SOUTHAMPTON OCEANOGRAPHY CENTRE

CRUISE REPORT

No. 1

RRS *DISCOVERY* CRUISE 217
27 SEP-22 OCT 1995

The biology, chemistry and physics of the Goban Spur on the European continental slope of the northeast Atlantic

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1996

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DOCUMENT DATA SHEET

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PUBLICATION DATE

1996

TITLE

RRS Discovery Cruise 217, 27 Sep-22 Oct 1995. The biology, chemistry and physics of the Goban Spur on the European continental slope of the northeast Atlantic.

REFERENCE

Southampton Oceanography Centre, Cruise Report No. 1, 51pp.

ABSTRACT

Discovery Cruise 217 was one of a series of cruises to the continental slope southwest of the UK in support of an EEC MAST programme "OMEX"(Ocean Margin Exchange). The overall objectives of the programme are "to measure and to model exchange processes at the ocean margins..." and permanent repeat stations were established on the Goban Spur (around 49°N 12°W) in 1993 to address these. *Discovery* 217 focused primarily on the biological and chemical processes of the upper water column and the flux of particulate material associated with these processes. In spite of a number of technical problems associated with scientific equipment and significant losses of time due to poor weather, most of the original objectives were successfully met and the results will make a major contribution to the overall programme.

KEYWORDS

ADCP, BATHYSNAP; BENTHIC COMMUNITIES, BENTHIC ENRICHMENT, CONTINENTAL SLOPE; CRUISE 217 1995, *DISCOVERY*/RRS; DISSOLVED OXYGEN, GOBAN SPUR, LONGHURST HARDY PLANKTON RECORDER, MACROFAUNA, MARINE SNOW, MESOZOOPLANKTON, MICROZOOPLANKTON; NUTRIENTS; OMEX, PARTICULATE FLUX, PORCUPINE ABYSSAL PLAIN, PRIMARY PRODUCTION, SEASOAR

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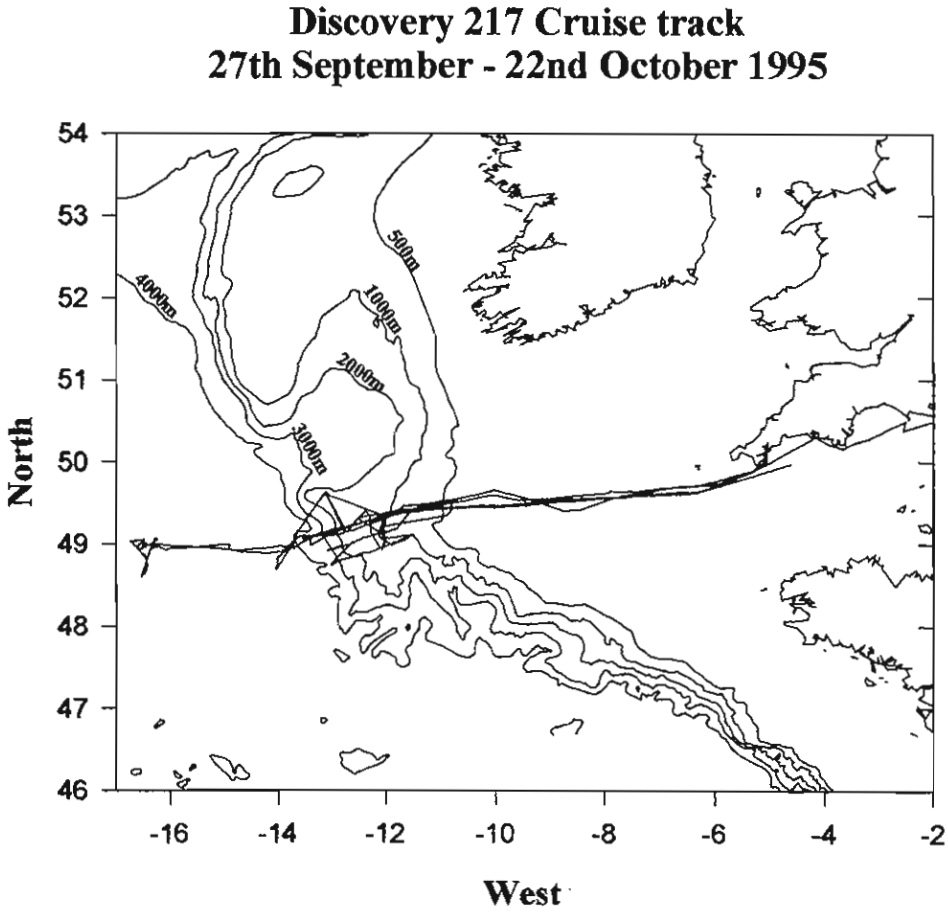

Figure 1 Cruise track

Scientific Personnel

Dr Avan Antia	IFM Kiel
Dr Sonia Batten	SAHFOS
Ms Petra Berger	IFM Kiel
Dr Brian Bett	SOC
Mr Danny Boardman	Univ. Liverpool
Mr Eike Breitbarth	IFM Kiel
Ms Ilse Buens	Univ. Hamburg
Ms Elaine Edwards	PML
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Mr Andy Geary	SOC
Mr Keith Goy	SOC
Mr Mark Hartman	SOC
Ms Sue Holley	SOC
Ms Jacky Hunter	SOC
Dr Ian Joint	PML
Mr Stirling Jordan	RVS
Mr Steve Keen	SOC
Dr Richard Lampitt (PSO)	SOC
Mr Robert Lloyd	RVS
Mr Thomas Raabe	Univ. Hamburg
Mr Andy Rees	PML
Mr Rhys Roberts	RVS
Ms Monika Schuett	Univ. Hamburg
Dr Ian Tottedell	SOC
Mr Kai Viehweger	Univ. Hamburg
Mr Garry White	RVS
Dr Mike Zubkov	Univ. Soton.

Ship's Personnel

M.A. Harding	Master
R.J. Chamberlain	Chief Off
R. Atkinson	2/0
J. Mitchell	3/0
B. Donaldson	R/O
I.G. McGill	Chief Eng.
J.Clarke	2/E
R.Perriam	3/E
B.Walker	3/E
G.A. Pook	CPO(Deck)
T.G. Lewis	PO(Deck)
R.Avery	Seaman 1A
S.C. Cook	
T.R. Edwards	
K. Hobb	
I.N.M. Thomson	
A.M. Bridge	PO(Motorman)
C.Elliott	SCM
J.P.Dane	Chef
W.Latta	Messman
J. Osborn	Steward
P. Robinson	Steward

Itinerary

Depart Southampton 27 September 1995
Arrive Southampton 22 October 1995

Introduction

The OMEX programme is an EEC funded MAST programme with the overall aim "to measure and to model exchange processes at the ocean margins as a basis for the development of global models to predict the impact of environmental changes on the oceanic system and more specifically on the coastal zone." The programme is divided into 5 sub-projects (Physical processes, Biological processes, Biogeochemical processes, Benthic processes and Biogasses) and the cruise reported upon here addressed aims of all but the last of these. The cruise objectives were primarily directed at the biology and biogeochemistry of the OMEX box over the Goban Spur and are presented below. Consequently the scientific complement was drawn almost exclusively from these two sub-projects but with the welcome addition of a benthic biology group from outwith OMEX.

In spite of a number of technical problems with overside equipment and a degree of bad weather which was to be expected at this time of year, many of the cruise objectives were successfully met even exceeding expectations in some cases.

