plankton nets.
	05:25		212	Deploy Nansen bottle.
	05:28			CTD @ 150m.
	05:42			Plankton nets recovered.
	05:43			CTD recovered.
	05:47			Nansen bottle recovered.
	05:53		213	CTD deployed. Lat 46 59.4N Long 20 01.7W
	06:00			CTD @ 200m.
	06:15			CTD recovered.
	06:25			Gantry secure.
	06:30			Vessel under way @ passage speed 11.8kts.
	06:33		214	XBT deployed Lat 46 59.4N Long 20 01.4W
	10:49		215	XBT deployed Lat 47 11.6N Long 18 51.0W
	15:18		216	XBT deployed Lat 47 24.2N Long 17 38.1W
	19:14		217	XBT deployed Lat 47 34.5N Long 16 37.5W
05-05-00	00:27		218	XBT deployed Lat 47 45.9N Long 15 28.3W
	03:24		219	XBT deployed Lat 47 53.9N Long 14 40.7W
	07:10		220	XBT deployed Lat 48 07.5N Long 13 19.0W
	08:50			Slow for station.
	09:06	22	221	Optics rig deployed to 100m.
	09:08		222	Deploy plankton nets to 200m.
	09:08		223	CTD deployed. Lat 48 12.3N Long 12 50.0W
	09:12			CTD @ 150m.
	09:22			Plankton nets recovered.
	09:27			CTD recovered.
	09:29			Optics rig recovered.
	09:32			Gantry secure.
	09:37			Vessel under way @ passage speed, 076° 11.8kts.

Date	Time	Sta.	Event	Remarks
05-05-00	09:43		224	XBT deployed Lat 48 12.6N Long 12 48.2W
	13:23		225	XBT deployed Lat 48 23.0N Long 11 44.5W
	19:16		226	XBT deployed Lat 48 40.2N Long 10 00.5W
	23:39		227	XBT deployed Lat 48 53.2N Long 08 42.8W
06-05-00	08:50			Slow for station.
	09:00	23	228	Deploy plankton nets to 100m.
	09:01		229	Deploy optics rig to 50m.
	09:02		230	CTD deployed. Lat 49 19.3N Long 06 00.0W
	09:12			Plankton nets recovered.
	09:12			CTD @ 100m.
	09:19		231	Deploy phyto net.
	09:20			Optics rig recovered.
	09:26			CTD recovered.
	09:27			Phyto net recovered.
	09:33			Gantry secure.
	09:36			Vessel under way @ passage speed, 076° 12kts.
	13:50			Slow for station.
	14:00	24	232	Optics rig deployed Lat 49 31.5N Long 04 46.7W
	14:05			Optics rig failure, recovered & aborted.
	14:20			Vessel under way @ passage speed, 076° 12kts.

AMT 10 Cruise Report

APPENDIX 2: Navigation Log

Date	SDY	Time	Latitude	Longitude
11/04/00	102	13:00:00	-34.9024	56.21206
		14:00:00	-34.9024	56.21208
		15:00:00	-34.9025	56.21208
		16:00:00	-34.9024	56.21209
		17:00:00	-34.9024	56.21209
		18:00:00	-34.9024	56.21211
		19:00:00	-34.9025	56.21208
		20:00:00	-34.9025	56.2121
		21:00:00	-34.9025	56.21209
		22:00:00	-34.9027	56.2121
		23:00:00	-34.9025	56.21207
12/04/00	103	00:00:00	-34.9025	56.21206
		01:00:00	-34.9025	56.21208
		02:00:00	-34.9025	56.21207
		03:00:00	-34.9025	56.21209
		04:00:00	-34.9025	56.21208
		05:00:00	-34.9025	56.21209
		06:00:00	-34.9025	56.21208
		07:00:00	-34.9025	56.2121
		08:00:00	-34.9025	56.21208
		09:00:00	-34.9025	56.2121
		10:00:00	-34.9025	56.21209
		11:00:00	-34.9025	56.21208
		12:00:00	-34.9024	56.21213
		13:00:00	-34.9025	56.21211
		14:00:00	-34.9795	56.18849
		15:00:00	-34.9944	55.96021
		16:00:00	-35.0172	55.72198
		17:00:00	-35.0385	55.48564
		18:00:00	-35.0591	55.24769
		19:00:00	-35.0777	55.00541
		20:00:00	-35.0911	54.75414
		21:00:00	-35.0935	54.50932
		22:00:00	-35.0937	54.26332

Date	SDY	Time	Latitude	Longitude
		23:00:00	-35.0945	54.01598
13/04/00	104	00:00:00	-35.0906	53.77153
		01:00:00	-35.0918	53.52565
		02:00:00	-35.0915	53.27899
		03:00:00	-35.0912	53.03053
		04:00:00	-35.0914	52.78493
		05:00:00	-35.0919	52.54136
		06:00:00	-35.1089	52.30102
		07:00:00	-35.1082	52.06253
		08:00:00	-35.1013	51.81929
		09:00:00	-35.0913	51.57712
		10:00:00	-35.0887	51.33771
		11:00:00	-35.0907	51.09759
		12:00:00	-35.0886	50.86119
		13:00:00	-35.0895	50.6238
		14:00:00	-35.0925	50.37665
		15:00:00	-35.1034	50.12765
		16:00:00	-35.1063	49.87995
		17:00:00	-35.0957	49.6309
		18:00:00	-35.0924	49.37848
		19:00:00	-35.0896	49.29959
		20:00:00	-35.0573	49.27365
		21:00:00	-34.9131	49.1139
		22:00:00	-34.7654	48.95516
		23:00:00	-34.6152	48.7941
14/04/00	105	00:00:00	-34.4635	48.63617
		01:00:00	-34.3219	48.48155
		02:00:00	-34.172	48.32441
		03:00:00	-34.0187	48.16824
		04:00:00	-33.8689	48.00589
		05:00:00	-33.7185	47.84357
		06:00:00	-33.5516	47.7098
		07:00:00	-33.3945	47.56827
		08:00:00	-33.2507	47.40817

Date	SDY	Time	Latitude	Longitude
		09:00:00	-33.1046	47.24103
		10:00:00	-32.9576	47.07658
		11:00:00	-32.8234	46.92853
		12:00:00	-32.7064	46.79591
		13:00:00	-32.5908	46.67628
		14:00:00	-32.4386	46.50594
		15:00:00	-32.2871	46.3378
		16:00:00	-32.1305	46.17375
		17:00:00	-31.972	46.01114
		18:00:00	-31.8146	45.84573
		19:00:00	-31.6583	45.68488
		20:00:00	-31.508	45.526
		21:00:00	-31.3551	45.37349
		22:00:00	-31.208	45.22823
		23:00:00	-31.0547	45.07111
15/04/00	106	00:00:00	-30.9134	44.93151
		01:00:00	-30.7511	44.76909
		02:00:00	-30.6042	44.61387
		03:00:00	-30.4484	44.43955
		04:00:00	-30.285	44.2828
		05:00:00	-30.1272	44.1292
		06:00:00	-29.9768	43.96773
		07:00:00	-29.8225	43.80903
		08:00:00	-29.6669	43.64558
		09:00:00	-29.5095	43.4907
		10:00:00	-29.3538	43.33709
		11:00:00	-29.1989	43.18379
		12:00:00	-29.0577	43.03202
		13:00:00	-29.0438	43.02056
		14:00:00	-28.9386	42.91674
		15:00:00	-28.7917	42.76936
		16:00:00	-28.6438	42.61942
		17:00:00	-28.4964	42.4729
		18:00:00	-28.3507	42.32834

Date	SDY	Time	Latitude	Longitude
		19:00:00	-28.2035	42.17941
		20:00:00	-28.053	42.03145
		21:00:00	-27.9022	41.87906
		22:00:00	-27.7528	41.72736
		23:00:00	-27.6008	41.58278
16/04/00	107	00:00:00	-27.4525	41.43374
		01:00:00	-27.3042	41.28623
		02:00:00	-27.1566	41.13779
		03:00:00	-27.0073	40.9883
		04:00:00	-26.856	40.84116
		05:00:00	-26.7065	40.69695
		06:00:00	-26.5613	40.55228
		07:00:00	-26.4133	40.40623
		08:00:00	-26.2604	40.25897
		09:00:00	-26.1078	40.113
		10:00:00	-25.9559	39.96797
		11:00:00	-25.805	39.82068
		12:00:00	-25.6755	39.69137
		13:00:00	-25.6652	39.68447
		14:00:00	-25.657	39.67467
		15:00:00	-25.5641	39.58042
		16:00:00	-25.4145	39.4339
		17:00:00	-25.2638	39.28693
		18:00:00	-25.114	39.14077
		19:00:00	-24.9619	38.99676
		20:00:00	-24.8121	38.85319
		21:00:00	-24.6605	38.70807
		22:00:00	-24.5159	38.56072
		23:00:00	-24.3647	38.41635
17/04/00	108	00:00:00	-24.2124	38.27037
		01:00:00	-24.0619	38.12577
		02:00:00	-23.9136	37.9804
		03:00:00	-23.7429	37.86455
		04:00:00	-23.5763	37.74836

Date	SDY	Time	Latitude	Longitude
		05:00:00	-23.4053	37.63469
		06:00:00	-23.2359	37.51661
		07:00:00	-23.0691	37.40102
		08:00:00	-22.9014	37.28743
		09:00:00	-22.7327	37.17339
		10:00:00	-22.5641	37.05874
		11:00:00	-22.3928	36.94448
		12:00:00	-22.2507	36.84176
		13:00:00	-22.2456	36.83873
		14:00:00	-22.0874	36.73525
		15:00:00	-21.9112	36.62031
		16:00:00	-21.7297	36.50495
		17:00:00	-21.5501	36.38842
		18:00:00	-21.3793	36.26019
		19:00:00	-21.2057	36.13994
		20:00:00	-21.0343	36.02295
		21:00:00	-20.8643	35.91066
		22:00:00	-20.6952	35.79702
		23:00:00	-20.5273	35.68587
18/04/00	109	00:00:00	-20.3478	35.59076
		01:00:00	-20.1664	35.50267
		02:00:00	-19.9869	35.41785
		03:00:00	-19.8045	35.32972
		04:00:00	-19.6204	35.23672
		05:00:00	-19.4322	35.14794
		06:00:00	-19.2451	35.05666
		07:00:00	-19.0594	34.96419
		08:00:00	-18.8745	34.87563
		09:00:00	-18.6939	34.78618
		10:00:00	-18.5103	34.69436
		11:00:00	-18.3225	34.60633
		12:00:00	-18.1621	34.53714
		13:00:00	-18.1589	34.5379
		14:00:00	-18.156	34.5374

Date	SDY	Time	Latitude	Longitude
		15:00:00	-17.99	34.45275
		16:00:00	-17.8079	34.36104
		17:00:00	-17.6253	34.27722
		18:00:00	-17.4442	34.19212
		19:00:00	-17.2632	34.10074
		20:00:00	-17.0783	34.00977
		21:00:00	-16.8954	33.92363
		22:00:00	-16.7122	33.83638
		23:00:00	-16.5323	33.75025
19/04/00	110	00:00:00	-16.3509	33.66604
		01:00:00	-16.1682	33.58058
		02:00:00	-15.9878	33.49274
		03:00:00	-15.8052	33.40643
		04:00:00	-15.6261	33.31993
		05:00:00	-15.4443	33.23532
		06:00:00	-15.2637	33.14838
		07:00:00	-15.0821	33.06103
		08:00:00	-14.8966	32.97269
		09:00:00	-14.7123	32.88485
		10:00:00	-14.5305	32.79868
		11:00:00	-14.3478	32.71399
		12:00:00	-14.1881	32.64691
		13:00:00	-14.1807	32.65597
		14:00:00	-14.0247	32.567
		15:00:00	-13.8494	32.47883
		16:00:00	-13.6718	32.39623
		17:00:00	-13.5129	32.32614
		18:00:00	-13.5126	32.34017
		19:00:00	-13.3416	32.25602
		20:00:00	-13.1591	32.16432
		21:00:00	-12.9823	32.06994
		22:00:00	-12.8009	31.98224
		23:00:00	-12.6205	31.89766
20/04/00	111	00:00:00	-12.4382	31.81466

Date	SDY	Time	Latitude	Longitude
		01:00:00	-12.2569	31.73326
		02:00:00	-12.0757	31.64786
		03:00:00	-11.8994	31.56318
		04:00:00	-11.7184	31.47729
		05:00:00	-11.5359	31.39438
		06:00:00	-11.3541	31.31192
		07:00:00	-11.1709	31.22591
		08:00:00	-10.9872	31.14009
		09:00:00	-10.806	31.05448
		10:00:00	-10.623	30.96913
		11:00:00	-10.4417	30.8872
		12:00:00	-10.2852	30.8195
		13:00:00	-10.2862	30.8382
		14:00:00	-10.1338	30.75545
		15:00:00	-9.95879	30.66507
		16:00:00	-9.78233	30.57907
		17:00:00	-9.60126	30.49565
		18:00:00	-9.41791	30.41058
		19:00:00	-9.23331	30.3249
		20:00:00	-9.04923	30.24114
		21:00:00	-8.86592	30.15527
		22:00:00	-8.68531	30.06961
		23:00:00	-8.50376	29.9872
21/04/00	112	00:00:00	-8.32098	29.90377
		01:00:00	-8.14005	29.81992
		02:00:00	-7.96018	29.73546
		03:00:00	-7.78027	29.64953
		04:00:00	-7.5983	29.56955
		05:00:00	-7.41823	29.48672
		06:00:00	-7.23694	29.40279
		07:00:00	-7.05364	29.31882
		08:00:00	-6.86927	29.23414
		09:00:00	-6.68554	29.15004
		10:00:00	-6.50157	29.06428

Date	SDY	Time	Latitude	Longitude
		11:00:00	-6.34435	28.98699
		12:00:00	-6.33719	29.00015
		13:00:00	-6.16669	28.91067
		14:00:00	-5.98252	28.82536
		15:00:00	-5.7996	28.74071
		16:00:00	-5.61873	28.65799
		17:00:00	-5.43893	28.57519
		18:00:00	-5.25636	28.49181
		19:00:00	-5.07573	28.40689
		20:00:00	-4.89373	28.32366
		21:00:00	-4.71285	28.24089
		22:00:00	-4.53058	28.15941
		23:00:00	-4.34941	28.07568
22/04/00	113	00:00:00	-4.16874	27.99323
		01:00:00	-3.98877	27.91119
		02:00:00	-3.8084	27.82903
		03:00:00	-3.62857	27.74452
		04:00:00	-3.44967	27.66
		05:00:00	-3.27068	27.57835
		06:00:00	-3.09097	27.49688
		07:00:00	-2.91441	27.41483
		08:00:00	-2.73818	27.33208
		09:00:00	-2.55796	27.25042
		10:00:00	-2.37751	27.16762
		11:00:00	-2.22361	27.09478
		12:00:00	-2.22713	27.10594
		13:00:00	-2.05449	27.02177
		14:00:00	-1.87583	26.93971
		15:00:00	-1.69487	26.85839
		16:00:00	-1.51369	26.77619
		17:00:00	-1.33382	26.6934
		18:00:00	-1.1516	26.60931
		19:00:00	-0.96511	26.52636
		20:00:00	-0.76782	26.48553

Date	SDY	Time	Latitude	Longitude
		21:00:00	-0.59003	26.39015
		22:00:00	-0.4115	26.29663
		23:00:00	-0.23658	26.20359
23/04/00	114	00:00:00	-0.05982	26.11298
		01:00:00	0.124764	26.0301
		02:00:00	0.308922	25.95295
		03:00:00	0.490675	25.87402
		04:00:00	0.671516	25.79478
		05:00:00	0.854659	25.71697
		06:00:00	1.036904	25.64014
		07:00:00	1.220443	25.56351
		08:00:00	1.403854	25.48144
		09:00:00	1.587695	25.39985
		10:00:00	1.773142	25.31936
		11:00:00	1.93583	25.25158
		12:00:00	1.947606	25.26585
		13:00:00	2.128776	25.18124
		14:00:00	2.310016	25.09689
		15:00:00	2.491957	25.01248
		16:00:00	2.671931	24.9328
		17:00:00	2.852966	24.85229
		18:00:00	3.035211	24.77292
		19:00:00	3.21988	24.69285
		20:00:00	3.39999	24.61461
		21:00:00	3.58174	24.53605
		22:00:00	3.763773	24.45666
		23:00:00	3.946457	24.37769
24/04/00	115	00:00:00	4.128744	24.30113
		01:00:00	4.311722	24.22113
		02:00:00	4.490743	24.14373
		03:00:00	4.670208	24.06776
		04:00:00	4.849723	23.98904
		05:00:00	5.029717	23.90882
		06:00:00	5.211251	23.83145

Date	SDY	Time	Latitude	Longitude
		07:00:00	5.396113	23.75339
		08:00:00	5.577254	23.66963
		09:00:00	5.762039	23.59176
		10:00:00	5.944058	23.51425
		11:00:00	6.100501	23.44531
		12:00:00	6.097525	23.45382
		13:00:00	6.276486	23.37161
		14:00:00	6.460594	23.28713
		15:00:00	6.649638	23.20574
		16:00:00	6.828403	23.11773
		17:00:00	7.0138	23.04197
		18:00:00	7.197272	22.96083
		19:00:00	7.377986	22.88852
		20:00:00	7.557056	22.81171
		21:00:00	7.734753	22.7362
		22:00:00	7.909572	22.65872
24/04/00	115	23:00:00	8.084817	22.58111
		00:00:00	8.262398	22.4983
		01:00:00	8.442513	22.42202
		02:00:00	8.621061	22.34457
		03:00:00	8.799188	22.2683
		04:00:00	8.983155	22.19201
		05:00:00	9.161546	22.11062
		06:00:00	9.343137	22.03091
		07:00:00	9.526262	21.95449
		08:00:00	9.701746	21.87566
		09:00:00	9.879394	21.79798
		10:00:00	10.05571	21.71824
		11:00:00	10.20858	21.65148
		12:00:00	10.20164	21.65935
		13:00:00	10.3719	21.57985
		14:00:00	10.5499	21.50182
		15:00:00	10.72695	21.4247
		16:00:00	10.90777	21.35307