Objectives

1: To describe the spatial structure of the Goban Spur in terms of its physics and certain aspects of biogeochemistry using SeaSoar, CTD, underway measurements and satellite remote sensing.
2: To measure the distribution of certain dissolved chemical components which are relevant to slope biogeochemistry using vertical profiles from collected water, *in situ* measurements and underway analyses.
3: To measure primary production using both *in situ* and deck incubations.
4: To examine the distribution of microzooplankton and measure their grazing pressure on the phytoplankton and bacterial communities.
5: To asses the distribution of mesozooplankton in time and space using a variety of techniques and to carry out experimental work on live collected specimens.
6: To make repeated vertical series of *in situ* photographs of Marine Snow particles (>0.5mm diameter) across the slope and to collect samples for analysis and experimentation.
7: Turn round sediment trap moorings deployed on a previous cruise (Meteor 20/7) and to examine the distribution of fine suspended particles (Transmissometer and nephelometer).
8: To examine the distribution of benthic megafauna using photosledge and net sledge and to examine their behaviour using benthic time lapse camera system, "Bathysnap".
9: To collect samples of benthic macrofauna and meiofauna using multicore and box corer.
10 To carry out a benthic *in situ* incubation experiment.

Narrative

Loading commenced on September 25th in Ocean Dock Southampton during winding on of a new CTD wire. Shortly after scientific staff officially joined Discovery on the 26th, it was realised that part of the equipment dispatched from Hamburg had not arrived on board and it was not till after sailing on 27th that they were located in Southampton by the agent and arrangements were made to transport it to Plymouth for trans-shipment by pilot boat that evening. This did not present a serious problem as plans were already in place for such a rendezvous. A three man film crew joined the ship just prior to sailing on 27th with Prof. Fauzi Mantoura of PML as part of a film production on his life and work. The weather was good, providing many photo-opportunities for both interviews and overside work during testing of some items of equipment. An additional unplanned photo-opportunity was provided by a sailing ship which required assistance off Portland Bill. RRS Discovery provided a lee for the Weymouth lifeboat which was trying to establish a tow of the vessel while a Naval helicopter stood by. The tow was eventually established and Discovery proceeded to Plymouth for transfer of the film crew and Fauzi Mantoura and for delivery of the lost packages from Hamburg. We were fully away and on passage to the Goban Spur shortly after midnight.

Although the initial intention was to carry out a full seasoar survey at the start of the cruise, it soon became apparent that the equipment required significant preparatory work before this would be possible. Similarly the CTD required some preparation but the initial period was most productively used to recover two of the sediment trap moorings, to collect water for incubation experiments and to deploy for the first time the new Longhurst Hardy Plankton Recorder (LHPR) as part of the cross slope transect. During the time when the CTD is not in use, it is customary for it to be bolted to the deck as a safety precaution. Unfortunately on 30th September, the loose end of the CTD wire became snagged on the aluminium top of the secured CTD frame as it was being tightened due to the extension of the Box Frame. This was during deployment of a Go-Flo bottle. The force exerted was sufficient to break off the top of the CTD frame damaging 4 water bottles as it did so. There being no aluminium welding gear on board, there was no option but to return to the UK for a replacement. The opportunity was also taken to obtain some additional electronic parts and circuit diagrams for the CTD. The seasoar was still not operational so course was set at 1700h on Sunday 1st October for a rendezvous off Falmouth. As a result of the dedicated activity of John Smithers (SOC), a successful transfer of equipment was made at 1700h on 2nd October. Course was again set for the Goban Spur at 1830h but after a while the SW gales forecast became a reality and progress was significantly affected.

The remainder of the cruise focused on the OMEX transect along 49°N extending out to the Porcupine Abyssal Plane at 16.5° W. The successful highlights of the period were that all the Goban Spur sediment trap moorings were successfully recovered and redeployed, primary production measurements were done on every day when the weather permitted, numerous profiles of dissolved and particulate water column properties were determined, many micro and mesozooplankton profiles were obtained although the conducting warp swivel was unreliable. Acoustic assessment of zooplankton distribution proceeded almost continually using the ADCP. The benthic incubation rig was successfully deployed and recovered as was a Bathysnap (benthic time laps camera system) and the required number of box cores and multicores were successfully taken. Notable problems were that the sediment trap mooring on the

Porcupine Abyssal Plain (PAP) could not be recovered and a new one was put in its place, a primary production rig was also lost, the constant temperature facility broke down and could not be repaired in spite of determined efforts by the ships engineers and furthermore, in this room, there was a spillage of formalin preventing any live zooplankton experimental work from being carried out. The planned benthic photographic survey could not be carried out due to electronic failure of the cameras. The SeaSoar continued to be a problem due to electronic and mechanical failures and of the two detailed and extensive surveys which were planned, only part of one was completed. This was a serious blow to the cruise objectives. The weather was not untypical for the Northeast Atlantic in late Autumn (*Figure 2*) but nevertheless on several occasions it precluded all overside activity leading to the loss of a total of 66 hours of such work. Apart from the constant temperature facility and the conducting warp termination, shipside equipment was maintained very effectively and efficiently thanks to the diligent efforts of RVS staff.

Discovery finally berthed at Southampton at 0800h on 22nd October.

An essential prerequisite for the success of a complex multidisciplinary cruise such as this is a high degree of good communication between the scientific and ship side staff. I take this opportunity to thank Captain Mike Harding, the officers and the crew for the good communication which characterised the cruise, for their enthusiasm for success and for their skill in maintaining such an efficient working environment.

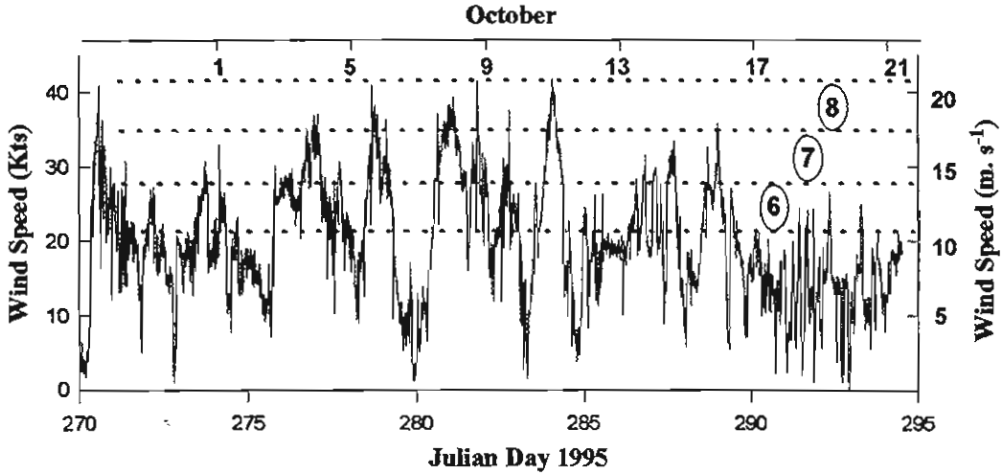

Figure 2 *Wind speed during the cruise taken from the ship's anemometer. Beaufort Numbers are encircled. Data are 6 minute running means. Tick marks for day number and date represent the start of the day (0000h).*

Richard Lampitt
Principal Scientist D217
Southampton Oceanography Centre

Scientific and technical reports

Environmental Observations (CTD and SeaSoar)

At the beginning of the cruise it was discovered that there were a number of faults with the CTD and SeaSoar systems. This created difficulties with the initial CTD profiles and had a knock-on effect in preparing the SeaSoar system. The first SeaSoar survey, that had been designed to obtain large-scale information about the Goban Spur area had therefore to be cancelled. Although we were eventually able to carry out 40 CTD profiles, we were only able to tow SeaSoar for 16 hours in all. From the point of view of OMEX we were unable to carry out one of the major objectives, namely a detailed SeaSoar survey of the shelf-break.