Date	SDY	Time	Latitude	Longitude
		17:00:00	11.08114	21.27188
		18:00:00	11.25136	21.19287
		19:00:00	11.42583	21.1165
		20:00:00	11.60301	21.03906
		21:00:00	11.78365	20.96003
		22:00:00	11.95891	20.87922
		23:00:00	12.13578	20.80192
26/04/00	117	00:00:00	12.31732	20.72401
		01:00:00	12.46928	20.65549
		02:00:00	12.46361	20.64968
		03:00:00	12.629	20.58402
		04:00:00	12.80172	20.50735
		05:00:00	12.98035	20.45537
		06:00:00	13.16304	20.47478
		07:00:00	13.34433	20.49326
		08:00:00	13.5268	20.51147
		09:00:00	13.72011	20.53085
		10:00:00	13.912	20.54902
		11:00:00	14.10582	20.56934
		12:00:00	14.30489	20.59036
		13:00:00	14.50133	20.60818
		14:00:00	14.69915	20.62775
		15:00:00	14.89313	20.64841
		16:00:00	15.08221	20.66525
		17:00:00	15.27432	20.68601
		18:00:00	15.46319	20.70633
		19:00:00	15.64982	20.72598
		20:00:00	15.84505	20.74676
		21:00:00	16.04082	20.76442
		22:00:00	16.23616	20.78175
		23:00:00	16.42945	20.80011
27/04/00	118	00:00:00	16.62137	20.82306
		01:00:00	16.81597	20.84096
		02:00:00	17.00864	20.86316
		03:00:00	17.20494	20.88225
		04:00:00	17.358	20.89607
		05:00:00	17.55151	20.91688
		06:00:00	17.74259	20.93751
		07:00:00	17.9381	20.95807
		08:00:00	18.13076	20.97567
		09:00:00	18.32389	20.99609
		10:00:00	18.51288	21.01679
		11:00:00	18.69752	21.03167
		12:00:00	18.87941	21.05489
		13:00:00	19.05912	21.07188
		14:00:00	19.24329	21.08789
		15:00:00	19.39693	21.10135
		16:00:00	19.54182	21.11056
		17:00:00	19.71015	21.13623
		18:00:00	19.87436	21.15458
		19:00:00	20.04417	21.1709
		20:00:00	20.21889	21.18846
		21:00:00	20.39502	21.20633
		22:00:00	20.57574	21.22503
		23:00:00	20.74961	21.24464
28/04/00	119	00:00:00	20.92244	21.26282
		01:00:00	21.09154	21.28037
		02:00:00	21.26329	21.29952
		03:00:00	21.44161	21.31451
		04:00:00	21.62556	21.33569
		05:00:00	21.81484	21.35589
		06:00:00	21.99791	21.37634
		07:00:00	22.18935	21.39281
		08:00:00	22.38492	21.41189
		09:00:00	22.5808	21.43186
		10:00:00	22.77931	21.46006
		11:00:00	22.97842	21.48264
		12:00:00	23.17771	21.4997

Date	SDY	Time	Latitude	Longitude
		13:00:00	23.37109	21.52497
		14:00:00	23.56792	21.53971
		15:00:00	23.69318	21.55886
		16:00:00	23.67952	21.56472
		17:00:00	23.88217	21.5731
		18:00:00	24.09559	21.59526
		19:00:00	24.30852	21.61955
		20:00:00	24.52441	21.63891
		21:00:00	24.73663	21.66095
		22:00:00	24.94863	21.6888
		23:00:00	25.16398	21.70986
29/04/00	120	00:00:00	25.37918	21.73153
		01:00:00	25.59469	21.75874
		02:00:00	25.81275	21.77824
		03:00:00	26.03119	21.80487
		04:00:00	26.25037	21.82732
		05:00:00	26.46412	21.85295
		06:00:00	26.68262	21.87526
		07:00:00	26.9013	21.89662
		08:00:00	27.11908	21.91743
		09:00:00	27.33832	21.94534
		10:00:00	27.5374	21.97238
		11:00:00	27.53107	21.95658
		12:00:00	27.69518	21.80838
		13:00:00	27.86442	21.64434
		14:00:00	28.04125	21.47584
		15:00:00	28.2152	21.30639
		16:00:00	28.38785	21.13857
		17:00:00	28.55888	20.96867
		18:00:00	28.73134	20.79584
		19:00:00	28.90852	20.62525
		20:00:00	29.08774	20.4512
		21:00:00	29.26503	20.27606
		22:00:00	29.44197	20.10123

Date	SDY	Time	Latitude	Longitude
		23:00:00	29.61828	19.93056
30/04/00	121	00:00:00	29.79283	19.75722
		01:00:00	29.96882	19.58115
		02:00:00	30.14682	19.40852
		03:00:00	30.31704	19.23642
		04:00:00	30.48828	19.06009
		05:00:00	30.66615	18.88812
		06:00:00	30.84223	18.71551
		07:00:00	31.01369	18.5419
		08:00:00	31.18187	18.36922
		09:00:00	31.35057	18.19798
		10:00:00	31.52334	18.03037
		11:00:00	31.69152	17.86038
		12:00:00	31.85758	17.69154
		13:00:00	32.03081	17.51927
		14:00:00	32.20485	17.34444
		15:00:00	32.38201	17.16571
		16:00:00	32.55693	16.98465
		17:00:00	32.64085	16.90114
		18:00:00	32.61729	17.03749
		19:00:00	32.67943	17.25872
		20:00:00	32.78571	17.42423
		21:00:00	32.93432	17.54165
		22:00:00	33.08145	17.6571
		23:00:00	33.23028	17.77202
01/05/00	122	00:00:00	33.37186	17.8826
		01:00:00	33.50504	17.98889
		02:00:00	33.63844	18.10408
		03:00:00	33.78471	18.21602
		04:00:00	33.93945	18.33713
		05:00:00	34.09361	18.45851
		06:00:00	34.25374	18.58286
		07:00:00	34.41438	18.71602
		08:00:00	34.58662	18.84733

Date	SDY	Time	Latitude	Longitude
		09:00:00	34.75841	18.98771
		10:00:00	34.93898	19.13501
		11:00:00	35.11326	19.27988
		12:00:00	35.29101	19.42316
		13:00:00	35.4729	19.56823
		14:00:00	35.65473	19.71652
		15:00:00	35.84131	19.87049
		16:00:00	35.99764	20.00155
		17:00:00	35.99984	19.99181
		18:00:00	36.17508	19.99853
		19:00:00	36.37712	19.99914
		20:00:00	36.5815	19.99795
		21:00:00	36.78471	19.99893
		22:00:00	36.96081	19.99363
		23:00:00	36.95405	19.98238
02/05/00	123	00:00:00	37.15531	19.99801
		01:00:00	37.35805	20.00388
		02:00:00	37.5566	19.99991
		03:00:00	37.75963	20.00147
		04:00:00	37.91777	20.00303
		05:00:00	37.91465	20.01725
		06:00:00	38.10851	20.00244
		07:00:00	38.30736	20.00404
		08:00:00	38.50714	20.00296
		09:00:00	38.70589	19.99682
		10:00:00	38.8774	19.99796
		11:00:00	38.85907	20.00541
		12:00:00	39.01729	20.00449
		13:00:00	39.20587	19.99329
		14:00:00	39.39469	20.00261
		15:00:00	39.5887	20.00097
		16:00:00	39.7662	20.00017
		17:00:00	39.96266	20.00092
		18:00:00	40.16186	19.99762
		19:00:00	40.35797	19.99692
		20:00:00	40.55423	19.9989
		21:00:00	40.74989	19.99768
		22:00:00	40.94754	20.0001
		23:00:00	41.14121	19.99869
03/05/00	124	00:00:00	41.33642	20.00206
		01:00:00	41.53142	20.00428
		02:00:00	41.72943	19.99947
		03:00:00	41.92208	20.00009
		04:00:00	42.11863	20.00194
		05:00:00	42.3119	20.00144
		06:00:00	42.50554	20.00219
		07:00:00	42.6951	20.00211
		08:00:00	42.88944	20.00008
		09:00:00	43.08431	20.00274
		10:00:00	43.27996	20.00312
		11:00:00	43.47466	20.00018
		12:00:00	43.67643	19.99928
		13:00:00	43.87693	20.00052
		14:00:00	44.0794	20.00205
		15:00:00	44.27921	19.99999
		16:00:00	44.47151	19.99606
		17:00:00	44.66229	19.99556
		18:00:00	44.85865	19.9992
		19:00:00	45.05298	19.99909
		20:00:00	45.25003	20.00354
		21:00:00	45.44517	20.00077
		22:00:00	45.6414	20.0035
		23:00:00	45.83915	20.00118
04/05/00	125	00:00:00	46.0385	20.00017
		01:00:00	46.23918	19.99979
		02:00:00	46.43836	19.99971
		03:00:00	46.63435	19.99509
		04:00:00	46.83557	20.00123

Date	SDY	Time	Latitude	Longitude
		05:00:00	47.00361	20.00316
		06:00:00	46.9873	20.03495
		07:00:00	47.0136	19.90524
		08:00:00	47.06557	19.63567
		09:00:00	47.10949	19.35841
		10:00:00	47.15729	19.07813
		11:00:00	47.20295	18.80274
		12:00:00	47.25063	18.53417
		13:00:00	47.29574	18.257
		14:00:00	47.3401	17.98114
		15:00:00	47.3885	17.71416
		16:00:00	47.43421	17.45419
		17:00:00	47.47196	17.20319
		18:00:00	47.52127	16.94411
		19:00:00	47.5642	16.68961
		20:00:00	47.60578	16.42234
		21:00:00	47.65231	16.13491
		22:00:00	47.70186	15.85912
		23:00:00	47.74629	15.59389
05/05/00	126	00:00:00	47.78586	15.32574
		01:00:00	47.83176	15.06155
		02:00:00	47.87924	14.79205
		03:00:00	47.92424	14.50773
		04:00:00	47.97175	14.22215
		05:00:00	48.01712	13.94241
		06:00:00	48.0648	13.66164
		07:00:00	48.1173	13.36891
		08:00:00	48.16164	13.07938
		09:00:00	48.20623	12.82977
		10:00:00	48.22319	12.7244
		11:00:00	48.26969	12.43653
		12:00:00	48.32092	12.1472
		13:00:00	48.36485	11.85585
		14:00:00	48.4169	11.56246

Date	SDY	Time	Latitude	Longitude
		15:00:00	48.46566	11.27367
		16:00:00	48.51416	10.97794
		17:00:00	48.56172	10.68146
		18:00:00	48.6107	10.38642
		19:00:00	48.65743	10.09066
		20:00:00	48.70508	9.797094
		21:00:00	48.75596	9.502567
		22:00:00	48.80394	9.210174
		23:00:00	48.85231	8.91822
06/05/00	127	00:00:00	48.90208	8.623605
		01:00:00	48.95472	8.324667
		02:00:00	48.99998	8.026499
		03:00:00	49.0449	7.734295
		04:00:00	49.09395	7.43826
		05:00:00	49.14179	7.137698
		06:00:00	49.18936	6.838608
		07:00:00	49.22963	6.539917
		08:00:00	49.26903	6.248
		09:00:00	49.32294	6.000124
		10:00:00	49.34385	5.89508
		11:00:00	49.39003	5.599224
		12:00:00	49.44303	5.307296
		13:00:00	49.47927	5.041169
		14:00:00	49.52499	4.7791
		15:00:00	49.56204	4.566801
		16:00:00	49.61097	4.259135

APPENDIX 3: CTD Log

Date	Stn no.	Time (local)	Time (GMT)	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
13/4/00	A10-01	15:30	18:30	35.1	42.9													
						200			Y		sampled	sampled	sampled					
						150	2	1	Y		sampled	sampled	sampled					
						100	2	1	Y									
						75	2	1	Y									
						50	2	1	Y		sampled	sampled	sampled				Y	
						45			Y		sampled	sampled	sampled					
						40	2	1	Y		sampled	sampled	sampled					
						25	2	1	Y		sampled	sampled	sampled				Y	
						15			Y									
						7	2	1	Y		sampled	sampled	sampled				Y	Y
15/4/00	A10-02	10:14	12:14	29.9	43.0													
						200			Y		sampled	sampled	sampled					
						150	2	1	Y	Y	sampled	sampled	sampled	Y				
						130	2	1	Y		sampled	sampled	sampled					
						105	2	1	Y									
						90	2	1	Y		sampled	sampled	sampled			Y	Y	
						75	2	1	Y		sampled	sampled	sampled					
						60	2	1	Y		sampled	sampled	sampled					
						45	2	1	Y		sampled	sampled	sampled			Y	Y	
						20			Y		sampled	sampled	sampled					
						15			Y									
						7	2	1	Y		sampled	sampled	sampled			Y	Y	Y
16/4/00	A10-03	03:36	12:15	25.7	39.7													
						150	2	1	Y	Y								
						135	2	1	Y									
						105	2	1	Y									
						90	2	1	Y								Y	
						75	2	1	Y									
						50	2	1	Y								Y	
						40	2	1	Y									
						7	2	1	Y								Y	Y

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
17/4/00	A10-04	10:02	12:02	-22.3	-36.8													
						250			Y		sampled	sampled	sampled	Y	Y			
						175			Y		sampled	sampled	sampled		Y			
						150	2	1	Y									
						135			Y		sampled	sampled	sampled		Y			
						105		1	Y		sampled	sampled	sampled		Y			
						90	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						80	2	1	Y		sampled	sampled	sampled		Y			
						45	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						35	2	1	Y		sampled	sampled	sampled		Y			
						30			Y		sampled	sampled	sampled		Y			
						20			Y		sampled	sampled	sampled		Y			
						15			Y									
						7	2	1	Y		sampled	sampled	sampled		Y	Y	Y	Y
18/4/00	A10-05	10:00	12:00	-18.2	-34.5													
						175	2	1	Y	Y					Y			
						150	2	1	Y						Y			
						125	2	1	Y						Y			
						115	2	1	Y						Y		Y	
						100	2	1	Y						Y			
						75	2	1	Y						Y			
						60	2	1	Y						Y		Y	
						55	2	1	Y						Y			
						7	2	1	Y						Y		Y	Y
19/4/00	A10-06	10:00	12:00	-14.2	-32.6													
						250			Y		sampled	sampled	sampled					
						175	2	1	Y	Y	sampled	sampled	sampled		Y			
						150	2	1	Y		sampled	sampled	sampled		Y			
						135	2	1	Y		sampled	sampled	sampled		Y			
						125	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						100	2	1	Y		sampled	sampled	sampled		Y			
						65	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						55	2	1	Y		sampled	sampled	sampled		Y			
						30			Y		sampled	sampled	sampled					

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						20			Y		sampled	sampled	sampled					
						15			Y									
						7	2	1	Y		sampled	sampled	sampled			Y	Y	Y
19/4/00	A10-07	15:05	17:05	-13.5	-32.3													
						1000			Y		sampled	sampled	sampled					
						500			Y		sampled	sampled	sampled					
						300			Y		sampled	sampled	sampled					
						233			Y		sampled	sampled	sampled					
						180			Y		sampled	sampled	sampled					
						150			Y		sampled	sampled	sampled					
						130	2		Y		sampled	sampled	sampled				Y	
						100	2	1	Y		sampled	sampled	sampled		Y		Y	
						25	2	1	Y		sampled	sampled	sampled		Y		Y	
						7									Y			
4/20/00	A10-08	10:00	12:00	-10.3	-30.8													
						250			Y		sampled	sampled	sampled		Y			
						175			Y		sampled	sampled	sampled		Y			
						150	2	1	Y									
						130	2	1	Y		sampled	sampled	sampled		Y			
						120	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						110	2	1	Y		sampled	sampled	sampled					
						100	2	1	Y		sampled	sampled	sampled		Y			
						80	2	1	Y						Y			
						60	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						55	2	1	Y		sampled	sampled	sampled					
						30			Y		sampled	sampled	sampled					
						20			Y		sampled	sampled	sampled					
						7	2	1	Y		sampled	sampled	sampled		Y	Y	Y	Y
4/21/00	A10-09	10:00	11:00	-6.2	-28.6													
						250			Y		sampled	sampled	sampled	Y	Y			
						175	2	1	Y	Y	sampled	sampled	sampled					
						150	2	1	Y						Y			
						125	2	1	Y		sampled	sampled	sampled		Y			
						105	2	1	Y		sampled	sampled	sampled		Y	Y	Y	

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						95	2	1	Y						Y			
						80	2	1	Y		sampled	sampled	sampled		Y			
						70	2	1	Y		sampled	sampled	sampled		Y			
						55	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						30			Y		sampled	sampled	sampled					
						20			Y		sampled	sampled	sampled					
						15			Y		sampled	sampled	sampled					
						7		1	Y		sampled	sampled	sampled		Y	Y	Y	Y
22/4/00	A10-10	10:00	11:00	-2.2	-27.1													
						250			Y	Y	sampled	sampled	sampled	Y	Y			
						175			Y		sampled	sampled	sampled		Y			
						150	2	1	Y									
						100	2	1	Y		sampled	sampled	sampled		Y			
						60	2	1	Y		sampled	sampled	sampled		Y			
						55	2	1	Y		sampled	sampled	sampled		Y	Y	Y	
						50	2	1	Y		sampled	sampled	sampled					
						40			Y		sampled	sampled	sampled					
						35	2		Y		sampled	sampled	sampled					
						25	2		Y		sampled	sampled	sampled			Y	Y	
						20			Y		sampled	sampled	sampled					
						15			Y									
						7	2		Y		sampled	sampled	sampled		7	Y	Y	Y
23/04/00	A10-11	10:00	11:00	-1.9	-25.3													
						200			Y	Y	sampled	sampled	sampled					
						150	2		Y		sampled	sampled	sampled		Y			
						110	2		Y		sampled	sampled	sampled		Y			
						80	2		Y		sampled	sampled	sampled		Y			
						70			Y		sampled	sampled	sampled					
						60	2		Y		sampled	sampled	sampled		Y	Y	Y	
						55	2		Y		sampled	sampled	sampled		Y			
						45	2		Y		sampled	sampled	sampled		Y	Y		
						35	2		Y						Y			
						30	2		Y						Y		Y	
						25			Y		sampled	sampled	sampled					

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						15			Y									
						7	2		Y		sampled	sampled	sampled		Y	Y	Y	Y
24/04/00	A10-12	10:00	11:00	6.1	-23.5													
						200			Y	Y	sampled	sampled	sampled	Y				
						150	2		Y		sampled	sampled	sampled		Y			
						100	2		Y		sampled	sampled	sampled		Y			
						75	2		Y		sampled	sampled	sampled		Y			
						55			Y		sampled	sampled	sampled			Y		
						45	2		Y		sampled	sampled	sampled		Y		Y	
						35	2		Y		sampled	sampled	sampled		Y		Y	
						25	2		Y		sampled	sampled	sampled		Y			
						20	2		Y		sampled	sampled	sampled		Y	Y	Y	
						15			Y									
						7	2		Y		sampled	sampled	sampled				Y	
						2			Y		sampled	sampled	sampled		Y	Y		Y
25/04/00	A10-13	10:00	11:00	10.2	-21.7													
						200			Y	Y	sampled	sampled	sampled	Y	Y			
						150			Y		sampled	sampled	sampled					
						100	2		Y		sampled	sampled	sampled					
						75	2		Y		sampled	sampled	sampled		Y			
						50	2		Y						Y			
						45			Y		sampled	sampled	sampled					
						30	2		Y		sampled	sampled	sampled		Y	Y	Y	
						25	2		Y		sampled	sampled	sampled		Y		Y	
						20	2		Y		sampled	sampled	sampled		Y			
						15	2		Y						Y	Y		
						7	2		Y		sampled	sampled	sampled		Y			
						2			Y		sampled	sampled	sampled			Y	Y	
25/04/00	A10-14	23:59	01:00	12.5	-20.7													
						200			Y	Y	sampled	sampled	sampled					
						150			Y		sampled	sampled	sampled					
						75	2		Y		sampled	sampled	sampled		Y		Y	
						55	2		Y		sampled	sampled	sampled		Y		Y	
						47	2		Y		sampled	sampled	sampled		Y		Y	

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						40	2		Y		sampled	sampled	sampled		Y		Y	
						7	2		Y		sampled	sampled	sampled		Y		Y	
28/04/00	A10-15	13:12	13:12	23.7	-21.6													
						230			Y		sampled	sampled	sampled	Y	Y			
						175	2		Y	Y								
						163			Y		sampled	sampled	sampled					
						125	2		Y						Y			
						115			Y		sampled	sampled	sampled					
						95	2		Y		sampled	sampled	sampled		Y			
						80	2		Y		sampled	sampled	sampled		Y	Y		
						75	2		Y		sampled	sampled	sampled		Y			
						70	2		Y		sampled	sampled	sampled		Y			
						60			Y		sampled	sampled	sampled					
						40	2		Y		sampled	sampled	sampled		Y	Y	Y	
						20			Y		sampled	sampled	sampled					
						15			Y									
						7	2		Y		sampled	sampled	sampled		Y	Y	Y	
29/04/00	A10-16	10:00	10:00	27.5	-22.0													
						250			Y	Y	sampled	sampled	sampled	Y				
						175	2		Y		sampled	sampled	sampled		Y			
						130	2		Y						Y			
						120	2		Y		sampled	sampled	sampled		Y			
						107	2		Y		sampled	sampled	sampled		Y		Y	
						95	2		Y		sampled	sampled	sampled		Y	Y		
						80	2		Y		sampled	sampled	sampled		Y			
						60			Y		sampled	sampled	sampled					
						53	2		Y		sampled	sampled	sampled		Y	Y	Y	
						30			Y		sampled	sampled	sampled					
						20			Y		sampled	sampled	sampled					
						15			Y									
						7	2		Y		sampled	sampled	sampled		Y	Y	Y	Y
01/05/00	A10-17	16:00	16:00	36.0	-20.0													
						200			Y	Y	sampled	sampled	sampled					
						150	2		Y		sampled	sampled	sampled					

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						100	2		Y		sampled	sampled	sampled					
						75	2		Y		sampled	sampled	sampled		Y			-
						60	2		Y		sampled	sampled	sampled		Y			
						50			Y		sampled	sampled	sampled		Y			
						40	2		Y		sampled	sampled	sampled		Y	Y	Y	
						30	2		Y		sampled	sampled	sampled		Y		Y	
						20	2		Y		sampled	sampled	sampled		Y	Y	Y	
						15			Y									
						7	2		Y		sampled	sampled	sampled		Y	Y	Y	Y
01/05/00	A10-18	22:00	22:00	37.0	-20.0													
						200			Y		sampled	sampled	sampled					
						150	2		Y		sampled	sampled	sampled		Y			
						100	2		Y		sampled	sampled	sampled		Y			
						75	2		Y		sampled	sampled	sampled		Y			
						60	2		Y		sampled	sampled	sampled		Y			
						50			Y		sampled	sampled	sampled					
						40	2		Y		sampled	sampled	sampled		Y		Y	
						30	2		Y		sampled	sampled	sampled		Y		Y	
						20	2		Y		sampled	sampled	sampled		Y		Y	
						15			Y									
						7	2		Y		sampled	sampled	sampled		Y		Y	
02/05/00	A10-19	04:00	04:00															
						135			Y	Y	sampled	sampled	sampled					
						101			Y		sampled	sampled	sampled					
						71	2		Y		sampled	sampled	sampled		Y		Y	
						65			Y		sampled	sampled	sampled					
						63			Y		sampled	sampled	sampled					
						51	2		Y		sampled	sampled	sampled		Y	Y	Y	
						47			Y		sampled	sampled	sampled					
						35	2		Y		sampled	sampled	sampled		Y	Y	Y	
						23	2		Y		sampled	sampled	sampled		Y		Y	
						9	2		Y		sampled	sampled	sampled		Y	Y	Y	
02/05/00	A10-20	10:00	10:00	38.9	-20.0													
						200			Y	Y	sampled	sampled	sampled	Y				

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						150	2		Y						Y			
						140			Y		sampled	sampled	sampled			Y		
						125	2		Y		sampled	sampled	sampled					
						110			Y		sampled	sampled	sampled					
						90	2		Y									
						75			Y		sampled	sampled	sampled					
						60	2		Y		sampled	sampled	sampled		Y			
						40	2		Y		sampled	sampled	sampled		Y		Y	
						30	2		Y		sampled	sampled	sampled				Y	
						20			Y		sampled	sampled	sampled		Y	Y		
						15	2		Y		sampled	sampled	sampled		Y		Y	
						7	2		Y		sampled	sampled	sampled		Y	Y	Y	Y
03/05/00	A10-21	05:22	05:22	47.0	-20.0													
						182			Y	Y	sampled	sampled	sampled	Y				
						137	2		Y									
						131			Y		sampled	sampled	sampled					
						100			Y									
						89	2								Y			
						75	2		Y									
						65			Y		sampled	sampled	sampled					
						61	2								Y			
						58			Y		sampled	sampled	sampled					
						50	2								Y		Y	
						45			Y		sampled	sampled	sampled					
						40			Y		sampled	sampled	sampled					
						35	2		Y		sampled	sampled	sampled				Y	
						30			Y							Y		
						20	2		Y		sampled	sampled	sampled		Y	Y	Y	
						15			Y		sampled	sampled	sampled					
						7	2		Y		sampled	sampled	sampled		7	Y	Y	
05/05/00	A10-22	10:00	09:00	48.7	-12.8													
						150			Y		$NO NO_2^-, PO_4^{3-}$	sampled	sampled					
						125			Y		$NO NO_2^-, PO_4^{3-}$	sampled	sampled					
						100			Y		$NO NO_2^-, PO_4^{3-}$	sampled	sampled					

Date	Stn no.	Time	Time	Lat.	Long	Z(m)	HPLC	CHL 'A'	SFC/T	FRRF	Nutrients	Spectra	CO	FRRF	Pico	P/I	PA	NEE
						75	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						50	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						40	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						30	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled			Y	Y	
						20	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled			Y	Y	
						7	2		Y		$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled			Y	Y	
06/05/00	A10-23	10:00	09:00	49:3	-6:0													
						100	2											
						90	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						80	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						70	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						60	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						50	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					
						40	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled				Y	
						30	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled				Y	
						20					$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled				Y	
						15	2										Y	
						7	2				$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled			Y	Y	
						2					$NO\ NO_2^-, PO_4^{3-}$	sampled	sampled					

APPENDIX 4: XBT Log

Date	Time	Remarks	Latitude	Longitude	Type
13-04-00	18:58	XBT deployed.			
14-04-00	02:12	XBT deployed.	34 08.2S	48 17.4W	7
	07:10	XBT deployed.	33 22.3S	47 32.7W	7
	13:26	XBT deployed.	32 32.5S	46 37.3W	7
	19:36	XBT deployed.	31 33.8S	45 35.1W	7
15-04-00	01:10	XBT deployed.	30 43.4S	44 44.5W	7
	07:02	XBT deployed.	29 48.9S	43 48.1W	7
	13:22	XBT deployed.	29 02.3S	43 00.5W	7
	19:15	XBT deployed.	28 09.8S	42 08.4W	7
16-04-00	01:00	XBT deployed.	27 18.2S	41 17.1W	7
	07:00	XBT deployed.	26 24.8S	40 24.4W	7
	13:02	XBT deployed.	25 33.6S	39 34.6W	7
	20:22	XBT deployed.	24 45.4S	38 48.0W	7
17-04-00	01:00	XBT deployed.	24 03.6S	38 07.4W	7
	06:55	XBT deployed.	23 05.1S	37 24.7W	7
	13:10	XBT deployed.	22 13.8S	36 49.7W	7
	19:28	XBT deployed.	21 07.5S	36 05.1W	7
18-04-00	01:12	XBT deployed.	20 07.7S	35 29.0W	7
	09:30	XBT deployed.	18 36.1S	34 44.4W	7
	14:30	XBT deployed.	18 04.8S	34 29.9W	7
	23:02	XBT deployed.	16 31.4S	33 44.8W	7
19-04-00	00:20	XBT deployed.	16 17.5S	33 38.3W	7
	08:06	XBT deployed.	14 52.9S	32 57.9W	7
	13:15	XBT deployed.	14 09.3S	32 38.6W	7
	21:03	XBT deployed.	14 09.3S	32 38.6W	7
20-04-00	01:03	XBT deployed.	14 09.3S	32 38.6W	7
	05:13	XBT deployed.	14 09.3S	32 38.6W	7
	09:31	XBT deployed.	14 09.3S	32 38.6W	7
	13:10	XBT deployed.	10 16.5S	30 50.0W	7
	17:24	XBT deployed.	9 31.6S	30 27.6W	7
	21:05	XBT deployed.	8 51.0S	30 08.8W	7
21-04-00	01:49	XBT deployed.	7 59.7S	29 45.1W	7
	04:20	XBT deployed.	7 32.4S	29 32.6W	7
	09:08	XBT deployed.	6 39.4S	29 08.2W	7
	12:11	XBT deployed.	6 18.7S	28 59.2W	7
	16:05	XBT deployed.	5 36.1S	28 39.1W	7
	20:15	XBT deployed.	4 51.0S	28 18.2W	7
22-04-00	00:05	XBT deployed.	4 09.0S	27 59.0W	7
	04:25	XBT deployed.	3 22.6S	27 37.6W	7
	08:40	XBT deployed.	2 37.0S	27 16.6W	7
	12:11	XBT deployed.	2 11.9S	27 05.4W	7
	16:51	XBT deployed.	1 21.6S	26 42.4W	7
	19:48	XBT deployed.	0 45.8S	26 29.0W	7
23-04-00	00:06	XBT deployed.	0 01.8S	27 06.0W	7
	03:00	XBT deployed.	0 40.3N	25 47.7W	7
	08:36	XBT deployed.	1 30.9N	25 25.8W	7
	12:12	XBT deployed.	1 59.3N	25 14.9W	7
	16:19	XBT deployed.	2 43.8N	24 54.4W	7
	20:00	XBT deployed.	3 23.9N	24 36.9W	7
24-04-00	00:05	XBT deployed.	4 08.7N	24 17.6W	7
	04:22	XBT deployed.	4 54.9N	23 57.6W	7
	08:44	XBT deployed.	5 42.9N	23 36.7W	7
24-04-00	12:12	XBT deployed.	6 08.3N	23 26.1W	7
	20:32	XBT deployed.	7 39.4N	22 46.1W	7
25-04-00	00:12	XBT deployed.	8 18.0N	22 28.8W	7
	04:00	XBT deployed.	8 59.0N	22 11.5W	7
	08:01	XBT deployed.	9 42.2N	21 52.5W	7
	12:06	XBT deployed.	10 13.0N	21 39.3W	7

Date	Time	Remarks	Latitude	Longitude	Type
	16:45	XBT deployed.	11 02.3N	21 17.5W	7
	20:04	XBT deployed.	11 36.9N	21 02.0W	7
	06:08	XBT deployed.	13 11.1N	20 28.6W	7
	10:15	XBT deployed.	13 57.7N	20 33.3W	7
	13:53	XBT deployed.	14 40.7N	20 37.5W	7
	18:30	XBT deployed.	15 33.3N	20 42.9W	7
	22:08	XBT deployed.	16 15.7N	20 47.0W	7
27-04-00	05:38	XBT deployed.	17 40.2N	20 55.8W	5
	10:00	XBT deployed.	18 30.7N	21 01.0W	7
	14:00	XBT deployed.	19 14.1N	21 05.2W	7
	15:00	XBT deployed.	19 36.5N	21 07.9W	7
	19:20	XBT deployed.	20 06.3N	21 10.6W	7
	23:35	XBT deployed.	20 51.1N	21 15.4W	7
	03:40	XBT deployed.	21 34.0N	21 19.8W	7
	07:40	XBT deployed.	22 19.3N	21 24.4W	7
	11:20	XBT deployed.	23 02.7N	21 29.2W	7
	16:26	XBT deployed.	23 46.1N	21 33.8W	7
	20:56	XBT deployed.	24 43.4N	21 39.5W	7
	23:51	XBT deployed.	25 21.0N	21 43.7W	7
29-04-00	05:00	XBT deployed.	26 27.8N	21 51.2W	7
	08:08	XBT deployed.	27 08.7N	21 55.3W	7
	11:04	XBT deployed.	27 32.3N	21 57.0W	7
	15:45	XBT deployed.	28 20.6N	21 11.0W	5
	19:32	XBT deployed.	29 00.3N	20 31.9W	7
	23:57	XBT deployed.	29 47.1N	19 45.8W	7
30-04-00	04:54	XBT deployed.	30 39.0N	18 54.0W	7
	08:21	XBT deployed.	31 14.7N	18 18.1W	7
	09:55	XBT deployed.	31 30.5N	18 02.6W	7
	23:22	XBT deployed.	33 17.0N	17 48.9W	5
01-05-00	03:12	XBT deployed.	33 49.0N	18 14.4W	5
	08:21	XBT deployed.	34 39.0N	18 53.8W	5
	13:13	XBT deployed.	35 30.8N	19 36.1W	7
	23:06	XBT deployed	36 58.7N	19 59.0W	5
02-05-00	01:38	XBT deployed	37 29.0N	20 00.2W	7
	05:12	XBT deployed	37 56.9N	20 00.3W	7
	08:14	XBT deployed	38 33.4N	20 00.1W	5
	11:12	XBT deployed	38 52.5N	20 00.5W	5
	15:52	XBT deployed	39 44.5N	20 00.0W	7
	19:55	XBT deployed	40 32.4N	19 59.9W	7
03-05-00	01:26	XBT deployed	39 44.5N	20 00.0W	7
	03:33	XBT deployed	40 32.4N	19 59.9W	7
	08:04	XBT deployed	39 44.5N	20 00.0W	7
	11:08	XBT deployed	40 32.4N	19 59.9W	7
	14:45	XBT deployed	39 44.5N	20 00.0W	7
	19:58	XBT deployed	40 32.4N	19 59.9W	7
04-05-00	00:44	XBT deployed	39 44.5N	20 00.0W	7
	02:50	XBT deployed	40 32.4N	19 59.9W	7
	06:33	XBT deployed	46 59.4N	20 01.4W	7
	10:49	XBT deployed	47 11.6N	18 51.0W	7
	15:18	XBT deployed	47 24.2N	17 38.1W	7
	19:14	XBT deployed	47 34.5N	16 37.5W	7
05-05-00	00:27	XBT deployed	47 45.9N	15 28.3W	7
	03:24	XBT deployed	47 53.9N	14 40.7W	7
	07:10	XBT deployed	48 07.5N	13 19.0W	7
05-05-00	09:43	XBT deployed	48 12.6N	12 48.2W	7
	13:23	XBT deployed	48 23.0N	11 44.5W	7
	19:16	XBT deployed	48 40.2N	10 00.5W	7
	23:39	XBT deployed	48 53.2N	08 42.8W	7

APPENDIX 5: Station HPLC Log

Date	Station no (e.g. A10-01)	Time (local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Replicate 1 Vial label	Replicate 1 Volume Filt.	Replicate 1 Leaks (ml)	Replicate 2 Vial Label	Replicate 2 Volume Filt.	Replicate 2 Leaks (ml)
13/4/00	A10-01	15:30	18:30	-35.0867	-42.92467	Surface	A10-01-NT	2.1		A10-01-NT	2.1	
						150	A10-01-150	4.2		A10-01-150	4.2	
						100	A10-01-100	4.2		A10-01-100	3.388	
						75	A10-01-75	2.1		A10-01-75	2.1	
						50	A10-01-50	2.1		A10-01-50	2.1	
						40	A10-01-40	2.1		A10-01-40	2.1	
						25	A10-01-25	2.1		A10-01-25	2.1	
						7	A10-01-7	2.1		A10-01-7	2.1	
15/4/00	A10-02	10:14	12:14	-29.90549	-43.02835	Surface	A10-02-NT	4.2	40	A10-02-NT	4.2	80
						150	A10-02-150	4.2		A10-02-150	4.2	100
						130	A10-02-130	4.2		A10-02-130	4.2	
						105	A10-02-105	4.2		A10-02-105	4.2	
						90	A10-02-90	4.2		A10-02-90	4.2	
						75	A10-02-75	4.2		A10-02-75	4.2	
						60	A10-02-60	4.2		A10-02-45	4.2	
						45	A10-02-45	4.2		A10-02-7	4.2	
						7	A10-02-75					
16/4/00	A10-03	10.15	12:15	-25.6795	-39.69072	Surface	A10-03-NT	4.2	50	A10-03-NT	4.2	50
						150	A10-03-150	4.2		A10-03-150	4.2	
						135	A10-03-135	4.2		A10-03-135	4.2	
						105	A10-03-105	4.2		A10-03-105	4.2	
						90	A10-03-90	4.2		A10-03-90	4.2	
						75	A10-03-75	4.2		A10-03-75	4.2	
						50	A10-03-50	4.2		A10-03-50	4.2	
						40	A10-03-40	4.2		A10-03-40	4.2	
						7	A10-03-7	4.2	100	A10-03-7	4.2	
17/4/00	A10-04	10:00	12:00	-22.25044	-36.84134	Surface	A10-04-NT	4.2		A10-04-NT	4.2	150
						150	A10-04-150	4.2		A10-04-150	4.2	
						90	A10-04-90	4.2		A10-04-90	4.2	
						80	A10-04-80	4.2		A10-04-80	4.2	
						45	A10-04-45	4.2		A10-04-45	4.2	
						35	A10-04-35	4.2		A10-04-35	4.2	
						7	A10-04-7	4.2		A10-04-7	4.2	
18/4/00	A10-05	10:00	12:00	-18.16247	-34.53718	NT	A10-05-NT	4.2		A10-05-NT	4.2	