CTD Profiling

On day 1 it was discovered that the Deep1 CTD pressure sensor drifted with time making it unusable. The second deep CTD could not be used as a back-up because the new mulitplexed analog channels could not be used with it. A new pressure sensor and interface board was delivered to the ship at Falmouth by John Smithers and was used for station 12796 onwards and this cured the problem for most of the cruise. However, on Station 12830 the pressure sensor made a discrete jump at some stage in the up haul so that it read -20db instead of +10db when at the surface. This problem occurred on all the remaining CTD profiles, although the down profiles were OK.

The sequence of the multiplexed variables within the level C computer file was not the same as that transmitted by the CTD output to the level A. This caused considerable confusion at the start of the cruise and appears to be caused by the level A software. It should be sorted out for future cruises.

We had the wrong RVS level A interface for recording bottle firing time from the IOSDL system. This meant that firing times had to recorded manually and a FORTRAN program (botin) and a new Exec (botexec) had to be written to read these times into a Pstar file and merge the results with the 2db CTD file. If the system had been connected up and tested before sailing this oversight would perhaps have been discovered.

A UV nitrate sensor was deployed on nearly all the CTD dips and gave valuable information on the working of this new sensor (see report by S. Holley). A Chelsea Instruments PAR sensor was deployed on most of the shallow CTD dips.

The SeaSoar system

A large number of problems had to rectified before we eventually got the system into the water on the 12th October. These were:

a) The temperature sensor or associated electronics on Shallow2 would not work and no circuit diagrams were supplied making repair impossible. This was replaced with Shallow1 but meant that the nitrate sensor could not be sampled because the new multiplexing system could not be used with this CTD.

b) The hydraulics system was not working and had to be replaced with the spare.

c) The brackets for the fluorometer had not been modified for the new shorter Chelsea fluorometer.

Before the First SeaSoar deployment a sediment trap rolled onto it breaking the top plastic wing. There were no spares and so a new wing was made out of marine plywood. On retrieval the bottom plastic wing had also broken and this also was subsequently replaced with plywood. The

propeller was bent, perhaps hit by a piece of the broken wing. The first SeaSoar run was intended to be mainly a short system test which was just as well as it was later discovered that the conductivity probe had not been working at all. This was found to be due to a wiring fault.

The second deployment on the 15th October (1630h) was intended to be a survey of the shelf break area consisting of 4 long transects separated by 20 km. It was immediately apparent that the SeaSoar was not flying properly. On being brought in it was found that the hydraulics were leaking and the tail stabilising bar had broken off. The other hydraulic system had been repaired and so this was used as a replacement. However, as there was no spare stabilising bar (or drawings) a new one had to be made from memory. The first attempt did not work but the second was successful.

The proposed shelf break survey was begun at 1300h on the 17th October. Two crossings of the shelf break were made but the SeaSoar experienced further flying problems before the shelf break was reached on the third transect (*Figure 3*). It was later discovered that the bolt on the hydraulic motor had bent. In all only 16 hours of good SeaSoar data were obtained from the whole cruise.

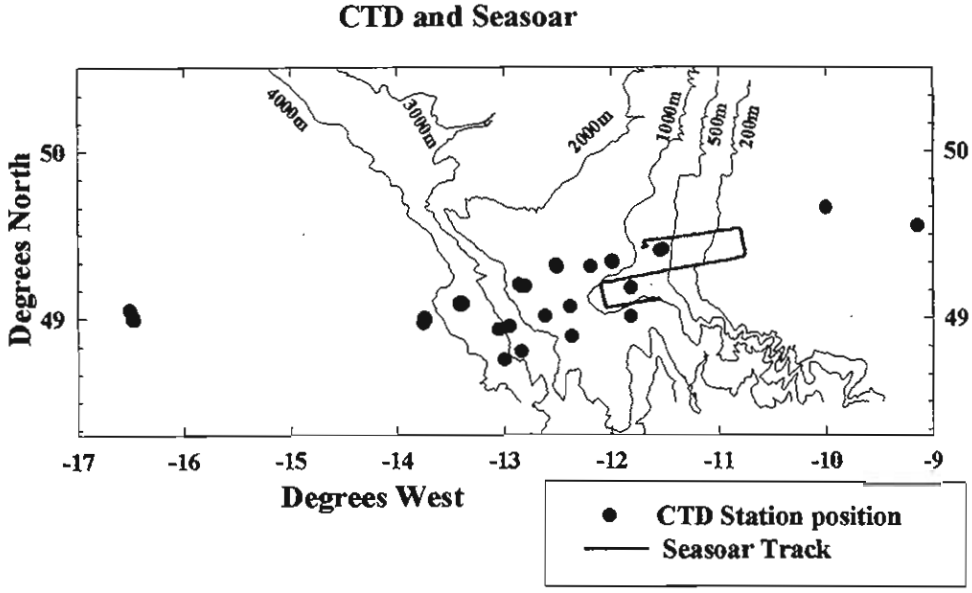

Figure 3: Locations where CTD profiles were taken and the track of the SeaSoar.

Mike Fasham & Ian Totterdell
Southampton Oceanography Centre

CTD and SeaSoar Operations

CTD and Multisampler system

Instruments used for the CTD/multisampler set-up were:

Neil Brown MKIIIB CTD (DEEP01),
General Oceanics 24 bottle multisampler,
Chelsea Instruments flourometer,
Sea Tech 100cm Transmissometer,
FSI 10 litre water bottles,
SIS digital reversing thermometers,
SIS digital reversing pressure meters,
Valeport / SOC nitrate sensor,
PML Irradience (PAR) sensor,
Nephelometer.

On day 273, after CTD station 12793#1, the top plate of the multisampler was irreparably damaged when the CTD winch cable caught its rim and ripped it upwards whilst a GO-FLO was being deployed. The ship steamed to Falmouth and another plate collected. This was fitted onto the existing assembly and performed successfully for the remainder of the cruise.

Six water bottles were glued at the top brace with PVC glue, two due to poor gluing in manufacture and four were pulled apart when the multisampler top plate broke. One white bottle retaining rod broke when the multisampler plate broke. Four of the bottles' top lids sheared off where they joined the springs during cocking. The broken bottles were either replaced or repaired using the six spare bottles on board, thus 24 bottles were operational for the majority of the CTD profiles.

On installation, the CTD (DEEP01) showed problems with respect to pressure. The displayed pressure drifting upwards a few minutes after switching on and continuing, with a greater drift rate, the longer the instrument was on. A new pressure sensor and electronics board were collected with the multisampler plate. These functioned successfully until the last few casts, when large hysteresis between the up and the down and a 40db jump in pressure were seen. As CTD profiles were now abundant and there was not time in-between casts to examine the CTD electronics, the depths for the remaining few profiles were calculated using the 'cable out' reading taken from the CTD winch system. The 'cable out' was compared previously in the cruise with CTD pressure and altimeter readings and proved fairly accurate.