Date	Station no (e.g. A10-01)	Time (local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Replicate 1 Vial label	Replicate 1 Volume Filt.	Replicate 1 Leaks (ml)	Replicate 2 Vial Label	Replicate 2 Volume Filt.	Replicate 2 Leaks (ml)
						175	A10-05-175	4.2		A10-05-175	4.2	
						150	A0-05-150	4.2		A0-05-150	4.2	
						125	A10-05-125	4.2		A10-05-125	4.2	
						115	A10-05-115	4.2		A10-05-115	4.2	
						100	A10-05-100	4.2		A10-05-100	4.2	
						75	A10-05-75	4.2		A10-05-75	4.2	
						60	A10-05-60	4.2		A10-05-60	4.2	
						55	A10-05-55	4.2		A10-05-55	4.2	
						7	A10-05-7	4.2		A10-05-7	4.2	
19/4/00	A10-06	10:00	12:00	-14.18813	-32.64699	NT	A10-06-NT	4.2	60		4.2	50
						175	A10-06-175	4.2			4.2	
						150	A10-06-150	4.2			4.2	
						135	A10-06-135	4.2			4.2	
						125	A10-06-125	4.2			4.2	
						100	A10-06-100	4.2			4.2	
						65	A10-06-65	4.2			4.2	
						55	A10-06-55	4.2			4.2	
						7	A10-06-7	4.2			4.2	
19/4/00	A10-07	15:05	17:05	-13.51306	-32.32726	7	A10-07-NT	4.2			4.2	
						130	A10-07-130	4.2			4.2	
						100		4.2			4.2	
						25		4.2			4.2	
4/20/00	A10-08	10:00	12:00	-10.28524	-30.8194	7	A10-08-NT	4.2			4.2	
						150		4.2			4.2	
						130		4.2			4.2	
						120		4.2			4.2	
						110		4.2			4.2	
						100		4.2			4.2	
						80		4.2			4.2	
						60		4.2			4.2	
						55		4.2			4.2	
						7		4.2			4.2	
4/21/00	A10-09	10:00	11:00	-6.20665	-28.5926	7	A10-09-NT	4.2			4.2	
						175		4.2			4.2	
						150		4.2			4.2	

Date	Station no. (e.g. A10-01)	Time (local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Replicate 1 Vial label	Replicate 1 Volume Filt.	Replicate 1 Leaks (ml)	Replicate 2 Vial Label	Replicate 2 Volume Filt.	Replicate 2 Leaks (ml)
						125		4.2			4.2	
						105		4.2			4.2	
						95		4.2			4.2	
						80		4.2			4.2	
						70		4.2			4.2	
						55		4.2			4.2	
						7		4.2			4.2	
22/4/00	A10-10	10:00	11:00	-2.2237	-27.0943	7	A10-10-NT	4.2	40		4.2	70
						150		4.2			4.2	
						100		4.2			4.2	18
						60		4.2	5		4.2	10
						55		4.2	2		4.2	10
						50		4.2	50		4.2	23
						35		4.2			4.2	30
						25		4.2	10		4.2	40
						7		4.2			4.2	
4/23/00	A10-11	10:00	11:00	1.9354	-25.2513	NT	A10-11-NT	2.1	45		2.1	
						150		4.2			4.2	
						110		4.2			4.2	
						80		4.2			4.2	
						60		2.1			2.1	5
						55		4.2	20		4.2	17
						45		4.2	10		4.2	7
						35		4.2	50		4.2	200
						30		4.2			4.2	
						7		2.1			2.1	
4/24/00	A10-12	10:00	11:00	6.1005	-23.49	NT	A10-12-NT	4.2	8		4.2	12
						150		4.2	10		4.2	30
						100		4.2	50		4.2	10
						75		4.2	10		4.2	20
						45		4.2	25		4.2	1
						35		2.1	13		2.1	
						25		2.1	60		2.1	15
						20		2.1			2.1	
						7		2.1	65		2.1	

Date	Station no (e.g. A10-01)	Time (local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Replicate 1 Vial label	Replicate 1 Volume Filt.	Replicate 1 Leaks (ml)	Replicate 2 Vial Label	Replicate 2 Volume Filt.	Replicate 2 Leaks (ml)
4/25/00	A10-13	10:00	11:00	10.20865	-21.6513	NT	A10-13-NT	2.1			2.1	
						100		4.2	16		4.2	11
						75		4.2	20		4.2	250
						50		2.1	10		2.1	11
						30		2.1	270		2.1	5
						25		2.1	10		2.1	5
						20		2.1	25		2.1	70
						15		2.1	13		2.1	25
						7		2.1	40		2.1	
4/25/00	A10-14	midnight	1:00	12.466	-20.655	NT	A10-14-NT	2.1			2.1	
						75		2.1			2.1	
						55		2.1	15		2.1	25
						47		2.1			2.1	
						40		2.1	15		2.1	20
						7		2.1			2.1	
4/28/00	A10-15	14.55	14.55	23.695	-21.5578	NT	A10-15-NT	4.2	68		4.2	58
						175		4.2	6		4.2	11
						125		4.2	2		4.2	30
						95		4.2	390		4.2	
						80		4.2	18		4.2	30
						75		4.2	20		4.2	30
						70		4.2	6		4.2	9
						40		4.2	3		4.2	3
						7		4.2	13		4.2	
4/29/00	A10-16	10:00	10:00	27.537	-21.972	NT	A10-16-NT	4.2	24		4.2	22
						175		4.2	15		4.2	
						130		4.2	25		4.2	10
						120		4.2	100		4.2	10
						107		4.2	25			NO FILTER
						95		4.2			4.2	50
						80		4.2	20		4.2	15
						53		4.2	180		4.2	13
						7		4.2			4.2	
5/1/00	A10-17	16:00	16:00	35.997	-20.001	NT	A10-17-NT	2.1	6		2.1	2
						7		2.1	2		2.1	2.5

Date	Station no.	Time	Time	Latitude	Longtitude	Depth	Replicate 1	Replicate 1	Replicate 1	Replicate 2	Replicate 2	Replicate 2
	(e.g. A10-01)	(local)	(GMT)			(m)	Vial label	Volume Filt.	Leaks (ml)	Vial Label	Volume Filt.	Leaks (ml)
						20		2.1	125		2.1	
						30		2.1	2		2.1	11
						40		2.1			2.1	5
						60		2.1	10		2.1	15
						75		4.2	20		4.2	10
						100		4.2	15		4.2	30
						150		4.2	23		4.2	0
5/1/00	A10-18	22:00	22:00	36.961	-19.994	NT	A10-18-NT	2.1	6		2.1	6
						7		2.1	3		2.1	15
						20		2.1	7		2.1	5
						30		2.1	30		2.1	2
						40		2.1	10.5		2.1	
						60		2.1	7		2.1	1
						75		4.2	15		4.2	7
						100		4.2	60		4.2	4
						150		4.2	12		4.2	25
5/2/00	A10-19	4:00	4:00			NT	A10-19-NT	2.1	15		2.1	10
						9		2.1	10		2.1	
						23		2.1	20		2.1	
						35		2.1	5		2.1	
						51		2.1			2.1	
						71		2.1			2.1	
4/2/00	A10-20	10:00	10:00	38.8767	-19.999	NT	A10-20-NT	2.1	1		2.1	6
						7		2.1			2.1	
						15		2.1	10		2.1	10
						30		2.1			2.1	
						40		2.1	12		2.1	14
						60		2.1	22		2.1	2
						90		4.2			4.2	
						125		4.2	400		4.2	
						150		4.2			4.2	5
5/3/00	A10-21	5:22	5:22	47	-20	NT	A10-21-NT	2.1	13		2.1	12
						7		2.1	5		2.1	15
						20		2.1	5		2.1	15
						35		2.1	40		2.1	20

Date	Station no (e.g. A10-01)	Time (local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Replicate 1 Vial label	Replicate 1 Volume Filt.	Replicate 1 Leaks (ml)	Replicate 2 Vial Label	Replicate 2 Volume Filt.	Replicate 2 Leaks (ml)
						50		2.1	7		2.1	15
						61		2.1	5		2.1	2
						77		4.2	15		4.2	15
						89		4.2	35		4.2	30
						137		4.2	8		4.2	30
5/5/00	A10-22	10:00	9:00	48.7	-12.83	NT	A10-22-NT					
						7		2.1	25		2.1	12
						20		1			1	
						30		1			1	
						40		1			1	
						50		1	57		1	
						75		1	1		1	15
5/6/00	A10-23	10:00	9:00	49.324	-6.0106	NT	A10-23-NT	2.1			2.1	
						100		1			1	
						90		1			1	
						80		1			1	
						70		1			1	
						60		1			1	
						50		1			1	
						40		1			1	
						30		1			1	
						20		1			1	
						15		1			1	
						7		1			1	

APPENDIX 6: Underway HPLC Log

Date	Time		Position		Repl. A	Vol.	Leaks	Repl. B	Vol.	Leaks	Chla conc.
	local	GMT	Lat	Long		Filt'd			Filt'd		
13/4/00	13:05	16:03	-35.11	-49.88	A10-uw-01	2.1		A10-uw-01	2.1		0.166
13/4/00	19:00	22:00	-34.70	-48.95	A10-uw-02	2.1		A10-uw-02	2.1		0.1388
13/4/00	23:00	2:00	-34.17	-48.95	A10-uw-03	4.2		A10-uw-03	4.2		0.152
14/4/00	4:05	6:05	-33.54	-49.70	A10-uw-04	4.2		A10-uw-04	4.2		0.1836
14/4/00	8:00	10:00	-32.96	-47.07	A10-UW-32.1	4.2		A10-uw-05	4.2		0.1926
14/4/00	12:00	14:00	-32.44	-46.51	A10-uw-06	4.2		A10-uw-06	4.2		0.1968
14/4/00	14:30	16:30	-32.04	-46.09	A10-TAG-01	2.1	100	A10-TAG-01	2.1		0.212
14/4/00	16:00	18:00	-31.81	-45.84	A10-uw-07	4.2	70	A10-uw-07	4.2	40	0.204
14/4/00	20:00	22:00	-31.21	-45.23	A10-uw-08	4.2	90	A10-uw-08	4.2		0.2
14/4/00	22:00	0:00	-30.92	-44.93	A10-uw-09	4.2	45	A10-uw-09	4.2	25	0.1808
15/4/00	0:00	2:00	-30.60	-44.61	A10-uw-10	4.2		A10-uw-10	4.2		0.1872
15/4/00	4:00	6:05	-30.00	-43.97	A10-uw-11	4.2	25	A10-uw-11	4.2	50	0.1748
15/4/00	8:00	10:00	-29.35	-43.36	A10-uw-12	4.2	40	A10-uw-12	4.2	10	0.1444
15/4/00	13:00	15:00	-28.79	-42.77	A10-uw-13	4.2	60	A10-uw-13	4.2	770	0.238
15/4/00	16:00	18:00	-28.35	42.33	A10-uw-14	4.2	110	A10-uw-14	4.2	100	0.178
15/4/00	20:00	22:00	-27.53	-41.73	A10-uw-15	4.2	70	A10-uw-15	4.2	110	0.1784
16/4/00	0:00	2:00	-27.16	-41.14	A10-uw-16	4.2	50	A10-uw-16	4.2	25	0.1324
16/4/00	4:00	6:00	-26.56	-40.55	A10-uw-17	4.2	25	A10-uw-17	4.2	50	0.1568
16/4/00	8:00	10:00	-25.95	-40.00	A10-uw-18	4.2	40	A10-uw-18	4.2		0.1148
16/4/00	14:00	14:00	-25.41	-39.43	A10-uw-19	4.2	90	A10-uw-19	4.2	60	0.1012
4/16/00	16:00	18:00	-25.11	-39.14	A10-uw-20	4.2	50	A10-uw-20	4.2	40	0.1008
16/4/00	20:00	22:00	-24.52	-38.56	A10-uw-21	4.2	50	A10-uw-21	4.2		0.0876
17/4/00	0:00	2:00	-23.92	-37.98	A10-uw-22	4.2	6	A10-uw-22	4.2	8.5	0.104
17/4/00	4:00	6:00	-23.23	-37.52	A10-uw-23	4.2	50	A10-uw-23	4.2	40	0.0848
17/4/00	8:00	10:00	-23.27	-37.06	A10-uw-24	4.2	170	A10-uw-24	4.2	100	0.1084
17/4/00	12:07	14:07	-22.06	-36.72	A10-uw-25	4.2	60	A10-uw-25	4.2		0.0872
17/4/00	16:01	18:01	-21.14	-36.26	A10-uw-26	4.2		A10-uw-26	4.2		0.1352
17/4/00	20:00	22:00	-20.69	-35.79	A10-uw-27	4.2		A10-uw-27	4.2		0.0832
18/4/00	0:00	2:00	-19.99	-35.42	A10-UW-28	4.2	100	A10-UW-28	4.2	250	0.194
18/4/00	4:00	6:00	-19.20	-35.03	A10-UW-29	4.2	150	A10-UW-29	4.2	50	0.1256
18/4/00	8:00	10:01	-18.51	-34.69	A10-UW-30	4.2	50	A10-UW-30	4.2	50	0
18/4/00	9:00	11:00	-18.26	-34.57	A10-UW-31	4.2		A10-UW-31	4.2		0
18/4/00	16:00	18:00	-17.44	-34.19	A10-UW-32	4.2	230	A10-UW-32	4.2	50	0.0944
18/4/00	20:00	22:00	-16.71	-33.84	A10-UW-33	4.2	40	A10-UW-33	4.2	10	0.05616
19/4/00	0:00	2:00	-15.98	-33.49	A10-UW-34	4.2		A10-UW-34	4.2		0.06624
19/4/00	4:00	6:00	-15.26	-33.15	A10-UW-36	4.2		A10-UW-36	4.2		0
19/4/00	8:00	10:00	-14.53	-32.80	A10-UW-37	4.2	40	A10-UW-37	4.2	60	0.0824
19/4/00	14:00	16:00	-13.67	-32.40	A10-UW-38	4.2	50	A10-UW-38	4.2		0.04176
19/4/00	20:00	22:00	-12.80	-31.98	A10-UW-39	4.2	60	A10-UW-39	4.2	80	0.03638
20/4/00	0:00	2:00	-12.08	-31.17	A10-UW-40	4.2	50	A10-UW-40	4.2	40	0.05032
20/4/00	4:00	6:00	-22.35	-31.31	A10-UW-41	4.2	60	A10-UW-41	4.2	10	0.04896
20/4/00	6:00	8:00	-10.99	-31.13	A10-UW-42	4.2		A10-UW-42	4.2		0.06264
20/4/00	8:00	10:00	-10.06	-30.97	A10-UW-43	4.2		A10-UW-43	4.2		0.07038
20/4/00	13:00	15:00	-9.96	-30.07	A10-UW-44	4.2	40	A10-UW-44	4.2	50	0.09036
20/4/00	15:00	17:00	-9.60	-30.50	A10-UW-45	4.2		A10-UW-45	4.2	50	0.0864
20/4/00	17:00	19:00	-9.23	-30.33	A10-UW-46	4.2		A10-UW-46	4.2		0.06012
20/4/00	19:00	21:00	-9.86	-30.13	A10-UW-47	4.2		A10-UW-47	4.2		0.04968
20/4/00	21:00	23:00	-9.84	-29.98	A10-UW-48	4.2		A10-UW-48	4.2		0.06336
20/4/00	23:00	1:00	-8.14	-29.82	A10-UW-49	4.2		A10-UW-49	4.2		0.04794
21/4/00	2:00	3:00	-7.74	-29.82	A10-UW-50	4.2	7	A10-UW-50	4.2	18.5	0.0425
21/4/00	5:00	6:00			A10-UW-51	4.2	14.5	A10-UW-51	4.2	8.5	0.05796
21/4/00	6:00	7:00			A10-UW-52	4.2		A10-UW-52	4.2		0.0703
21/4/00	8:00	9:00	-6.48	-29.09	A10-UW-53	4.2		A10-UW-53	4.2		0.021888

Date	Time		Position		Repl. A	Vol.	Leaks	Repl. B	Vol.	Leaks	Chla conc.
	local	GMT	Lat.	Long.		Filt'd			Filt'd		
21/4/00	10:00	11:00			A10-UW-54	4.2		A10-UW-54	4.2		0
21/4/00	12:00	13:00	-6.17	-28.91	A10-UW-55	4.2		A10-UW-55	4.2		0.06656
21/4/00	14:05	15:05	-5.79	-28.73	A10-UW-56	4.2		A10-UW-56	4.2		0.06004
21/4/00	16:05	16:05	-5.43	-28.57	A10-UW-57	4.2		A10-UW-57	4.2		0.06536
21/4/00	18:05	18:05	-5.08	-28.84	A10-UW-58	4.2		A10-UW-58	4.2		0.10716
21/4/00	20:00	21:00	-4.71	-28.24	A10-UW-59	4.2	5	A10-UW-59	4.2	20	0.08968
21/4/00	22:00	23:00	-4.35	-28.07	A10-UW-60	4.2	10	A10-UW-60	4.2	10	0.1482
21/4/00	0:00	1:00	-3.99	-27.91	A10-UW-61	4.2	5	A10-UW-61	4.2	20	0.24358
22/4/00	2:00	3:00	-3.63	-27.75	A10-UW-62	4.2	10	A10-UW-62	4.2	15	0.5206
22/4/00	4:00	5:00	-3.27	-27.76	A10-UW-63	4.2	25	A10-UW-63	4.2	50	0.38
22/4/00	6:00	7:00	#####	-27.74	A10-UW-64	4.2		A10-UW-64	4.2		0.28234
22/4/00	8:00	9:00	-2.35	-27.25	A10-UW-65	4.2		A10-UW-65	4.2		0.19836
					A10-UW-66	4.2	40	A10-UW-66	4.2	25	0.18582
22/4/00	10:00	11:00	-2.06	-27.02	A10-UW-67	4.2		A10-UW-67	4.2		0.13908
22/4/00	12:00	13:00	-1.70	-26.86	A10-UW-68	4.2		A10-UW-68	4.2		0.17138
22/4/00	14:00	15:00	-1.33	-26.61	A10-UW-69	4.2		A10-UW-69	4.2		0.1121
22/4/00	16:00	17:00	-0.97	-26.53	A10-UW-70	4.2		A10-UW-70	4.2		0.12236
22/4/00	18:00	19:00	-0.59	-26.29	A10-UW-71	4.2		A10-UW-71	4.2		0.1197
22/4/00	20:00	21:00	-0.22	-26.19	A10-UW-72	4.2	25	A10-UW-72	4.2	370	0.07486
22/4/00	22:00	23:00	0.14	-26.02	A10-UW-73	2.1	4.5	A10-UW-73	2.1	25	0.08398
23/4/00	0:00	1:00	0.05	-25.87	A10-UW-74	2.1	7.5	A10-UW-74	2.1	2	0.1311
23/4/00	2:00	3:00	0.90	-25.70	A10-UW-75	2.1	5.5	A10-UW-75	2.1	3.5	0.114
23/4/00	6:00	7:00	1.22	-25.56	A10-UW-76	2.1	30	A10-UW-76	2.1	11	0.15884
23/4/00	8:00	9:00	1.59	-25.40	A10-UW-77	2.1	12	A10-UW-77	2.1	30	0.13946
23/4/00	12:00	13:00	2.13	-25.18	A10-UW-78	2.1		A10-UW-78	2.1	15	0.08136
23/4/00	14:00	15:00	2.49	-25.01	A10-UW-79	2.1	8	A10-UW-79	2.1		0.08604
23/4/00	16:00	17:00	2.85	-24.59	A10-UW-80	2.1	13	A10-UW-80	2.1	10.5	0
23/4/00	18:00	19:00	3.23	-24.69	A10-UW-82	2.1	50	A10-UW-82	2.1	17	0
23/4/00	20:00	21:00	3.58	-24.45	A10-UW-83	2.1	11	A10-UW-83	2.1	20	0.07104
23/4/00	22:00	23:00	3.94	-24.38	A10-UW-84	2.1		A10-UW-84	2.1		0.09864
23/4/00	0:00	1:00	4.31	-24.22	A10-UW-85	2.1	87	A10-UW-85	2.1	12	0.09728
24/4/00	2:00	3:00	4.41	-24.04	A10-UW-86	2.1	46	A10-UW-86	2.1	18	0.12024
24/4/00	4:00	5:00	5.01	-23.55	A10-UW-87	2.1	10.5	A10-UW-87	2.1	105	0.16606
24/4/00	6:00	7:00	5.40	-23.75	A10-UW-88	2.1	15	A10-UW-88	2.1		0.12138
24/4/00	8:00	9:00	5.76	-23.59	A10-UW-89	2.1	13	A10-UW-89	2.1	25	0.12064
24/4/00	12:00	13:00	6.28	-23.37	A10-UW-90	2.1	16.5	A10-UW-90	2.1	15	0.11248
24/4/00	14:00	15:00	6.65	-23.20	A10-UW-91	2.1	45	A10-UW-91	2.1	11	0.13212
24/4/00	16:00	17:00	7.01	-23.04	A10-UW-92	2.1	35	A10-UW-92	2.1	25	0.1428
24/4/00	18:00	19:00	7.37	-22.89	A10-UW-93	2.1	9.5	A10-UW-93	2.1	22.5	0.1332
24/4/00	20:00	21:00	7.74	-22.73	A10-UW-94	2.1	90	A10-UW-94	2.1	7	0.12084
24/4/00	22:00	23:00	8.09	-22.58	A10-UW-95	2.1	9.5	A10-UW-95	2.1	7.5	0.11304
24/4/00	0:00	1:00	8.46	-22.43	A10-UW-96	2.1	5	A10-UW-96	2.1	18.5	0.11196
25/4/00	2:00	3:00	8.79	-22.69	A10-UW-97	2.1	3.5	A10-UW-97	2.1	5.5	0.1026
25/4/00	4:00	5:00	9.15	-22.11	A10-UW-98	2.1	50	A10-UW-98	2.1	10	0.10188
25/4/00	6:00	7:00	9.52	-21.60	A10-UW-99	2.1		A10-UW-99	2.1	26	0.13946
25/4/00	8:00	9:00	9.88	-21.80	A10-UW-100	2.1	20	A10-UW-100	2.1	20	0.188
25/4/00	12:00	13:00	10.21	-21.65	A10-UW-101	2.1	20	A10-UW-101	2.1	45	0.1656
25/4/00	14:00	15:00	10.71	-21.43	A10-UW-102	2.1	20	A10-UW-102	2.1	15	0.1636
25/4/00	16:00	17:00	11.05	-21.16	A10-UW-103	2.1	21	A10-UW-103	2.1		0.2356
25/4/00	18:00	19:00	11.43	-21.12	A10-UW-106	2.1		A10-UW-106	2.1		0.096
25/4/00	20:00	21:00	11.78	-20.96	A10-UW-107	2.1		A10-UW-107	2.1		0.1708
25/4/00	22:00	23:00			A10-UW-108	2.1		A10-UW-108	2.1	860	0.0884
					A10-UW-109	2.1	1000	A10-UW-109	2.1		0.20952

Date	Time		Position		Repl. A	Vol.	Leaks	Repl. B	Vol.	Leaks	Chla conc.
	local	GMT	Lat.	Long.		Filt'd			Filt'd		
26/4/00	2:00	3:00	12.66	-20.57	A10-UW-110	2.1		A10-UW-110	2.1	20	0.16416
26/4/00	4:00	5:00	12.99	-20.46	A10-UW-111	2.1	14	A10-UW-111	2.1	12	0.14688
26/4/00	6:00	7:00	13.35	-20.49	A10-UW-112	2.1	15	A10-UW-112	2.1	7	0.21168
26/4/00	8:00	9:00	13.72	-20.53	A10-UW-113	2.1	7.5	A10-UW-113	2.1	3	0.4864
26/4/00	12:21	13:21	14.57	-20.61	A10-UW-114	2.1	6	A10-UW-114	2.1	11	0
26/4/00	14:00	15:00	14.90	-20.65	A10-UW-115	2.1	8	A10-UW-115	2.1	2	0
26/4/00	16:40	17:40	15.40	-20.70	A10-UW-116	2.1	2	A10-UW-116	2.1	20	0.12128
26/4/00	20:05	21:05	16.01	-20.77	A10-UW-117	2.1	50	A10-UW-117	2.1	150	0.15436
26/4/00	22:00	23:00	16.42	-20.80	A10-UW-118	2.1	60	A10-UW-118	2.1	156	0.153
26/4/00	23:55	0:55	16.80	-20.08	A10-UW-120	2.1		A10-UW-120	2.1	2	0.15372
27/4/00	2:00	3:00	17.21	-20.88	A10-UW-121	2.1	5	A10-UW-121	2.1	10	0.24776
27/4/00	4:00	5:00	17.55	-20.92	A10-UW-122	2.1	8	A10-UW-122	2.1	10	0.17244
27/4/00	6:00	7:00	17.93	-20.96	A10-UW-123	2.1	5	A10-UW-123	2.1	8	0.16834
27/4/00	8:00	9:00	18.32	-21.00	A10-UW-124	2.1	7	A10-UW-124	2.1	15	0.4148
27/4/00	10:00	11:00	18.69	-21.03	A10-UW-125	1.75	12	A10-UW-125	1.75	6	0.6912
27/4/00	12:00	13:00	19.05	-21.01	A10-UW-126	2.1	29.5	A10-UW-126	2.1	15.5	0.5338
27/4/00	14:00	15:00	19.40	-21.11	A10-UW-127	1.55	18.5	A10-UW-127	1.55	10	0.5814
27/4/00	16:00	17:00	19.71	-21.14	A10-UW-128	2.1		A10-UW-128	2.1	15	0.5256
27/4/00	18:00	19:00	20.64	-21.17	A10-UW-129	2.1	5	A10-UW-129	2.1	30	0.6048
27/4/00	20:00	21:00	20.40	-21.21	A10-UW-130	2.1	10	A10-UW-130	2.1	10	0.4556
27/4/00	22:00	23:00	20.50	-21.24	A10-UW-131	2.1	100	A10-UW-131	2.1	25	0.29808
28/4/00	0:00	2:00	20.21	-21.30	A10-UW-132	2.1	10	A10-UW-132	2.1	40	0.26964
28/4/00	2:00	4:00	21.62	-21.34	A10-UW-133	2.1		A10-UW-133	2.1	25	0.14832
28/4/00	4:00	4:00	22.00	-21.38	A10-UW-134	2.1	25	A10-UW-134	2.1	11	0.14148
28/4/00	6:00	6:00	22.24	-21.14	A10-UW-135	4.2	10	A10-UW-135	4.2	56	0.16164
28/4/00	8:00	8:00	22.77	-21.46	A10-UW-136	4.2	28	A10-UW-136	4.2	32	0.14472
28/4/00	10:00	10:00	23.17	#####	A10-UW-137	4.2	67	A10-UW-137	4.2	10	0.12492
28/4/00	12:00	12:00	23.57	-21.54	A10-UW-138	4.2		A10-UW-138	4.2	60	0.18
28/4/00	14:00	14:00	24.11	-21.60	A10-UW-139	4.2	100	A10-UW-139	4.2	50	0.14364
28/4/00	18:00	18:00	24.15	-21.64	A10-UW-140	4.2	50	A10-UW-140	4.2	20	0.10872
28/4/00	20:00	20:00	24.95	-21.69	A10-UW-141	4.2	22	A10-UW-141	4.2		0.07336
28/4/00	22:00	22:00	25.38	-21.73	A10-UW-143	4.2	90	A10-UW-143	4.2		0.152
29/4/00	0:00	0:00	25.83	-21.78	A10-UW-144	4.2	90	A10-UW-144	4.2		0.09396
29/4/00	2:00	2:00	26.22	-21.82	A10-UW-145	4.2		A10-UW-145	4.2		0.12138
29/4/00	4:00	4:00	26.63	-21.87	A10-UW-146	4.2	43	A10-UW-146	4.2	40	0.13032
29/4/00	6:00	6:00	27.13	-21.92	A10-UW-147	4.2	96	A10-UW-147	4.2	18	0.10872
29/4/00	8:00	8:00	28.04	-21.48	A10-UW-148	4.2	12	A10-UW-148	4.2	9	0.1037
29/4/00	14:00	14:00	28.38	-21.11	A10-UW-149	4.2		A10-UW-149	4.2		0.08058
29/4/00	16:00	16:00	28.74	-20.79	A10-UW-150	4.2		A10-UW-150	4.2		0.08262
29/4/00	18:00	18:00	29.09	-20.47	A10-UW-151	4.2	22.5	A10-UW-151	4.2	21	0.09252
29/4/00	20:00	20:00	29.44	-20.01	A10-UW-152	4.2	10.5	A10-UW-152	4.2	5.5	0.05688
30/4/00	22:00	22:00	29.79	-19.76	A10-UW-153	4.2	7	A10-UW-153	4.2	9	0.0666
30/4/00	0:00	0:00	30.16	-19.40	A10-UW-154	4.2	12.5	A10-UW-154	4.2	12	0.06156
30/4/00	2:00	2:00	30.49	-19.06	A10-UW-155	4.2	18.5	A10-UW-155	4.2	21.5	0.06726
30/4/00	4:00	4:00	30.89	-18.67	A10-UW-156	4.2	15	A10-UW-156	4.2	7	0.08028
30/4/00	6:00	6:00	31.18	-18.37	A10-UW-157	4.2	1	A10-UW-157	4.2	25	0.0931
1/5/00	8:00	8:00	33.37	-17.88	A10-UW-158	4.2	2	A10-UW-158	4.2	10	0.1159
1/5/00	2:00	2:00	33.63	-18.10	A10-UW-159	4.2	10	A10-UW-159	4.2		0.17822
1/5/00	4:00	4:00	33.93	-18.33	A10-UW-160	4.2		A10-UW-160	4.2		0.22876
1/5/00	6:00	6:00	34.25	-18.58	A10-UW-161	4.2	75	A10-UW-161	4.2		0.2242
1/5/00	8:00	8:00	34.59	-18.85	A10-UW-162	4.2		A10-UW-162	4.2	5	0.22762
1/5/00	10:00	10:00	34.94	-19.14	A10-UW-163	2.1	50	A10-UW-163	2.1		0.2603
1/5/00	12:00	12:00	35.29	-19.42	A10-UW-164	2.1	7	A10-UW-164	2.1	15	0.437

Date	Time		Position		Repl. A	Vol.	Leaks	Repl. B	Vol.	Leaks	Chla conc.
	local	GMT	Lat.	Long.		Filt'd			Filt'd		
1/5/00	14:00	14:00	35.67	-19.73	A10-UW-165	2.1	25	A10-UW-165	2.1	5	0.437
1/5/00	19:00	19:00	36.39	-20.00	A10-UW-166	2.1	9.5	A10-UW-166	2.1	9	0.399
2/5/00	0:55	0:55	37.34	-20.00	A10-UW-167	2.1	7	A10-UW-167	2.1		0.6304
2/5/00	7:00	7:00	38.30	-20.00	A10-UW-168	2.1	7	A10-UW-168	2.1		0.4788
2/5/00	12:00	12:00	39.00	-20.01	A10-UW-169	2.1	5	A10-UW-169	2.1	3	0.5054
2/5/00	14:00	14:00	39.38	-20.00	A10-UW-170	2.1	8	A10-UW-170	2.1	6.5	0.6384
2/5/00	16:00	16:00	39.98	-20.00	A10-UW-171	2.1	11	A10-UW-171	2.1	10	0.4794
2/5/00	18:00	18:00	40.14	-20.00	A10-UW-172	2.1	6	A10-UW-172	2.1	13.5	0.57
2/5/00	20:00	20:00	40.55	-20.00	A10-UW-173	2.1	4	A10-UW-173	2.1	4	0.448
2/5/00	22:00	22:00	40.93	-20.00	A10-UW-174	2.1	8	A10-UW-174	2.1	6	0.6878
3/5/00	0:00	0:00	41.32	-20.00	A10-UW-175	2.1	6	A10-UW-175	2.1	11	0.684
3/5/00	2:00	2:00	41.72	-20.00	A10-UW-176	2.1		A10-UW-176	2.1	3	0.646
3/5/00	4:00	4:00	42.11	-20.00	A10-UW-177	2.1	15	A10-UW-177	2.1		0.722
3/5/00	6:00	6:00	42.46	-20.00	A10-UW-178	2.1		A10-UW-178	2.1		0.7144
3/5/00	8:00	8:00	42.90	-20.00	A10-UW-179	2.1		A10-UW-179	2.1		0.8064
3/5/00	10:00	10:00	43.28	-20.00	A10-UW-180	2.1	20	A10-UW-180	2.1		0.92
3/5/00	12:00	12:00	43.67	-20.00	A10-UW-181	2.1	15	A10-UW-181	2.1		0.956
3/5/00	14:00	14:00	44.08	-20.00	A10-UW-182	2.1	55	A10-UW-182	2.1	10	0.78
3/5/00	16:00	16:00	44.47	-20.00	A10-UW-183	2.1	20	A10-UW-183	2.1	20	0.652
3/5/00	18:00	18:00	44.83	-20.00	A10-UW-184	2.1	9	A10-UW-184	2.1	50	0.612
3/5/00	17:50	17:50	45.25	-20.00	A10-UW-185	10	10	A10-UW-185	2.1	23	0.3708
3/5/00	22:00	22:00	45.64	-20.00	A10-UW-186	18		A10-UW-186	2.1	0	0.7812
4/5/00	0:00	0:00	46.04	-20.00	A10-UW-187	6		A10-UW-187	2.1	4	0.5184
4/5/00	2:00	1:00	46.25	-20.00	A10-UW-188	6		A10-UW-188	2.1	5	0.9452
4/5/00	4:00	3:00	46.64	-20.00	A10-UW-189	5		A10-UW-189	2.1	5	0.9144
4/5/00	6:00	5:00			A10-UW-190	10		A10-UW-190	2.1	15	0.9108
4/5/00	8:00	7:00	47.00	-19.99	A10-UW-191	30		A10-UW-191	2.1	5	0.396
4/5/00	10:00	9:00	47.08	-19.36	A10-UW-192	23		A10-UW-192	2.1	9	0.5256
4/5/00	12:00	11:00	47.20	-18.79	A10-UW-193	18		A10-UW-193	2.1	7	0.4832
4/5/00	14:00	13:00	47.29	-18.30	A10-UW-194	5.5		A10-UW-194	2.1	13	0.4832
4/5/00	16:00	15:00	47.39	-17.71	A10-UW-195	2.1		A10-UW-195	2.1	4	1.8672
4/5/00	18:00	17:00	47.46	-17.24	A10-UW-196	12		A10-UW-196	2.1	6	0.5928
4/5/00	17:50	16:50	47.56	-16.69	A10-UW-197	6		A10-UW-197	2.1	8	1.4782
4/5/00	22:00	21:00	47.64	-26.23	A10-UW-198	4		A10-UW-198	2.1	9	1.197
5/5/00	0:00	23:00	47.73	-15.68	A10-UW-199	10		A10-UW-199	2.1	7	0.8436
5/5/00	2:00	1:00	47.81	-15.19	A10-UW-200	103		A10-UW-200	2.1	13	1.9038
5/5/00	4:00	3:00	47.93	-14.50	A10-UW-201	21.5		A10-UW-201	2.1	30	2.603
5/5/00	6:00	5:00	46.02	-13.94	A10-UW-202	3		A10-UW-202	2.1	13	1.9912
5/5/00	8:00	7:00	48.11	-13.42	A10-UW-203	1.5		A10-UW-203	2.1	4	1.197
5/5/00	10:00	9:00	48.26	-12.46	A10-UW-204	2		A10-UW-204	2.1	6	1.0526
5/5/00	12:00	11:00	48.36	-11.94	A10-UW-205	13		A10-UW-205	2.1	8	1.2388
5/5/00	14:00	13:00	48.46	-11.32	A10-UW-206	2.1		A10-UW-206	2.1	21	0.7676
5/5/00	16:00	15:00	48.55	-10.73	A10-UW-207	2.1		A10-UW-207	2.1	6.5	1.197
5/5/00	18:00	17:00	48.65	-10.40	A10-UW-208	2.1		A10-UW-208	2.1	1.5	2.964
5/5/00	17:50	19:00	48.75	-9.55	A10-UW-209	2.1		A10-UW-209	2.1	1	3.382
5/5/00	22:00	21:00	48.84	-8.97							0.5738
5/5/00	0:00	23:00	48.95	-8.37							1.4022
5/5/00	2:00	1:00	49.04	-7.74							0
5/5/00	4:00	3:00	49.14	-7.14							0
5/5/00	6:00	5:00	49.23	-6.54							0

APPENDIX 7: Station Chlorophyll Log

Date	Station no.	Time		Position		Depth	Fluor	Volume	Acetone	Chl a
		Local	GMT	Lat	Long	(m)	Value	Filtered	Volume	
13/4/00	A10-01	15:30	18:30	-35.09	-42.92	Surface	3.35	250	10	0.134
						150	0.355	250	10	0.014
						100	3.57	250	10	0.143
						75	4.85	250	10	0.194
						50	9.32	250	10	0.373
						40	5.86	250	10	0.234
						25	3.92	250	10	0.157
						7	3.86	250	10	0.154
15/4/00	A10-02	10:14	12:14	-29.91	-43.03	Surface	3.8	250	10	0.152
						150	1.93	250	10	0.077
						130	2.95	250	10	0.118
						105	5.6	250	10	0.224
						90	8.41	250	10	0.336
						75	9.53	250	10	0.381
						60	6.1	250	10	0.244
						45	3.25	250	10	0.130
						7	2.85	250	10	0.114
16/4/00	A10-03	10.15	12:15	-25.68	-39.69	Surface	3.06	250	10	0.122
						150	1.72	250	10	0.069
						135	2.9	250	10	0.116
						105	5.26	250	10	0.210
						90	8.1	250	10	0.324
						75	7.79	250	10	0.312
						50	4.27	250	10	0.171
						40	3.44	250	10	0.138
						7	2.81	250	10	0.112
17/4/00	A10-04	10.02	12:02	-22.25	-36.84	Surface	2.44	250	10	0.098
						150	1.64	250	10	0.066
						90	7.45	250	10	0.298
						80	7.46	250	10	0.298
						45	3.81	250	10	0.152
						35	2.69	250	10	0.108
						7	2.64	250	10	0.106
18/4/00	A10-05	10:00	12:00	-18.16	-34.54	NT	4.39	250	10	0.176
						175	2.83	250	10	0.113
						150	0.84	250	10	0.034
						125	10.1	250	10	0.404
						115	5.02	250	10	0.201
						100	7.11	250	10	0.284
						75	6.6	250	10	0.264
						60	4.27	250	10	0.171
						55	5.18	250	10	0.207
						7	2.83	250	10	0.113
19/4/00	A10-06	10:00	12:00	-14.19	-32.65	NT	1.85	250	10	0.074
						175	2.53	250	10	0.101
						150	4.01	250	10	0.160
						135	4.75	250	10	0.190
						125	5.34	250	10	0.214
						100	7.15	250	10	0.286
						65	3.29	250	10	0.132
						55	2.83	250	10	0.113
						7	2.67	250	10	0.107