Prior to the final CTD profile (stn 12838#1) the conductivity sensor had snapped off onto the deck, the cause of which is unknown. A new cell was fitted.

For several casts the nephelometer was installed instead of the PAR sensor. This was configured for it's greatest sensitivity and on comparison with the transmissometer showed good results (See report by Antia et al).

The new SOC 8-channel analogue to digital board, enabling the nitrate sensor to be used, functioned fully until steaming home, the cause of its demise is yet unknown. The shallow nitrate sensor, intended to be used on the SeaSoar, was installed on the profiling frame instead of the deep nitrate sensor for several of the shallow casts, enabling its performance to be assessed.

The CTD cable needed terminating only twice. Once at the beginning of the cruise and once due to a kink in the wire, probably from snatching in the steadying roller. Both termination's were strain tested to 1.8 tonnes for four minutes after construction.

SeaSoar

Instruments used for the SeaSoar set-up were:

Neil Brown MKIIIB CTD (SHALLOW01),
Chelsea Instruments Flourometer,
Irradience (PAR) sensor.

The CTD (Shallow02) intended for interfacing the shallow nitrate sensor had a temperature fault throughout the cruise, therefore the backup CTD (Shallow01) was used.

Prior to deploying the SeaSoar the primary hydraulic unit had a broken connector, this unit was replaced by the secondary unit. The flourometer did not match with the nose cone opening and the retaining clamps had to be modified. The towing cable, which had already been terminated, was thought to have major corrosion so a length was removed and strain tested to 2 tonnes for four minutes. The strain test established that the cable was satisfactory so it was re-terminated.

The top rear wing was broken by a sediment trap, which fell onto it whilst being manoeuvred, a wooden replacement was manufactured and fitted.

On recovering the SeaSoar after its first survey, where depths of over 220 metres were achieved for 420 metres of cable out, the bottom rear wing had snapped from both sides of the body and the impeller was bent. It is thought that something might have hit the fish in the water, which broke the wing, consequently damaging the impeller. Another wooden wing was manufactured and fitted. The hydraulic unit had also leaked oil so was replaced with the repaired primary unit. Conductivity for this first survey was not functioning, this was thought to be due to a loose wire in the wiring loom within the CTD, which was re-soldered and on the deck seemed to cure the problem.

Shortly after deploying for the next survey the conductivity was still not working and the fish was not flying correctly. On recovery, the rudder stabilising bar was found to be missing. A replacement, designed from memory and constructed from current meter fins was fitted. The conductivity circuit board was replaced with one from Shallow02.

Again the SeaSoar was deployed and shortly after recovered was still not flying correctly, it occasionally flipped on its back and flew upside down. The replacement stabilising bar was modified.

On the next deployment the SeaSoar flew for several hours without fault. The wire was shortened, to avoid the shelf, to 150 metres and depths of over 100 metres were achieved. After turning off of the shelf and paying out the cable to 500 metres problems were yet again experienced with flying the fish. Upside down flying and lack of control were again experienced. Hauling in the cable to 200 metres did not help, so the fish was recovered with the assumption that the course change contributed to the instability and the stabilising bar was still not correct. A bent ram on the hydraulic unit and a fault with the deck unit controlling the SeaSoar were found. These would have contributed partially to the poor flying, but not to the upside down flying experienced. Drawings faxed to the ship showed the correct dimensions of the stabilising bar to be considerably longer than the improvised version thus the probable reason for the belly-up flying.

Steve Keen
Ocean Scientific International Ltd

Dissolved Chemical distribution

Nutrients, Oxygen, chlorophyll, pH,, DOC etc.

Tasks: Onboard analysis of nutrients, oxygen, pH, chlorophyll, turbidity. Sampling for analysis of DOC, PCH, indiv. PCH, indiv. fatty acids, PP, PC, PN

Material and methods

From 28 CTD stations (*Figure 3*) a total of 353 water samples for nutrient analysis according to AutoAnalyzer methods (ammonium, nitrite, nitrate, phosphorus, silicate, total dissolved organic nitrogen and phosphorus) have been carried out. Furthermore, physico-chemical parameters such as oxygen (by Winkler), pH (WTW pH-meter), turbidity (Turner Designs nephelometer) and chlorophyll (1-Hz fluorometer) have been analysed.

From the same water, samples have been taken for analysis of the following parameters in the Hamburg laboratory: dissolved organic carbon, dissolved carbohydrates, particulate phosphorus, particulate carbohydrates, particulate carbon and nitrogen. The samples were filtered onto precombusted Whatman GF/C filters. The filtrate was preserved by adding mercuric chloride and stored at 7 °C. The filters were frozen immediately at - 21 °C.

At 4 CTD stations along the Goban Spur transect, 24 samples from the euphotic zone have been taken for analysis of particulate individual fatty acids and particulate individual carbohydrates. For each parameter 10 l of water were filtered onto Whatman GF/C filters. The fatty acid filters (under chloroform + BHT) and particulate carbohydrate filters were stored at - 21 °C.

First results

Along the Goban Spur a typical autumnal situation was observed. As reported by other groups on board of the Discovery, the biological activity (phytoplankton, zooplankton and bacteria) was rather low in the mixed layer which was separated from the deeper water column by a strong thermocline around the 50 m depth contour. The contents of all nutrients except from ammonium were very low (*Figure* 4), probably due to previous plankton blooms in this area. Apparently the nutrient exchange through the thermocline was restricted, and no major upwelling processes could be observed.

First remineralisation processes in the euphotic zone were indicated by partly higher ammonium and nitrite concentrations. Maximum concentrations of ammonium were detected in the upper parts of the mixed layer. Below these maxima, close to the thermocline, the ammonium was oxidised and as a consequence nitrite maxima were found at 50 m.

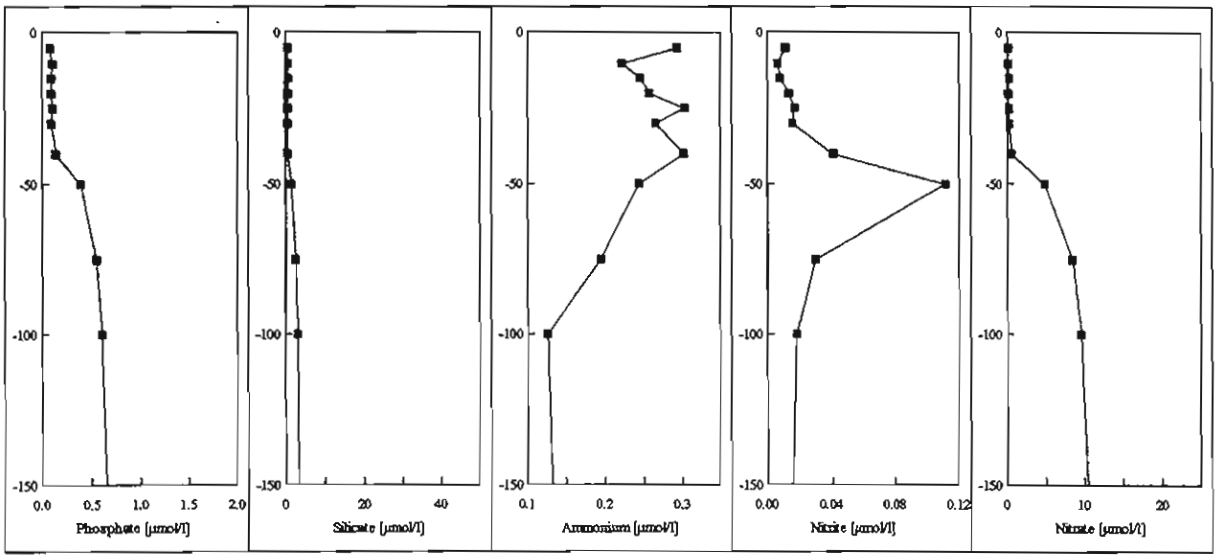

Figure 4 *Nutrients (0 - 150 m depth) at Discovery station 12806, Omex 3*

At all deeper stations the Mediterranean Outflow Water (MOW), characterised by low oxygen concentration (*Figure* 5) and high salinity values, was found at the 1000 m depth contour. Below 3000 m silicate and phosphate concentrations increased to maximum values of more than 40 µmol/l and 1.5 µmol/l, respectively. This was typical for Antarctic water masses as observed during previous cruises.