Date	Station no.	Time		Position		Depth	Fluor	Volume	Acetone	Chl 'a'
		Local	GMT	Lat.	Long.	(m)	Value	Filtered	Volume	
19/4/00	A10-07	15:05	17:05	-13.51	-32.33	7	1.97	250	10	0.079
						25	1.89	250	10	0.076
						100	1.25	250	10	0.050
								250	10	0.000
4/20/00	A10-08	10:00	12:00	-10.29	-30.82	7	2.51	250	10	0.100
						150	2.52	250	10	0.101
						130	4.59	250	10	0.184
						120	6.02	250	10	0.241
						110	6.39	250	10	0.256
						100	5.96	250	10	0.238
						80	3.86	250	10	0.154
						60	2.72	250	10	0.109
						55	2.73	250	10	0.109
						7	2.48	250	10	0.099
4/21/00	A10-09	10:00	11:00	-6.21	-28.59	7	2.61	250	10	0.104
						175		250	10	0.000
						150	1.43	250	9	0.051
						125	2.54	250	9	0.091
						105	9.24	250	9.5	0.351
						95	9.21	250	9	0.332
						80	6.78	250	9	0.244
						70	6.5	250	9	0.234
						55	5	250	9	0.180
						7	2.61	250	9.5	0.099
22/4/00	A10-10	10:00	11:00	-2.22	-27.09	7	1.85	250	8.5	0.063
						150	5.45	250	10	0.218
						100	1.55	250	9.5	0.059
						60	0.983	250	10	0.039
						55	9.04	250	10	0.362
						50	10.9	250	10	0.436
						35	12.1	250	10	0.484
						25	9.31	250	10	0.372
						7	1.85	250	10	0.074
4/23/00	A10-11	10:00	11:00	1.94	-25.25 NT		1.65	250	9	0.059
						150	0.217	250	9.5	0.008
						110	6.28	250	9.5	0.239
						80	12.6	250	10	0.504
						60	13.1	250	9.5	0.498
						55	10.2	250	9.5	0.388
						45	8.37	250	9.5	0.318
						35	0.639	250	9.5	0.024
						7	3.87	250	9.5	0.147
								250		0.000
4/24/00	A10-12	10:00	11:00	6.10	-23.49 NT		3.87	250	9	0.139
						150	0.639	250	9	0.023
						100	3.08	250	9	0.111
						75	5.3	250	9	0.191
						45	14.6	250	7	0.409
						35	16.9	250	7.5	0.507
						25	15.4	250	9	0.554
						20	6.48	250	9	0.233
						7	4.49	250	8	0.144

Date	Station no.	Time		Position		Depth	Fluor	Volume	Acetone	Chl a
		Local	GMT	Lat.	Long.	(m)	Value	Filtered	Volume	
4/25/00	A10-13	10:00	11:00	10.21	-21.65	NT	4.95	250	8	0.158
						100	1.3	250	8	0.042
						75	3.73	250	8	0.119
						50	13.6	250	8	0.435
						30	36.5	250	9.5	1.387
						25	8.24	250	8.5	0.280
						20	6.58	250	9.5	0.250
						15	4.29	250	9.5	0.163
						7	4.33	250	9.5	0.165
4/25/00	A10-14	23:59	1:00	12.47	-20.66	NT	6.62	250	9.5	0.252
						75	12.5	250	9.5	0.475
						55	5.48	250	9.5	0.208
						47	18.5	250	9.5	0.703
						40		250	9.5	0.000
						7	3.52	250	9.5	0.134
4/28/00	A10-15	14.55	14.55	23.70	-21.56	NT	4.8	250	9	0.173
						175	0.386	250	9	0.014
						125	2.07	250	9	0.075
						95	7.76	250	9	0.279
						80	17.2	250	8	0.550
						75	17.3	250	9	0.623
						70	12.4	250	9	0.446
						40	5.67	250	9	0.204
						7	4.45	250	9	0.160
4/29/00	A10-16	10:00	10:00	27.54	-21.97	NT	3.14	250	9	0.113
						175	1.46	250	9	0.053
						130	3.12	250	8.5	0.106
						120	4.97	250	8.5	0.169
						107	7.35	250	9	0.265
						95	9.22	250	9	0.332
						80	6.49	250	9	0.234
						53	3.56	250	9	0.128
						7	2.8	250	9	0.101
5/1/00	A10-17	16:00	16:00	36.00	-20.00	NT	10.5	250	9.5	0.399
						7	6.87	250	9.5	0.261
						20	9.78	250	9	0.352
						30	11.1	250	9.5	0.422
						40	11.8	250	10	0.472
						60	11.8	250	9.5	0.448
						75	11.6	250	9.5	0.441
						100	0.949	250	9.5	0.036
						150	0.222	250	9.5	0.008
5/1/00	A10-18	22:00	22:00	36.96	-19.99	NT	6.87	250	9.5	0.261
						7	7.48	250	9.5	0.284
						20	8.07	250	9.5	0.307
						30	6.31	250	9.5	0.240
						40	7.1	250	9.5	0.270
						60	9.18	250	9.5	0.349
						75	5.42	250	9	0.195
						100	8.49	250	9.5	0.323
						150	0.814	250	9	0.029
5/2/00	A10-19	4:00	4:00			NT		250		
						9		250		

Date	Station no.	Time		Position		Depth	Fluor	Volume	Acetone	Chl 'a'
		Local	GMT	Lat	Long	(m)	Value	Filtered	Volume	
						23		250		
						35		250		
						51		250		
						71		250		
4/2/00	A10-20	10:00	10:00	38.88	-20.00 NT		15.6	250	9.5	0.593
						7	15.3	250	9.5	0.581
						15	16.2	250	9.5	0.616
						30	15.2	250	9.5	0.578
						40	14.5	250	9.5	0.551
						60	12.5	250	9.5	0.475
						90	9.57	250	9.5	0.364
						125	8.64	250	9.5	0.328
						150	8.47	250	8.5	0.288
5/3/00	A10-21	5:22	5:22	47.00	-20.00 NT		23.5	250	9	0.846
						7	25.2	250	9	0.907
						20	24.1	250	9	0.868
						35	23.5	250	9.5	0.893
						50	10	250	9	0.360
						61	6.9	250	9	0.248
						77	5.69	250	9	0.205
						89	4.76	250	9	0.171
						137	5.03	250	8.5	0.171
5/5/00	A10-22	10:00	9:00	48.70	-12.83 NT		68.5	250	9.5	2.603
						7	30.4	250	9.5	1.155
						20	24.6	250	9.5	0.935
						30	33.4	250	9.5	1.269
						40	18.8	250	9.5	0.714
						50	15.1	250	9.5	0.574
						75	4.83	250	9.5	0.184
5/6/00	A10-23	10:00	9:00	49.32	-6.01 NT		55	250	9.5	2.090
						100	39.2	250	9.5	1.490
						90	41	250	10	1.640
						80	38.5	250	9.5	1.463
						60	42.5	250	9.5	1.615
						50	41.3	250	9.5	1.569
						40	46.1	250	9.5	1.752
						20	48	250	9.5	1.824
						15	48	250	9.5	1.824
						7	36.9	250	9.5	1.402

APPENDIX 8: Underway Chlorophyll Log

Date	Time		Position		Sample No.	Vial No.	Acetone volume	Volume filtered	Fluor val	Chla conc
	local	GMT	Lat	Long						
13/4/00	13:05	16:03	-35.11	-49.88	A10-uw-01	1	10	250	4.15	0.166
13/4/00	19:00	22:00	-34.70	-48.95	A10-uw-02	10	10	250	3.47	0.1388
13/4/00	23:00	2:00	-34.17	-48.95	A10-uw-03	11	10	250	3.8	0.152
14/4/00	4:05	6:05	-33.54	-49.70	A10-uw-04	12	10	250	4.59	0.1836
14/4/00	8:00	10:00	-32.96	-47.07	A10-uw-05	13	10	500	9.63	0.1926
14/4/00	12:00	14:00	-32.44	-46.51	A10-uw-06	14	10	250	4.92	0.1968
14/4/00	14:30	16:30	-32.04	-46.09	A10-TAG-01	15	10	500	10.6	0.212
14/4/00	16:00	18:00	-31.81	-45.84	A10-uw-07	16	10	250	5.1	0.204
14/4/00	20:00	22:00	-31.21	-45.23	A10-uw-08	17	10	250	5	0.2
14/4/00	22:00	0:00	-30.92	-44.93	A10-uw-09	18	10	250	4.52	0.1808
15/4/00	0:00	2:00	-30.60	-44.61	A10-uw-10	19	10	250	4.68	0.1872
15/4/00	4:00	6:05	-30.00	-43.97	A10-uw-11	20	10	250	4.37	0.1748
15/4/00	8:00	10:00	-29.35	-43.36	A10-uw-12	21	10	250	3.61	0.1444
15/4/00	13:00	15:00	-28.79	-42.77	A10-uw-13	34	10	250	5.95	0.238
15/4/00	16:00	18:00	-28.35	42.33	A10-uw-14	35	10	250	4.45	0.178
15/4/00	20:00	22:00	-27.53	-41.73	A10-uw-15	36	10	250	4.46	0.1784
16/4/00	0:00	2:00	-27.16	-41.14	A10-uw-16	37	10	250	3.31	0.1324
16/4/00	4:00	6:00	-26.56	-40.55	A10-uw-17	38	10	250	3.92	0.1568
16/4/00	8:00	10:00	-25.95	-40.00	A10-uw-18	39	10	250	2.87	0.1148
16/4/00	14:00	14:00	-25.41	-39.43	A10-uw-19	50	10	250	2.53	0.1012
4/16/00	16:00	18:00	-25.11	-39.14	A10-uw-20	51	10	250	2.52	0.1008
16/4/00	20:00	22:00	-24.52	-38.56	A10-uw-21	53	10	250	2.19	0.0876
17/4/00	0:00	2:00	-23.92	-37.98	A10-uw-22	54	10	250	2.6	0.104
17/4/00	4:00	6:00	-23.23	-37.52	A10-uw-23	55	10	250	2.12	0.0848
17/4/00	8:00	10:00	-23.27	-37.06	A10-uw-24	56	10	250	2.71	0.1084
17/4/00	12:07	14:07	-22.06	-36.72	A10-uw-25	66	10	250	2.18	0.0872
17/4/00	16:01	18:01	-21.14	-36.26	A10-uw-26	67	10	250	3.38	0.1352
17/4/00	20:00	22:00	-20.69	-35.79	A10-uw-27	68	10	250	2.08	0.0832
18/4/00	0:00	2:00	-19.99	-35.42	A10-UW-28	69	10	250	4.85	0.194
18/4/00	4:00	6:00	-19.20	-35.03	A10-UW-29	70	10	250	3.14	0.1256
18/4/00	8:00	10:01	-18.51	-34.69	A10-UW-30	71	10	250		0
18/4/00	9:00	11:00	-18.26	-34.57	A10-UW-31	72	10	250		0
18/4/00	16:00	18:00	-17.44	-34.19	A10-UW-32	73	10	250	2.36	0.0944
18/4/00	20:00	22:00	-16.71	-33.84	A10-UW-33	74	9	250	1.56	0.05616
19/4/00	0:00	2:00	-15.98	-33.49	A10-UW-34	75	9	250	1.84	0.06624
19/4/00	4:00	6:00	-15.26	-33.15	A10-UW-35	76	9	250		0
19/4/00	8:00	10:00	-14.53	-32.80	A10-UW-36	77	10	250	2.06	0.0824
19/4/00	14:00	16:00	-13.67	-32.40	A10-UW-37	78	9	250	1.16	0.04176
19/4/00	20:00	22:00	-12.80	-31.98	A10-UW-38	79	8.5	250	1.07	0.03638
20/4/00	0:00	2:00	-12.08	-31.17	A10-UW-39	80	8.5	250	1.48	0.05032
20/4/00	4:00	6:00	-22.35	-31.31	A10-UW-40	81	9	250	1.36	0.04896
20/4/00	6:00	8:00	-10.99	-31.13	A10-UW-41	82	9	250	1.74	0.06264
20/4/00	8:00	10:00	-10.06	-30.97	A10-UW-42	83	8.5	250	2.07	0.07038
20/4/00	13:00	15:00	-9.96	-30.07	A10-UW-43	84	9	250	2.51	0.09036
20/4/00	15:00	17:00	-9.60	-30.50	A10-UW-44	85	9	250	2.4	0.0864
20/4/00	17:00	19:00	-9.23	-30.33	A10-UW-45	86	9	250	1.67	0.06012
20/4/00	19:00	21:00	-9.86	-30.13	A10-UW-46	87	9	250	1.38	0.04968
20/4/00	21:00	23:00	-9.84	-29.98	A10-UW-47	88	8	250	1.98	0.06336
20/4/00	23:00	1:00	-8.14	-29.82	A10-UW-48	89	8.5	250	1.41	0.04794
21/4/00	2:00	3:00	-7.74	-29.82	A10-UW-49	90	8.5	250	1.25	0.0425
21/4/00	5:00	6:00			A10-UW-50	91	9	250	1.61	0.05796
21/4/00	6:00	7:00			A10-UW-51	92	9.5	250	1.85	0.0703
21/4/00	8:00	9:00	-6.48	-29.09	A10-UW-52	93	9	250	0.608	0.021888

Date	Time local	Time GMT	Position Lat	Position Long	Sample No.	Vial No.	Acetone volume	Volume filtered	Fluor val	Chla conc
21/4/00	10:00	11:00			A10-UW-53	94	9	250		0
21/4/00	12:00	13:00	-6.17	-28.91	A10-UW-54	95	8	250	2.08	0.06656
21/4/00	14:05	15:05	-5.79	-28.73	A10-UW-55	96	9.5	250	1.58	0.06004
21/4/00	16:05	16:05	-5.43	-28.57	A10-UW-56	97	9.5	250	1.72	0.06536
21/4/00	18:05	18:05	-5.08	-28.84	A10-UW-57	98	9.5	250	2.82	0.10716
21/4/00	20:00	21:00	-4.71	-28.24	A10-UW-58	99	9.5	250	2.36	0.08968
21/4/00	22:00	23:00	-4.35	-28.07	A10-UW-59	100	9.5	250	3.9	0.1482
21/4/00	0:00	1:00	-3.99	-27.91	A10-UW-60	101	9.5	250	6.41	0.24358
22/4/00	2:00	3:00	-3.63	-27.75	A10-UW-61	102	9.5	250	13.7	0.5206
22/4/00	4:00	5:00	-3.27	-27.76	A10-UW-62	103	9.5	250	10	0.38
22/4/00	6:00	7:00	-2957.00	-27.74	A10-UW-63	104	9.5	250	7.43	0.28234
22/4/00	8:00	9:00	-2.35	-27.25	A10-UW-64	105	9.5	250	5.22	0.19836
					A10-UW-65	106	9.5	250	4.89	0.18582
22/4/00	10:00	11:00	-2.06	-27.02	A10-UW-66	107	9.5	250	3.66	0.13908
22/4/00	12:00	13:00	-1.70	-26.86	A10-UW-67	108	9.5	250	4.51	0.17138
22/4/00	14:00	15:00	-1.33	-26.61	A10-UW-68	109	9.5	250	2.95	0.1121
22/4/00	16:00	17:00	-0.97	-26.53	A10-UW-69	110	9.5	250	3.22	0.12236
22/4/00	18:00	19:00	-0.59	-26.29	A10-UW-70	111	9.5	250	3.15	0.1197
22/4/00	20:00	21:00	-0.22	-26.19	A10-UW-71	112	9.5	250	1.97	0.07486
22/4/00	22:00	23:00	0.14	-26.02	A10-UW-72	113	9.5	250	2.21	0.08398
23/4/00	0:00	1:00	0.05	-25.87	A10-UW-73	114	9.5	250	3.45	0.1311
23/4/00	2:00	3:00	0.90	-25.70	A10-UW-74	115	9.5	250	3	0.114
23/4/00	6:00	7:00	1.22	-25.56	A10-UW-75	116	9.5	250	4.18	0.15884
23/4/00	8:00	9:00	1.59	-25.40	A10-UW-76	117	9.5	250	3.67	0.13946
23/4/00	12:00	13:00	2.13	-25.18	A10-UW-77	118	9	250	2.26	0.08136
23/4/00	14:00	15:00	2.49	-25.01	A10-UW-78	119	9	250	2.39	0.08604
23/4/00	16:00	17:00	2.85	-24.59	A10-UW-79	120	9	250		0
23/4/00	18:00	19:00	3.23	-24.69	A10-UW-80	121		250		0
23/4/00	20:00	21:00	3.58	-24.45	A10-UW-81	122	8	250	2.22	0.07104
23/4/00	22:00	23:00	3.94	-24.38	A10-UW-82	123	9	250	2.74	0.09864
23/4/00	0:00	1:00	4.31	-24.22	A10-UW-83	124	9.5	250	2.56	0.09728
24/4/00	2:00	3:00	4.41	-24.04	A10-UW-84	125	9	250	3.34	0.12024
24/4/00	4:00	5:00	5.01	-23.55	A10-UW-85	126	9.5	250	4.37	0.16606
24/4/00	6:00	7:00	5.40	-23.75	A10-UW-86	127	8.5	250	3.57	0.12138
24/4/00	8:00	9:00	5.76	-23.59	A10-UW-87	128	6.5	250	4.64	0.12064
24/4/00	12:00	13:00	6.28	-23.37	A10-UW-88	129	9.5	250	2.96	0.11248
24/4/00	14:00	15:00	6.65	-23.20	A10-UW-89	130	9	250	3.67	0.13212
24/4/00	16:00	17:00	7.01	-23.04	A10-UW-90	131	8.5	250	4.2	0.1428
24/4/00	18:00	19:00	7.37	-22.89	A10-UW-91	132	9	250	3.7	0.1332
24/4/00	20:00	21:00	7.74	-22.73	A10-UW-92	133	9.5	250	3.18	0.12084
24/4/00	22:00	23:00	8.09	-22.58	A10-UW-93	134	9	250	3.14	0.11304
24/4/00	0:00	1:00	8.46	-22.43	A10-UW-94	135	9	250	3.11	0.11196
25/4/00	2:00	3:00	8.79	-22.69	A10-UW-95	136	9	250	2.85	0.1026
25/4/00	4:00	5:00	9.15	-22.11	A10-UW-96	137	9	250	2.83	0.10188
25/4/00	6:00	7:00	9.52	-21.60	A10-UW-97	138	9.5	250	3.67	0.13946
25/4/00	8:00	9:00	9.88	-21.80	A10-UW-98	139	10	250	4.7	0.188
25/4/00	12:00	13:00	10.21	-21.65	A10-UW-99	140	10	250	4.14	0.1656
25/4/00	14:00	15:00	10.71	-21.43	A10-UW-100	141	10	250	4.09	0.1636
25/4/00	16:00	17:00	11.05	-21.16	A10-UW-101	142	9.5	250	6.2	0.2356
25/4/00	18:00	19:00	11.43	-21.12	A10-UW-102	143	8	250	3	0.096
25/4/00	20:00	21:00	11.78	-20.96	A10-UW-103	144	10	250	4.27	0.1708
25/4/00	22:00	23:00			A10-UW-104	145	6.5	250	3.4	0.0884
					A10-UW-105	146	9	250	5.82	0.20952

Date	Time		Position		Sample No.	Vial No.	Acetone volume	Volume filtered	Fluor. val.	Chla conc.
	local	GMT	Lat.	Long.						
26/4/00	2:00	3:00	12.66	-20.57	A10-UW-106	147	9	250	4.56	0.16416
26/4/00	4:00	5:00	12.99	-20.46	A10-UW-107	148	9	250	4.08	0.14688
26/4/00	6:00	7:00	13.35	-20.49	A10-UW-108	149	9	250	5.88	0.21168
26/4/00	8:00	9:00	13.72	-20.53	A10-UW-109	150	9.5	250	12.8	0.4864
26/4/00	12:21	13:21	14.57	-20.61	A10-UW-110	151		250		0
26/4/00	14:00	15:00	14.90	-20.65	A10-UW-111	152		250		0
26/4/00	16:40	17:40	15.40	-20.70	A10-UW-112	153	8	250	3.79	0.12128
26/4/00	20:05	21:05	16.01	-20.77	A10-UW-113	154	8.5	250	4.54	0.15436
26/4/00	22:00	23:00	16.42	-20.80	A10-UW-114	155	9	250	4.25	0.153
26/4/00	23:55	0:55	16.80	-20.08	A10-UW-115	156	9	250	4.27	0.15372
27/4/00	2:00	3:00	17.21	-20.88	A10-UW-116	157	9.5	250	6.52	0.24776
27/4/00	4:00	5:00	17.55	-20.92	A10-UW-117	158	9	250	4.79	0.17244
27/4/00	6:00	7:00	17.93	-20.96	A10-UW-118	159	9.5	250	4.43	0.16834
27/4/00	8:00	9:00	18.32	-21.00	A10-UW-119	160	8.5	250	12.2	0.4148
27/4/00	10:00	11:00	18.69	-21.03	A10-UW-120	161	8	250	21.6	0.6912
27/4/00	12:00	13:00	19.05	-21.01	A10-UW-121	162	8.5	250	15.7	0.5338
27/4/00	14:00	15:00	19.40	-21.11	A10-UW-122	163	8.5	250	17.1	0.5814
27/4/00	16:00	17:00	19.71	-21.14	A10-UW-123	164	9	250	14.6	0.5256
27/4/00	18:00	19:00	20.64	-21.17	A10-UW-124	165	9	250	16.8	0.6048
27/4/00	20:00	21:00	20.40	-21.21	A10-UW-125	166	8.5	250	13.4	0.4556
27/4/00	22:00	23:00	20.50	-21.24	A10-UW-126	167	9	250	8.28	0.29808
28/4/00	0:00	2:00	20.21	-21.30	A10-UW-127	168	9	250	7.49	0.26964
28/4/00	2:00	4:00	21.62	-21.34	A10-UW-128	169	9	250	4.12	0.14832
28/4/00	4:00	4:00	22.00	-21.38	A10-UW-129	170	9	250	3.93	0.14148
28/4/00	6:00	6:00	22.24	-21.14	A10-UW-130	171	9	250	4.49	0.16164
28/4/00	8:00	8:00	22.77	-21.46	A10-UW-131	172	9	250	4.02	0.14472
28/4/00	10:00	10:00	23.17	-21.50	A10-UW-132	173	9	250	3.47	0.12492
28/4/00	12:00	12:00	23.57	-21.54	A10-UW-133	174	9	250	5	0.18
28/4/00	14:00	14:00	24.11	-21.60	A10-UW-134	175	9	250	3.99	0.14364
28/4/00	18:00	18:00	24.15	-21.64	A10-UW-135	176	9	250	3.02	0.10872
28/4/00	20:00	20:00	24.95	-21.69	A10-UW-136	177	14	250	1.31	0.07336
28/4/00	22:00	22:00	25.38	-21.73	A10-UW-137	178	8	250	4.75	0.152
29/4/00	0:00	0:00	25.83	-21.78	A10-UW-138	179	9	250	2.61	0.09396
29/4/00	2:00	2:00	26.22	-21.82	A10-UW-139	180	8.5	250	3.57	0.12138
29/4/00	4:00	4:00	26.63	-21.87	A10-UW-140	181	9	250	3.62	0.13032
29/4/00	6:00	6:00	27.13	-21.92	A10-UW-141	182	9	250	3.02	0.10872
29/4/00	8:00	8:00	28.04	-21.48	A10-UW-142	183	8.5	250	3.05	0.1037
29/4/00	14:00	14:00	28.38	-21.11	A10-UW-143	184	8.5	250	2.37	0.08058
29/4/00	16:00	16:00	28.74	-20.79	A10-UW-144	185	8.5	250	2.43	0.08262
29/4/00	18:00	18:00	29.09	-20.47	A10-UW-145	186	9	250	2.57	0.09252
29/4/00	20:00	20:00	29.44	-20.01	A10-UW-146	187	9	250	1.58	0.05688
30/4/00	22:00	22:00	29.79	-19.76	A10-UW-147	188	9	250	1.85	0.0666
30/4/00	0:00	0:00	30.16	-19.40	A10-UW-148	189	9	250	1.71	0.06156
30/4/00	2:00	2:00	30.49	-19.06	A10-UW-149	190	9.5	250	1.77	0.06726
30/4/00	4:00	4:00	30.89	-18.67	A10-UW-150	191	9	250	2.23	0.08028
30/4/00	6:00	6:00	31.18	-18.37	A10-UW-151	192	9.5	250	2.45	0.0931
1/5/00	8:00	8:00	33.37	-17.88	A10-UW-152	193	9.5	250	3.05	0.1159
1/5/00	2:00	2:00	33.63	-18.10	A10-UW-153	194	9.5	250	4.69	0.17822
1/5/00	4:00	4:00	33.93	-18.33	A10-UW-154	195	9.5	250	6.02	0.22876
1/5/00	6:00	6:00	34.25	-18.58	A10-UW-155	196	9.5	250	5.9	0.2242
1/5/00	8:00	8:00	34.59	-18.85	A10-UW-156	197	9.5	250	5.99	0.22762
1/5/00	10:00	10:00	34.94	-19.14	A10-UW-157	198	9.5	250	6.85	0.2603
1/5/00	12:00	12:00	35.29	-19.42	A10-UW-158	199	9.5	250	11.5	0.437

Date	Time		Position		Sample No.	Vial No	Acetone volume	Volume filtered	Fluor val.	Chla conc.
	local	GMT	Lat.	Long.						
1/5/00	14:00	14:00	35.67	-19.73	A10-UW-159	200	9.5	250	11.5	0.437
1/5/00	19:00	19:00	36.39	-20.00	A10-UW-160	201	9.5	250	10.5	0.399
2/5/00	0:55	0:55	37.34	-20.00	A10-UW-161	202	8	250	19.7	0.6304
2/5/00	7:00	7:00	38.30	-20.00	A10-UW-162	203	9.5	250	12.6	0.4788
2/5/00	12:00	12:00	39.00	-20.01	A10-UW-163	204	9.5	250	13.3	0.5054
2/5/00	14:00	14:00	39.38	-20.00	A10-UW-164	205	9.5	250	16.8	0.6384
2/5/00	16:00	16:00	39.98	-20.00	A10-UW-165	206	8.5	250	14.1	0.4794
2/5/00	18:00	18:00	40.14	-20.00	A10-UW-166	207	9.5	250	15	0.57
2/5/00	20:00	20:00	40.55	-20.00	A10-UW-167	208	7	250	16	0.448
2/5/00	22:00	22:00	40.93	-20.00	A10-UW-168	209	9.5	250	18.1	0.6878
3/5/00	0:00	0:00	41.32	-20.00	A10-UW-169	210	9	250	19	0.684
3/5/00	2:00	2:00	41.72	-20.00	A10-UW-170	211	9.5	250	17	0.646
3/5/00	4:00	4:00	42.11	-20.00	A10-UW-171	212	9.5	250	19	0.722
3/5/00	6:00	6:00	42.46	-20.00	A10-UW-172	213	9.5	250	18.8	0.7144
3/5/00	8:00	8:00	42.90	-20.00	A10-UW-173	214	9	250	22.4	0.8064
3/5/00	10:00	10:00	43.28	-20.00	A10-UW-174	215	10	250	23	0.92
3/5/00	12:00	12:00	43.67	-20.00	A10-UW-175	216	10	250	23.9	0.956
3/5/00	14:00	14:00	44.08	-20.00	A10-UW-176	217	10	250	19.5	0.78
3/5/00	16:00	16:00	44.47	-20.00	A10-UW-177	218	10	250	16.3	0.652
3/5/00	18:00	18:00	44.83	-20.00	A10-UW-178	219	10	250	13.6	0.612
3/5/00	17:50	17:50	45.25	-20.00	A10-UW-179	220	9	250	15.3	0.3708
3/5/00	22:00	22:00	45.64	-20.00	A10-UW-180	221	9	250	10.3	0.7812
4/5/00	0:00	0:00	46.04	-20.00	A10-UW-181	222	9	250	21.7	0.5184
4/5/00	2:00	1:00	46.25	-20.00	A10-UW-182	223	8.5	250	14.4	0.9452
4/5/00	4:00	3:00	46.64	-20.00	A10-UW-183	224	9	250	27.8	0.9144
4/5/00	6:00	5:00			A10-UW-184	225	9	250	25.4	0.9108
4/5/00	8:00	7:00	47.00	-19.99	A10-UW-185	226	9	250	25.3	0.396
4/5/00	10:00	9:00	47.08	-19.36	A10-UW-186	227	9	250	11	0.5256
4/5/00	12:00	11:00	47.20	-18.79	A10-UW-187	228	8	250	14.6	0.4832
4/5/00	14:00	13:00	47.29	-18.30	A10-UW-188	229	8	250	15.1	0.4832
4/5/00	16:00	15:00	47.39	-17.71	A10-UW-189	230	12	250	15.1	1.8672
4/5/00	18:00	17:00	47.46	-17.24	A10-UW-190	231	9.5	250	38.9	0.5928
4/5/00	17:50	16:50	47.56	-16.69	A10-UW-191	232	9.5	250	20.3	1.4782
4/5/00	22:00	21:00	47.64	-26.23	A10-UW-192	233	9.5	250	18.3	1.197
5/5/00	0:00	23:00	47.73	-15.68	A10-UW-193	234	9.5	250	15.6	0.8436
5/5/00	2:00	1:00	47.81	-15.19	A10-UW-194	235	9.5	250	38.9	1.9038
5/5/00	4:00	3:00	47.93	-14.50	A10-UW-195	236	9.5	250	31.5	2.603
5/5/00	6:00	5:00	46.02	-13.94	A10-UW-196	237	9.5	250	22.2	1.9912
5/5/00	8:00	7:00	48.11	-13.42	A10-UW-197	238	9.5	250	50.1	1.197
5/5/00	10:00	9:00	48.26	-12.46	A10-UW-198	239	9.5	250	68.5	1.0526
5/5/00	12:00	11:00	48.36	-11.94	A10-UW-199	240	9.5	250	52.4	1.2388
5/5/00	14:00	13:00	48.46	-11.32	A10-UW-200	241	9.5	250	31.5	0.7676
5/5/00	16:00	15:00	48.55	-10.73	A10-UW-201	242	9.5	250	27.7	1.197
5/5/00	18:00	17:00	48.65	-10.40	A10-UW-202	243	9.5	250	32.6	2.964
5/5/00	17:50	19:00	48.75	-9.55	A10-UW-203	244	9.5	250	20.2	3.382
5/5/00	22:00	21:00	48.84	-8.97	A10-UW-204	245	9.5	250	31.5	0.5738
5/5/00	0:00	23:00	48.95	-8.37	A10-UW-205	246	9.5	250	78	1.4022
5/5/00	2:00	1:00	49.04	-7.74	A10-UW-206	247	9.5	250	89	0
5/5/00	4:00	3:00	49.14	-7.14	A10-UW-207	248	9.5	250	15.1	0
5/5/00	6:00	5:00	49.23	-6.54	A10-UW-208	249	9.5	250	36.9	0

APPENDIX 9: Size-Fractionated Chlorophyll & Phytoplankton Taxonomy Log

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
A10-01	4/13/00	12.00	10.00	-35.09		12	7/	12	7	0.008	0.023	0.128	**0.159**			
						11	7/	11	7							
						10	25	10	15	0.005	0.023	0.112	**0.140**			
						9	25	9	25							
						8	40	8	25	0.006	0.025	0.117	**0.148**			
						7	45	7	40	0.015	0.053	0.195	**0.263**			
						6	50	6	45	0.007	0.052	0.203	**0.262**			
						5	50	5	50							
						4	50	4	50	0.007	0.026	0.268	**0.301**			
						3	75	3	75							
						2	100	2	150	0.001	0.004	0.006	**0.011**			
						1	150	1	200							
A10-02	4/15/00	12.00	10.00	-29.06	-43.03	12	7	12	7	0.013	0.021	0.095	**0.129**	L5/F6	102	
						11	45	11	7							
						10	45	10	15							#1
						9	45	9	20	0.012	0.017	0.096	**0.125**			
						8	60	8	45	0.014	0.018	0.109	**0.141**			
						7	75	7	60	0.010	0.023	0.230	**0.263**			
						6	90	6	75	0.010	0.027	0.312	**0.349**			
						5	90	5	90							
						4	90	4	90	0.013	0.023	0.288	**0.324**	L7/F8	103	
						3	105	3	130							
						2	130	2	150	0.008	0.011	0.065	**0.084**			
						1	150	1	200							
A10-03	4/16/00	12.00	10.00	-25.68	-39.69	12	7	12								
						11	7	11								
						10	40	10								
						9	50	9	N/A							
						8	50	8								
						7	75	7								
						6	90	6								
						5	90	5								
						4	90	4								
						3	105	3								

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
						2	135	2								
						1	150	1								
A10-04	4/17/00	12.1	10.00	-22.25	-36.84	12	7	12	7	0.004	0.013	0.067		9L/10F	104	
						11	7	11	15							#2
						10	35	10	20							
						9	45	9	30							
						8	45	8	35							
						7	80	7	45							
						6	90	6	80							
						5	90	5	90	0.007	0.027	0.236		11L/12F	105	
						4	90	4	105							
						3	105	3	135							
						2	135	2	175							
						1	150	1	250							
A10-05	4/18/00	12.04	10.00	-18.16	-34.54	12	7	12								
						11	7	11								
						10	55	10								
						9	60	9	N/A							
						8	60	8								
						7	75	7								
						6	100	6								
						5	115	5								
						4	115	4								
						3	125	3								
						2	150	2								
						1	175	1								
A10-06	4/19/00	12.00	10.00	-14.18	-32.60	12	7	12	7	0.006	0.016	0.048	**0.070**	L13/F14	106	
						11	7	11	15							#3
						10	55	10	20	0.005	0.018	0.053	**0.076**			
						9	65	9	30							
						8	65	8	55	0.007	0.024	0.083	**0.114**			
						7	100	7	65	0.006	0.017	0.090	**0.113**			
						6	125	6	100	0.007	0.034	0.206	**0.247**			
						5	125	5	125	0.006	0.018	0.190	**0.214**	L15/F16	107	

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
						4	125	4	135	0.005	0.009	0.165	**0.179**			
						3	135	3	150							
						2	150	2	175							
						1	175	1	250							
A10-07	4/19/00	17.00	15.00	-13.51	-32.23	12	25									
						11	100									
						10	130									
						9	150									
						8	180									
						7	233									
						6	300									
						5	500									
						4	1000									
						3	1000									
						2	1000									
						1	1000									
A10-08	20/4/00	10.00	12.00	-10.28	-30.82	12	7	12	7	0.002	0.020	0.069	**0.091**	L17/F18	108	
						11	7	11	20							
						10	55	10	30	0.005	0.021	0.049	**0.075**			
						9	60	9	55							
						8	60	8	60	0.004	0.015	0.079	**0.098**			
						7	80	7	100	0.006	0.025	0.174	**0.205**			
						6	100	6	110	0.008	0.018	0.209	**0.235**			
						5	110	5	120	0.007	0.016	0.183	**0.206**	L19/F20	109	
						4	120	4	120							
						3	120	3	130	0.009	0.012	0.148	**0.169**			
						2	130	2	175							
						1	150	1	250							
A10-09	4/21/00	11.00	10.00	*6.20.6S*	*28.59.3 W*	12	7	12	7							
						11	7	11	15							#4
						10	55	10	20							
						9	55	9	30							
						8	70	8	55							

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
						7	80	7	70							
						6	95	6	80							
						5	105	5	105							
						4	105	4	105							
						3	125	3	125							
						2	150	2	175							
						1	175	1	250							
A10-10	4/22/00	11.00	10.00	-2.22	-27.09	12	7	12	7	0.062	0.021	0.105	**0.188**	L27/F28	110	
						11	7	11	15							#5
						10	25	10	20							
						9	25	9	25	0.045	0.024	0.130	**0.199**			
						8	35	8	35							
						7	50	7	40							
						6	55	6	50							
						5	55	5	55	0.018	0.075	0.400	**0.493**	L29/F30	111	
						4	55	4	60							
						3	60	3	100	0.011	0.007	0.020	**0.038**			
						2	100	2	175							
						1	150	1	250							
A10-11	4/23/00	11.00	10.00	1.93	-25.25	12	7	12	7	0.014	0.025	0.124	**0.163**	L31/F32	112	
						11	7	11	15	0.009	0.054	0.371	**0.434**			#6
						10	30	10	25							
						9	30	9	45							
						8	35	8	45							
						7	45	7	55							
						6	55	6	60	0.013	0.056	0.417	**0.486**	L33/F34	113	
						5	60	5	70							
						4	60	4	80							
						3	80	3	110	0.007	0.009	0.039	**0.055**			
						2	110	2	150							
						1	150	1	200							
A10-12	4/24/00	11.00	10.00	6.10	-23.44	12	7	12	2	0.007	0.018	0.098	**0.123**		112	
						11	7	11	7	0.014	0.033	0.119	**0.166**	L35/F36	114	
						10	20	10	15							#7