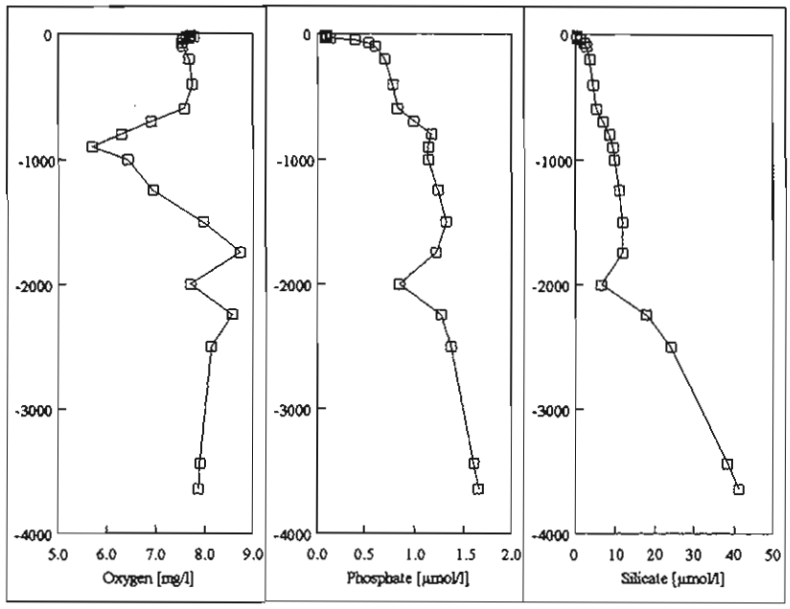

Figure 5 *Oxygen, phosphate and silicate at Discovery station 12806, Omex 3*

Acknowledgements

We would like to thank the officers and the crew of the Discovery for excellent help and support in every aspect during cruise 217. Furthermore, there has been very good cooperation between the various scientific groups on board. We experienced the Discovery as a perfect research vessel.

Mast- und Schotbruch und immer eine Handbreit Wasser unterm Kiel!

Ilse Büns, Thomas Raabe, Monika Schütt, Kai Henning Viehweger
University of Hamburg, Institute of Biogeochemistry and Marine Chemistry

Salinity measurements

On average six samples were drawn from each cast for salinity analysis. Glass sample bottles were emptied of old sea water rinsed twice with the new sample and then filled to the base of the neck, the tops were dried and then sealed using disposable stoppers and screw caps. Crates of bottles were left in the stable lab for a minimum of 12 hours to equilibrate before analysis. All analysis was carried out in the stable lab using the RVS Autosal salinometer (model 56747), fitted with an Ocean Scientific International peristaltic pump. 13% of the samples were taken in duplicate, the mean duplicate difference was 0.001 practical salinity units.

There was some initial concern in running the salinometer outside of a constant temperature laboratory however the temperature ranged from 21.7°C to 23.8°C throughout the cruise and the salinometer bath temperature was maintained at 24°C.

Standard IAPSO sea water ampoules were used as reference samples at the beginning and end of each crate of 24 samples. The RVS software (ATS) was used to calculate the final salinity.

There were initial problems in setting up the salinometer as the cell could not be flushed and a pump had to be replaced. Half way through the cruise the cell became difficult to fill and there were often bubbles in the final arm of the cell. Washing the cell in Decon overnight on day 287 removed the build up of bubbles and after this time no other problems were experienced with the equipment.

Samples were also drawn for salinity analysis for calibration of the thermosalinograph. These were taken at hourly intervals whilst the SeaSoar was deployed. Other underway samples collected hourly whilst the SeaSoar was in use were analysed for nutrient content by the Hamburg group and 100ml samples were filtered onto GF/F filters and frozen for subsequent chlorophyll analysis.

Nitrate sensor

A nitrate sensor that could be used to full ocean depth was developed by IOSDL just prior to the cruise. This was fitted to the CTD frame and used to obtain a continuous nitrate profile at each cast from 12793 - 12837. At stations 12791, 12810 and 12838 this deep nitrate sensor was replaced by a shallow sensor, which could only be used to depths of 500m. This sensor had been tested on previous cruises. It was not possible to connect the shallow nitrate sensor to the SeaSoar as originally planned due to problems at the CTD interface. During the last two days the shallow sensor was connected to the non toxic supply and a continuous underway trace obtained. This was a temporary arrangement. A more permanent arrangement, with a drain pipe from the sensor, would be useful on future cruises.

Dissolved nitrate ions absorb in the UV region between 220 and 230nm. The nitrate sensor operates at three wavelengths: corrections due to absorbance by organic compounds are made through measurements at 240nm; corrections for spurious apparent absorption are made by referencing signals in the 220nm and 240nm channels to changes in the signal at 300nm. The signals obtained are converted to absorbance readings, referenced to distilled water. The *in situ* response of the sensor was calibrated against colorimetric analysis of the nitrate in the water bottle samples (by the Hamburg group). Individual station calibrations were applied to the data although the overall 220nm absorbance to nitrate concentration relationship was fairly constant (R^2=0.9084).

The stability of the sensors was checked through regular on deck calibrations using a light shielded container placed over the sensor. The cover appears to restrict mixing of the water at the sensor, however it has the advantage of minimising contamination of the calibration solution. On deck calibrations were made in distilled water and in surface water, taken from the non toxic supply. This was done on seven occasions for the deep sensor and five for the shallow sensor. Standard curves were prepared from increasing additions of nitrate standard. A second stock standard was prepared on day

287 with no apparent shift in the calibrations. Aliquots of sample were taken from the cover during on deck calibrations and analysed colorimetrically by the Hamburg group. The on deck calibrations were not as linear as the calibrations calculated *in situ*, especially when calculated using the analyser corrected nitrate concentrations, this remains to be investigated. The sensitivity of the sensors to salinity was investigated on two occasions by on deck calibrations in a range of different salinity water from distilled to non toxic supply surface water. The response to changes in salinity is not linear for the deep sensor suggesting some salinity interference which will be investigated at a later date.

An upwards drift in the 300nm channel was seen on three occasions during on deck calibrations. More worrying were the shifts in the 300nm reading, during deck calibrations and during the casts, which resulted in overcorrecting of the 220nm and 240nm channels. However large shifts in the 300nm channel (order of 20%) only resulted in an 1.6% change in the nitrate concentration. The absorbance increased in the 240nm as well as the 220nm channel during calibrations of the deep sensor, this was not so apparent in the shallow sensor. This suggests that alignment of the wavelengths in the two instruments is not identical.