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
						9	20	9	20	0.011	0.056	0.170	**0.237**			
						8	25	8	25	0.018	0.043	0.184	**0.245**			
						7	35	7	35	0.012	0.081	0.354	**0.447**	L37/F38	117	
						6	35	6	45	0.027	0.088	0.405	**0.520**		115	
						5	45	5	55							
						4	45	4	75							
						3	75	3	100	0.013	0.021	0.103	**0.137**			
						2	100	2	150							
						1	150	1	200							
A10-13	4/25/00	11.00	10.00	10.21	-21.65	12	7	12	2							
						11	7	11	7	0.007	0.022	0.120	**0.149**	L39/F40	118	
						10	15	10	15							#8, #9
						9	20	9	15							
						8	25	8	20	0.019	0.058	0.176	**0.253**			
						7	25	7	25	0.086	0.111	0.231	**0.428**			
						6	25	6	30	0.819	0.456	0.573	**1.848**	L41/F42	119	
						5	30	5	45	0.327	0.193	0.421	**0.941**			
						4	30	4	75							
						3	50	3	100	0.021	0.024	0.059	**0.104**			
						2	75	2	150							
						1	100	1	200							
A10-14	4/25/00	01.00	12.00 (am)	12.46	-20.65	12	7			0.013	0.028	0.114	**0.155**			
						11	7							43L/44F	121	
						10	40			0.055	0.147	0.738	**0.940**			
						9	40									
						8	47			0.060	0.160	0.738	**0.958**			
						7	47							45L/46F	122	
						6	55			0.128	0.253	0.723	**1.104**			
						5	55									
						4	75			0.025	0.033	0.120	**0.178**			
						3	75									
						2	150									
						1	200									

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
A10-15	4/28/00	14.30	14.30	23.69	-22.55	12	7	12	7	0.018	0.026	0.142	**0.186**	47L/48F	123	
						11	7	11	15							#10, #11, #12
						10	40	10	20							
						9	40	9	40	0.006	0.032	0.153	**0.191**			
						8	70	8	60							
						7	75	7	70	0.009	0.043	0.210	**0.262**			
						6	80	6	75	0.015	0.066	0.441	**0.522**			
						5	80	5	80	0.021	0.119	0.517	**0.657**	49L/50F	124	
						4	80	4	95							
						3	95	3	115							
						2	125	2	163	0.005	0.007	0.014	**0.026**			
						1	175	1	230							
A10-16	4/29/00	10.05	10.05	27.53	-21.97	12	7	12	7	0.004	0.014	0.068	**0.086**	51L/52F	126	
						11	7	11	15							#13, #14
						10	53	10	20							
						9	53	9	30							
						8	80	8	53	0.004	0.016	0.073	**0.093**			
						7	95	7	60							
						6	107	6	80	0.006	0.031	0.233	**0.270**			
						5	107	5	95	0.013	0.048	0.277	**0.338**	53L/54F	127	
						4	107	4	107	0.016	0.032	0.269	**0.317**			
						3	120	3	120	0.010	0.026	0.206	**0.242**			
						2	130	2	175							
						1	175	1	250							
A10-17	5/1/00	16.00	16.00	35.99	-20.00	12	7	12	7	0.058	0.033	0.110	**0.201**	TAXA I	129	
						11	7	11	15							#15, #16
						10	20	10	15							
						9	20	9	20	0.098	0.049	0.135	**0.282**	TAXA II		
						8	30	8	30	0.185	0.060	0.154	**0.399**			
						7	30	7	40	0.173	0.067	0.154	**0.394**	TAXA III	130	
						6	40	6	50	0.217	0.051	0.164	**0.432**			
						5	40	5	60	0.157	0.065	0.137	**0.359**	TAXA IV		
						4	60	4	75					TAXA V		
						3	75	3	100	0.023	0.008	0.020	**0.051**			
						2	100	2	150							

Station	Date	Time		Position		Bottle	1st CTD	Bottle	2nd CTD	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/ Formalin	HMPA Slide	Trichodesmium
		Local	GMT	Lat.	Long.											
						1	150	1	200							
A10-18	5/1/00	22.00	22.00	36.96	-19.99	12	7	12	7	0.092	0.027	0.124	**0.243**	TAXA I	131	
						11	7	11	15							#17, #18 (6.6 litres)
						10	20	10	15							
						9	20	9	20	0.103	0.032	0.124	**0.259**	TAXA II		
						8	30	8	30	0.070	0.025	0.138	**0.233**			
						7	30	7	40	0.066	0.028	0.171	**0.265**	TAXA III	132	
						6	40	6	50	0.062	0.046	0.181	**0.289**	TAXA IV		
						5	40	5	60	0.069	0.037	0.198	**0.304**			
						4	60	4	75					TAXA V		
						3	75	3	100	0.034	0.025	0.111	**0.170**			
						2	100	2	150							
						1	150	1	200							
A10-19	5/2/00	04.00	04.00	37.91	-20.00	12	9		9	0.027	0.079	0.148	**0.254**	TAXA I	133	
						11	23		23	0.023	0.062	0.148	**0.233**	TAXA II		
						10	35		35	0.032	0.082	0.169	**0.283**	TAXA III		
						9	35		35							
						8	47		47							
						7	51		51	0.036	0.089	0.180	**0.305**	TAXA IV	134	
						6	51		51							
						5	63		63							
						4	71		71	0.031	0.081	0.153	**0.265**	TAXA V		
						3	65		65							
						2	101		101							
						1	135		135							
A10-20	5/2/00	10.00	10.00	38.57	-19.99	12	7	12	7	0.255	0.074	0.239	**0.568**	TAXA I	135	
						11	7	11	15							
						10	15	10	15							#19, #20 (8.8 litres)
						9	15	9	20	0.258	0.090	0.235	**0.583**	TAXA II	136	
						8	30	8	30							
						7	30	7	40	0.157	0.088	0.209	**0.454**	TAXA III		
						6	40	6	60	0.143	0.071	0.160	**0.374**	TAXA IV		

Station	Date	Time		Position		Bottle	1st	Bottle	2nd	Size-fractionated Chlorophyll (mg m^{-3})				Lugols/	HMPA	Trichodesmium
		Local	GMT	Lat.	Long.		CTD		CTD					Formalin	Slide	
						5	40	5	75							
						4	60	4	110	0.057	0.021	0.047	**0.125**			
						3	90	3	125							
						2	125	2	140	0.082	0.029	0.080	**0.191**	TAXA V		
						1	150	1	200	0.005	0.008	0.005	**0.018**			
A10-21	5/4/00	06.10	05.10	47.00	-20.00	12	7	12	7	0.071	0.251	0.516	**0.838**	TAXA I		
						11	7	11	15							#21
						10	20	10	15	0.072	0.286	0.543	**0.901**	TAXA II		
						9	20	9	20					TAXA III		
						8	30	8	35	0.075	0.269	0.493	**0.837**	TAXA IV		
						7	30	7	40					TAXA V		
						6	45	6	45							
						5	45	5	45							
						4	55	4	58							
						3	75	3	65							
						2	100	2	131							
						1	150	1	182							
A10-22	5/5/00	09.00	10.00	48.19	-12.9	12	7		7	0.756	0.103	0.224	**1.083**	TAXA I		
						11	7		7							
						10	20		20	0.619	0.157	0.231	**1.007**	TAXA II		
						9	20		20							
						8	30		30	0.824	0.143	0.186	**1.153**	TAXA III		
						7	30		30							
						6	40		40							
						5	50		50							
						4	75		75							
						3	100		100							
						2	125		125							
						1	150		150							

APPENDIX 10: Particle Absorption Log

Date	Station number	Time (Local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Vol filtered (L)	Label
13/4/00	A10-01	10	12	-35.09	-42.93	50	2.1	A10-01-50
						25	2.1	A10-01-25
						7	2.1	A10-01-7
15/4/00	A10-02	10	12	-29.05	-43.03	90	4.2	A10-02-90
						45	4.2	A10-02-45
						7	4.2	A10-02-7
16/4/00	A10-03	10.15	12.15	-25.68		90	4.2	A10-03-90
						50	4.2	A10-03-50
						7	4.2	A10-03-07
4/17/00	A10-04	10.02	12.02	-22.25	-36.84	90	4.2	A10-04-90
						45	4.2	A10-04-45
						7	4.2	A10-04-07
4/18/00	A10-05	10	12	-18.16	-34.54	115	4.2	A10-05-115
						60	4.2	A10-05-60
						7	4.2	A10-05-07
4/19/00	A10-06	10	12	-14.19	-32.65	125	4.2	A10-06-125
						65	4.2	A10-06-65
						7	4.2	A10-06-7
4/19/00	A10-07	15.05	17.05	-13.51	32.33	130	4.2	A10-07-130
						100	4.2	A10-07-100
						25	4.2	A10-07-25
4/20/00	A10-08	10		-10.29	30.82	120	4.2	A10-08-120
						60	4.2	A10-08-60
						7	4.2	A10-08-07
4/21/00	A10-09	10	11	-6.21	28.59	105	4.2	A10-09-105
						55	4.2	A10-09-55
						7	4.2	A10-09-07
4/22/00	A10-10	9.59	10.59	-2.22	27.09	55	4.2	A10-10-55
						25	4.2	A10-10-25
						7	4.2	A10-10-07
4/23/00	A10-11	10	11	1.94	-25.25	60	2.1	A10-11-60
						30	4.2	A10-11-30
						7	2.1	A10-11-07
4/24/00	A10-12	10	11	6.10	-23.49	45	2.1	A10-12-45
						35	2.1	A10-12-35
						20	2.1	A10-12-20
						7	2.1	A10-12-07
4/25/00	A10-13	10		10.21	-21.65	30	2.1	A10-13-30
						25	2.1	A10-13-25
						7	2.1	A10-13-07
4/25/00	A10-14	midnight	1	12.47	-20.66	75	2.1	A10-14-75
						55	2.1	A10-14-55
						47	2.1	A10-14-47
						40	2.1	A10-14-40
						7	2.1	A10-14-07
4/28/00	A10-15	14.55	14.55	23.70	-21.56	40	4.2	A10-15-40
						7	4.2	A10-15-07
4/29/00	A10-16	10	10	27.54	-21.97	107	4.2	A10-16-107
						53	4.2	A10-16-53

Date	Station number	Time (Local)	Time (GMT)	Latitude	Longtitude	Depth (m)	Vol filtered (L)	Label
						7	4.2	A10-16-07
5/1/00	A10-17	16:00	16:00	36.00	-20.00			
						7	2.1	A10-17-7
						20	2.1	A10-17-20
						30	2.1	A10-17-30
						40	2.1	A10-17-40
5/1/00	A10-18	22:00	22:00	36.96	-19.99			
						7	2.1	A10-18-7
						20	2.1	A10-18-20
						30	2.1	A10-18-30
						40	2.1	A10-18-40
5/2/00	A10-19	4:00	4:00	37.92	-20.00			
						9	2.1	A10-19-9
						23	2.1	A10-19-23
						35	2.1	A10-19-35
						51	2.1	A10-19-51
						71	2.1	A10-19-71
4/2/00	A10-20	10:00	10:00	38.88	-20.00			
						7	2.1	A10-20-7
						15	2.1	A10-20-15
						30	2.1	A10-20-30
						40	2.1	A10-20-40
5/3/00	A10-21	5:22	5:22	47.00	-20.00			
						7	2.1	A10-21-7
						20	2.1	A10-21-20
						35	2.1	A10-21-35
						50	2.1	A10-21-50
5/5/00	A10-22	10:00	9:00	48.70	-12.83			
						7	1	A10-22-7
						20	1	A10-22-20
						30	1	A10-22-30
5/6/00	A10-23	10:00	9:00	49.32	-6.01	40	1	A10-23-40
						30	1	A10-23-30
						20	1	A10-23-20
						15	1	A10-23-15
						7	1	A10-23-7

APPENDIX 11: PI Curve Log

Station	Latitude	Longitude	Date	Time GMT	Depth (m)	Light ($\mu E\ m^{-2}\ s^{-1}$)
CTD 2	-29.055	-43.028	15/04	12:00	7, 45, 90	589.27
CTD 4	-22.250	-36.841	17/04	12:00	7, 45, 90	642.54
CTD 6	-14.188	-32.647	19/04	12:00	7, 65, 125	644.18
CTD 8	-10.286	-30.837	20/04	12:00	7, 60, 120	1025.95
CTD 9	-6.337	-29.000	21/04	11:00	7, 55, 105	968.15
CTD 10	-2.225	-27.098	22/04	11:00	7, 25, 55	1001.39
CTD 11	1.943	-25.262	23/04	11:00	7, 45, 60	1050.23
CTD 12	6.101	-23.444	24/04	11:00	2, 20, 55	1005.43
CTD 13	10.208	-21.652	25/04	11:00	0, 15, 30	941.85
CTD 15	23.699	-21.556	28/04	14:45	7, 40, 80	2676.43
CTD 16	27.538	-21.973	29/04	10:00	7, 53, 95	2542.91
CTD 17	35.998	-20.001	01/05	16:02	7, 20, 40	2246.69
CTD 19	37.917	-20.004	02/05	4:00	9, 35, 51	2547.25
CTD 20	38.877	-19.999	02/05	10:00	7, 20, 140	2475
UW1	42.902	-20.000	03/05	8:00	7	2111.15
UW2	43.286	-20.003	03/05	10:00	7	2099.87
UW3	44.083	-20.002	03/05	14:00	7	1651.92
CTD 21	47.003	-20.004	04/05	5:00	7, 20, 30	2299.28
UW 4	47.296	-18.257	04/05	13:00	7	2706.77
UW 5	48.117	-13.369	05/05	7:00	7	2467.77
CTD 22	48.200	-12.830	05/05	9:00	7, 20, 30	2173.57
CTD 23	49.323	-6.000	06/05	9:00	7	1911.45

APPENDIX 12: Nutrient Enrichment Log

Station	Date	Latitude	Longitude	Time	EXPT
TAG 01	14.4.00	-32.044	-46.087	1630	**1**
AMT 10-02	15.4.200	-29.057	-43.020	1200	**2**
AMT 10-03	16.4.2000	-25.676	-39.692	1200	**3**
AMT10-04	17.4.2000	-22.248	-36.839	1200	**4**
AMT10-05	18.4.2000	-18.160	-74.530	1200	**5**
AMT 10-06	19.4.200	-14.188	-32.647	1200	**6**
AMT 10-08	20.4.2000	-10.285	-30.821	1200	**7**
AMT 10-08	21.4.2000			1100	**8**
AMT 10-10	22.4.2000	-2.227	-27.105	1100	**9**
AMT 10-11	23.4.2000	1.935	-25.250	1100	**10**
AMT 10-12	24.4.2000	6.100	-23.340	1100	**11**
AMT 10-13	25.4.2000	10.209	-21.651	1140	**12**
TAG 02	28.4.2000	23.170	-21.499	1200	**13**
AMT 10-16	29.4.2000	27.537	-21.972	1000	**14**
AMT 10-17	1.5.2000	35.997	-20.001	1600	**15**
AMT 10-10-20	2.5.2000	38.886	-20.004	1000	**16**
TAG 03	3.5.2000	43.282	-20.000	1000	**17**
TAG 04	4.5.2000	47.289	-18.300	1300	**18**

APPENDIX 13: Zooplankton Sampling Log

Date	SDY	Stn	Station	Biomass				Sample	OPC		Profiler	Comment	Uwy	Time	Duration	In-line sample	
			Time	200-500	500-1000	1000-2000	>2000		200m	20m	200m				(hr)	Start	End
4/13/00	104	1	10:00	Profiling rig failure - no nets									1	20:00	17.83		
4/14/00	105		10:00	Weather - no station									1	14:00	21.75		
4/15/00	106	2	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		1	15:00	20.85		
4/16/00	107	3	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		1	14:50	20.92	3:50	7:50
4/17/00	108	4	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		2	14:40	3.58		
														18:25	17.42		
4/18/00	109	5	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		1	14:05	21.67	22:10	2:10
4/19/00	110	6	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		2	13:30	1.50		
4/19/00	110	7	16:00	Station 7 -1000m CTD & Optics only										15:25	21.03	17:58	21:58
4/20/00	111	8	10:00	Y	Y	Y	Y	50/1000	Y	N	Y(F)	OPC 129µm	1	13:30	21.25	21:20	1:20
4/21/00	112	9	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		2	14:58	2.03		
														17:10	17.67	18:20	22:20
4/22/00	113	10	10:00	Y	Y	Y	Y	50/1000	Y	Y	N		1	12:35	22.22	19:05	23:05
4/23/00	114	11	10:00	Y	Y	Y	Y	50/1000	Y	N	Y	Bio 129µm	1	12:40	22.13	21:50	0:50
4/24/00	115	12	10:00	Y	Y	Y	Y	50/1000	Y	N	Y	OPC 129µm	1	12:37	22.12	20:41	0:41
4/25/00	116	13	10:00	Y	Y	Y	Y	50/1000	Y	N	Y	OPC 129µm	1	13:00	11.83	13:10	17:41
4/26/00	117	14	0:01	Y	Y	Y	Y	50/1000	Y	N	Y	Bio 129µm	2	3:35	8.42		
														14:40	24.88	19:40	11:40
4/27/00	118			Weather - no station									1	15:35	19.33	16:35	11:02
4/28/00	119	15	14:00	Y	Y	Y	Y	50/1000	Y	N	N		2	12:45	1.62		
														16:03	18.87	19:49	0:20
4/29/00	120	16	10:00	Y	Y	Y	Y	50/1000	Y	N	N		1	11:50	19.93		
4/30/00	121		10:00	Weather & Rolling - No station or underway													
5/1/00	122	17	16:00	Y	Y	Y	Y	50/1000	Y	N	N		1	18:00	5.02		
5/1/00	122	18	22:00	Y	Y	Y	Y	50/1000	Y	N	Y	Bio 129µm					
5/2/00	123	19	4:00	Weather - No nets									1	0:25	9.80		
5/2/00	123	20	10:00	Y	Y	Y	Y	50/1000	Y	N	N		1	12:00	21.98		
5/3/00	124			Weather - no station									2	10:03	4.03	10:05	14:05
														14:22	15.83		
5/4/00	125	21	5:00	Y	Y	Y	Y	50/1000	Y	N	N		1	7:15	24.68		
5/5/00	126	22	9:00	Y	Y	Y	Y	50/1000	Y	N	N		1	11:00	22.58		
5/6/00	127	23	9:00	Not sampled - pea soup									1				