Sue Holly
Southampton Oceanography Centre

Primary production

Measurements of phytoplankton and "new" production, ammonia regeneration and bacterial activity.

Objectives

1. To measure phytoplankton activity in the OMEX area in the autumn, so complementing measurements already made in spring and summer.
2. To estimate primary production by different size fractions of phytoplankton.
3. To determine the uptake of ammonia and nitrate by phytoplankton.
4. To measure the abundance and activity of bacteria in the surface 100m.

Methods

Primary production was measured on water samples taken from 8 depths in the surface mixed layer by measuring the incorporation of ^{14}C bicarbonate into 3 size fractions: >5μm, <5 to >2 μm and <2 to >0.2 μm. The samples were either incubated on deck, with a series of blue optical screens to simulate the light profile in the sea, or by *in situ* incubations with a free-floating drifting incubation system. All incubations began just before dawn, with 24h duration.

The assimilation of ammonia and nitrate was measured on samples taken from the same depths as the primary production experiments and also incubated either on

deck or *in situ* for 24h with ^{15}N ammonia and ^{15}N nitrate. On deck incubations were done to measure the rate of ammonia regeneration.

Bacterial activity was measured by the incorporation of ^{3}H thymidine and ^{3}H leucine. Samples were prepared for the assessment of bacterial abundance by epifluorescence microscopy.

Table 1 is a summary of activities throughout the cruise and *Figure* 6 shows the locations of relevant stations.

Results

Preliminary results were obtained on primary production and bacterial activity, and indicate that the picoplankton size fraction was the most active; at every station, the <2μm fraction accounted for about 60% of the daily primary production. The data are summarised in Table 2. There were two maxima in bacterial activity in many of the profiles, with high rates in the surface 10m and again in the upper part of the thermocline at *ca* 50m. The interpretation of these profiles will require data on bacterial cells size, which will be made in the laboratory on preserved samples. Similarly, all data from the ^{15}N experiments will require analysis at the PML.

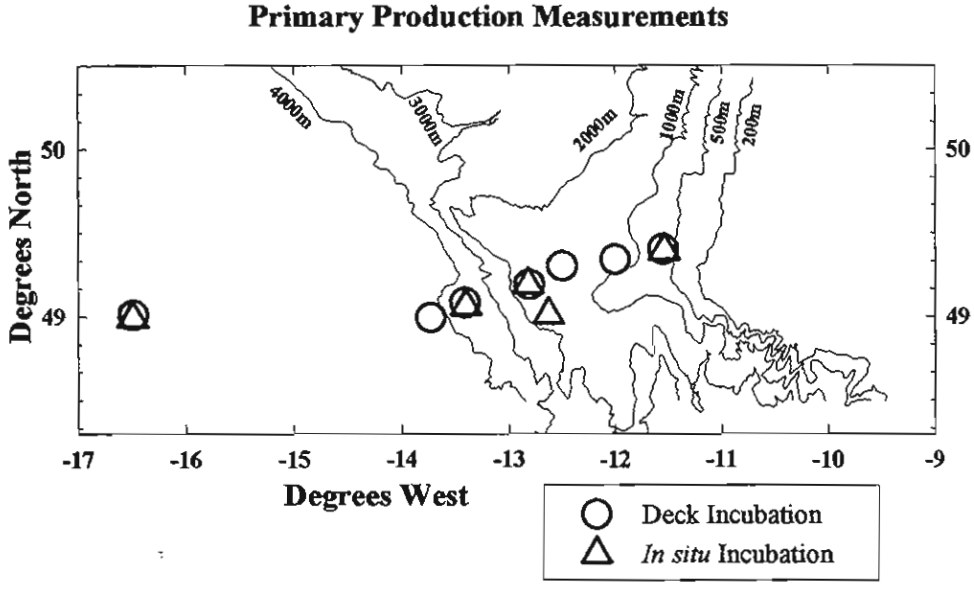

Figure 6: Locations of stations at which measurements of primary production were made.

Table 1: Summary of activities

Station	Date	Activity
12791#1	28 Sep	On deck 24h N assimilation experiment. <6hr surface N assimilation experiment. NH4 regeneration. (5m & 50m) nanomolar NH4 analysis (0 - 50m)
12793#1	30 Sep	On deck 24h C and N assimilation experiment. <6hr surface N assimilation experiment.
12794#1	1 Oct	<6hr surface N assimilation experiment. NH4 regeneration. (5m & 50m)
	2 Oct	N assimilation uptake time series (0 - 8 hrs)
	3 Oct	N assimilation uptake time series (0 - 4 hrs). Concentrations 0.05 - 1.0 mmol/l
12797#1	4 Oct	On deck 24h C and N assimilation experiment. <6hr surface N assimilation experiment
12800#1	5 Oct	*In situ* 24h C and N assimilation experiment. <6hr surface N assimilation experiment
12804#1	6 Oct	NH4 regeneration. 10m, 20m, 50m; nanomolar NH4 analysis (0 -50m); bacterial production.
12805#1	7 Oct	*In situ* 24h C and N assimilation experiment. <6hr surface N assimilation experiment; bacterial production
12807#1	9 Oct	*In situ* 24h C and N assimilation experiment. <6hr surface N assimilation experiment; bacterial production.
12809#1	10 Oct	On deck 24h C and N assimilation experiment. <6hr surface N assimilation experiment; NH4 regeneration. (5m & 50m); bacterial production.
	11 Oct	NH4 regeneration. time series (0 - 6 hrs)
12816#1	13 Oct	On deck 24h N assimilation experiment. <6hr surface N assimilation experiment; NH4 regeneration. (5m & 50m)
12819#1	14 Oct	On deck 24h C and N assimilation experiment; bacterial production.
12821#1	15 Oct	On deck 24h C and N assimilation experiment. <6hr surface N assimilation experiment; NH4 regeneration. (5m & 50m); bacterial production.
12825#1	17 Oct	On deck 24h C and N assimilation experiment. <6hr surface N assimilation experiment; bacterial production.
12832#1	19 Oct	*In situ* 24h C and N assimilation experiment. <6hr surface N assimilation experiment; bacterial production.
12837#5	20 Oct	*In situ* 24h C and N assimilation experiment. <6hr surface N assimilation experiment; bacterial production.

Table 2: Preliminary results of primary production experiments

			(mgC/ m2/d)				Propor tion		
Incubation	**Date**	**Station**	**>5µm**	**5-2µm**	**2-0.2µm**	**Total**	**>5µm**	**5-2µm**	**2-0.2µm**
In situ 1	05-Oct-95	12800#2	56.70	36.10	126.40	**219.20**	0.26	0.16	0.58
In situ 2	07-Oct-95	12805#6	40.40	20.00	78.70	**139.10**	0.29	0.14	0.57
In situ 3	09-Oct-95	12807#4	60.40	38.90	148.90	**248.20**	0.24	0.16	0.60
In situ 5	20-Oct-95	12837#6	35.40	25.70	108.90	**170.00**	0.21	0.15	0.64
On deck 1	30-Sep-95	12793#1	80.30	36.70	123.80	**240.80**	0.33	0.15	0.51
On deck 2	04-Oct-95	12797#1	84.50	30.80	124.10	**239.40**	0.35	0.13	0.52
On deck 3	10-Oct-95	12809#1	36.20	28.50	88.70	**153.40**	0.24	0.19	0.58
On deck 4	13-Oct-95	12816#1	47.50	29.70	134.50	**211.70**	0.22	0.14	0.64
On deck 5	14-Oct-95	12819#1	59.60	40.90	163.70	**264.20**	0.23	0.15	0.62
On deck 6	15-Oct-95	12821#1	68.90	34.90	176.50	**280.30**	0.25	0.12	0.63
On deck 7	17-Oct-95	12825#1	88.50	40.40	138.00	**266.90**	0.33	0.15	0.52
			Mean Producti on ($mg/m^2/d$)				**Mean Propor tion**		
			66.50	34.56	135.61	**236.67**	0.28	0.15	0.57

Ian Joint and Andy Rees
Plymouth Marine Laboratory,

Bacterivory in the surface water.

Low concentration of nutrients in the surface layer of stratified water column after the spring algal bloom can support only low rates of both primary and bacterial production during subsequent period of time. According to a recently commenced view that bacteria are more a sink of nutrients than their regenerator, bacterivorous protozoa could be an important link in the recycling of nutrients in the surface waters. We tried to estimate the rates of natural protozoan community grazing and assimilation of bacterial biomass using suspension of dual radioactive labelled marine bacteria *Vibrio natriegens* added to natural and concentrated by reverse flow filtration water samples. The grazing experiments were conducted with samples of water taken during complex physical, chemical and biological studies of vertical structure of water column from 10m depth at 10 stations which cover all areas studied. The natural concentration of heterotrophic bacteria was 1.1-1.5 x 10^6 bacteria per ml, the concentration of cyanobacteria was 9-21 x 10^3 cells per ml, the concentration of phytoflagellates of 1-3 µm diameter was 2-9 x 10^3 cells per ml, the concentration of heterotrophic flagellates, potential grazers on bacteria was low at about 200 cells per ml. The low concentration

of predators can result in very low rates of grazing on bacteria. The measurements of radioactivity will be done at the University of Southampton, Department of Biology immediately after the cruise. They require a special programme of high precision separation of radioactivity of two radioisotopes ^{3}H and ^{14}C present in the samples and cannot be done on board.

Mike Zubkov
Southampton University

Microzooplankton herbivory & community structure

The overall objective of this research is to test the hypothesis that microheterotrophic activity is higher at the ocean margin, due to locally enhanced primary production from nutrient input, than in adjacent ocean and shelf waters. More specifically the mains aims were to :
a) quantify the abundance, biomass and species composition of microzooplankton (20-200 μm) and heterotrophic nanoplankton (2-20 μm) of the surface mixed waters of the ocean margin and adjacent shelf and ocean regions and
b) to quantify herbivorous interactions between microzooplankton and phytoplankton in ocean margin surface waters.

Methods
Microzooplankton biomass studies
Water samples were collected from 10 litre water bottles on the CTD and were fixed as follows:
1) 500mls in 1% acid Lugols for the subsequent determination of total microzooplankton biomass and species composition.
2) 500mls in 2% hexamine buffered formaldehyde, for the enumeration and identification of autotrophic components of the community
3) 500mls in 5% Bouins solution for the subsequent determination of ciliate taxonomy by silver staining.
4) 30-50mls in 0.3% glutaraldehyde, dual-stained with DAPI and proflavin (final concentration 5 μg ml^{-1}) and filtered onto 0.8μm black polycarbonate filters. The filters were mounted onto slides and frozen until subsequent analysis by inverted fluorescence microscopy for the determination of heterotrophic nanoplankton abundance and biomass .

Details of samples collected are given in Table 3. the above samples will be analysed at PML using inverted microscopy and image analysis

Pigments
In addition to microzooplankton samples, 2 litres of water were filtered onto 25mm GFFs . These were frozen in liquid nitrogen until further analysis of pigment content using HPLC. Sample details given in Table 3. This work will be carried out by Dr Ray Barlow and Denise Cummings at PML.

Grazing experiments

Microzooplankton grazing experiments were carried out using the dilution technique described by Landry & Hassett in 1982 (*Mar Biol* 67: 283-288). Experimental water was collected from the surface 10-30m using 30 litre Go-Flo bottles (*Figure* 7). Half of this water was filtered through a 0.2 µm capsule filter which had been pre-rinsed in deionised water. The remaining water was pre-screened using a 200 µm mesh bag. A series of dilutions were made up by gently combining the screened water with the filtered in 2 litre polycarbonate bottles. All incubations lasted for 24 hours and due to the weather conditions and the nature of the cruise, all experiments except the final one were incubated in a Gallenkamp incubator with ambient temperature and light levels. Experiment number 8 was successfully incubated *in situ* as well as in the incubator. Sub-samples were taken from each dilution bottle for the determination of chlorophyll concentration and community structure at T0 and T24. All chlorophyll samples were extracted with 90% acetone and analysed on board by fluorometry. Details of each grazing experiments carried out are shown in Table 4. Preliminary results show that the microzooplankton are grazing between 12 and 21% of the phytoplankton population per day.

Apsteins

A series of Apstein net hauls were carried out as detailed in Table 5. The Apstein was fitted with a 20 µm mesh net and allows the qualitative assessment of the larger rarer and less delicate of the microzooplankton such as the tintinnids, large heterotrophic dinoflagellates, sarcodines and metazoa, together with the larger phytoplankton cells. The phytoplankton community composition remained similar throughout the duration of the cruise. The dominant taxon was *Ceratium* namely *C.fusus*, *C.furca*, *C.bucephalum*, *C.tripos*, *C.hexacanthum*, *C.minutum*. Other common phytoplankton included *Gonyaulax* sp. *Ptychodiscus* sp. *Dinophysis* sp. and some diatoms such as *Rhizosolenia*, *Chaetoceros, Nitzschia spp.* and *Thalassiothrix longissima*. Of the microzooplankton heterotrophic dinoflagellates seemed to be abundant in the net samples, *Protoperidinium* spp, *Pronoctiluca*, *Cochlodinium* and other members of the Gymnodiniales. Tintinnids were not common but those found included *Dictyocysta* sp., *Acanthostomella*, *Parundella*, *Codonellopsis* spp. Ciliates are generally not common in net samples however, some such as *Tiarina fusus* and *Leegardiella* were found. Radiolarians, acantharians, foraminerferans and metazoan nauplii were abundant. This list is by no means complete, many of the more delicate ciliates and naked dinoflagellates would not have been adequately sampled using this technique.

Table 3: Details of samples collected.

Date	Station	Lat.	Lon.	CTD Cast no.	Sample	Depths
30/09/95	OMEX 3	49° 05'N	13° 25'W	12793#1&12794#1	Lugols	5, 10, 20,30, 40, 50 75, 100, 250
					Glutaraldehyde	5, 10, 20, 30, 40, 50
					HPLC	5, 10, 20,30, 40, 50 75, 100, 250
10/04/95	OMEX 1	49° 24'N	11° 33'W	12797#1&12798#1	Lugols	5, 10, 20, 30, 50, 100, 200
					Glutaraldehyde	5, 10, 20, 30, 50
					Formaldehyde	10, 30, 50
					Bouins	10, 30, 50
					HPLC	5, 10, 20, 30,40, 50, 100, 200
10/05/95	OMEX 2	49° 12'N	12° 49'W	12802#1	Lugols	5, 10, 20,30, 40, 50 75, 100, 200
					Glutaraldehyde	5, 10, 20, 30, 40, 50
					HPLC	5, 10, 20,30, 40, 50 75, 100, 200
10/06/95	OMEX 3	48° 33'N	12° 57'W	12803#1&12804#1	Lugols	10, 20,30, 40, 50 75, 100, 200
					Glutaraldehyde	10, 20, 30, 40, 50, 75, 100
					HPLC	10, 20,30, 40, 50 75, 100, 200
10/09/95	"H"	48° 59'N	16° 30'W	12807#1	Lugols	5, 10, 20, 30, 40, 50
					Formaldehyde	10
					Bouins	10
10/12/95	OMEX4	48° 58'N	13° 37' W	12814#1&12815#1	Lugols	5, 10, 20, 30, 50, 75, 100, 200
					Glutaraldehyde	5, 10, 20, 30, 50, 75, 100
					Formaldehyde	10, 30, 50
					Bouins	10, 20, 30
					HPLC	5, 10, 20, 30, 40, 50, 75, 100, 200
14/10/95	OMEX2	49° 11'N	12°48'W	12819#1	Lugols	5, 10, 20, 30, 50, 60, 100, 200
					Glutaraldehyde	5, 10, 20, 30, 50, 60
					HPLC	5, 10, 20, 30,40, 50, 60, 100
15/10/95	OMEX 1a	49° 20'N	11° 59.8'W	12821#1&12822#1	Lugols	5, 10, 20, 30, 50, 60, 100, 150, 200
					Glutaraldehyde	5, 10, 20, 30, 50, 60, 100
					HPLC	5, 10, 20, 30, 50, 60, 100, 150, 200
17/10/95	OMEX 1a	49° 18.2'N	12° 30.2'W	12825#1	Lugols	5, 10, 20,30, 40, 50 75, 100
					Glutaraldehyde	5, 10, 20, 30, 40, 50, 75, 100
					Formaldehyde	10
					Bouins	10
					HPLC	5, 10, 20,30, 40, 50 75, 100
19/10/95	OMEX 1	49° 24.3'N	11° 31.6'W	12837#5	Lugols	5, 10, 20,30, 40, 50 75, 100
					Glutaraldehyde	5, 10, 20, 30, 40, 50, 75, 100
					Formaldehyde	10
					Bouins	10
					HPLC	5, 10, 20,30, 40, 50 75, 100

Table 4: Dilution grazing experiments

Expt. no	Date	Depth	Station	Lat.	Lon.
1	30/09/95	10m	OMEX 3	49° 05'N	13° 25'W
2	10/07/95	30m	OMEX 3	49° 05'N	13° 24'W
3	10/09/95	10m	St 'H'	48° 59.38'N	16°30.09'W
4	13/10/95	10m	OMEX 4	49° 00'N	13° 44.7'W
5	15/10/95	10m	St 1a	49° 20'N	11° 59.8'W
6	17/10/95	10m	St 1a	49° 18.7'N	12° 30.2'W
7	19/10/95	10m	St g	49° 00.78'N	12° 37.69'W
8	20/10/95	10m *In situ*	OMEX 1	49° 23.37'N	11° 32.12'W

Table 5: Apstein net hauls

Date	Station	Location	Lat.	Long.	Depth
07/10/95	12806#2	OMEX 3	49° 06'N	13° 25'W	50m
13/10/95	12817#3	OMEX4	49° 02'N	13° 44'W	50m
15/10/95	12821#6	St 1a	49° 20'N	11° 59'W	50m
19/10/95	12834#2	St e	48° 53'N	13° 12' W	60m

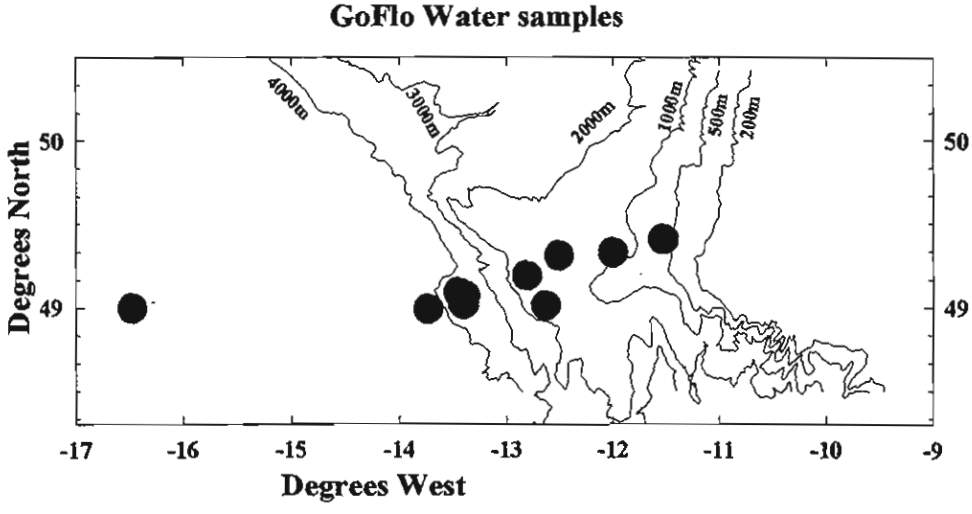

Figure 7: Locations of stations where GoFlo water samples were taken

Elaine Edwards
Plymouth Marine Laboratory

Mesozooplankton studies

Acoustic Doppler Current Profiler

The Acoustic Doppler Current Profiler (ADCP) was run continuously throughout cruise D217 (*Figure* 1) and after several teething problems produced consistent data. The instrument was set to record 128 x 4 metre bins giving a 512 metre profile with the centre of the first bin at a depth of approximately 11 metres. However the depth of the 25 % good data limit never exceeded 350 metres.
Data was collected virtually continuously apart from jday 268 at 11:20 when there was a 25.4 hour gap and jday 269 at 13:46 where there was a 3 hour gap. These were most likely due to the keyboard being inadvertently knocked. There was no keyboard cover available so the keyboard was placed alongside the computer as a preventative measure. Subsequent gaps in the data were small and unavoidable as the data stream from the ADCP to the RVS level C was being corrupted and so the data had to be transferred from the ADCP PC using diskettes. The data corruption was apparently caused by the printer buffer that is used to interface the two; the first letter of one of the variable names in the header would occasionally not be visible to the level C, this would disable the level C from recording the data until the logging program was restarted.
Intermittently the ADCP would display the error message 'LOW TRANSMITTER CURRENT' this became more frequent. The problem seemed to be remedied by moving the cable where it leads into the transducer housing, this may have been circumstantial but it might be prudent to have the cable/transducer connection inspected in case there is a loose connection.
The ADCP PC clock drift was noted at least daily as well as the transducer and electronics temperatures. These both remained constant to within a couple of degrees throughout. Bottom tracking was switched off for the majority of the cruise, it was only switched on when there was a long run above the continental shelf. Whilst the ship was in dock with the engines off the ADCP was set to transmit 1 metre pulses with 128 x 4 metre bins, this was done to measure the threshold noise level of the electronics.

Data Processing

Once the pingdata files had been transferred to the level C they were read into PSTAR in 24 hour long files, centred at 2100 hours GMT with 'adpexec0', the PC clock drift was corrected in 'adpexec1'. The acoustic backscatter data was required to be kept at 2 minute sampling so an exec called 'ampexec2' was used to mimic 'adpexec2' without averaging and without calibrating the data. 'Ampexec4' merged the navigation file with the ADCP and calculated relative backscatter. Another set of data files containing calibrated current data averaged to 15 minute intervals are to be generated.

Navigation

The RVS 'bestnav' was used as input to the exec navexec0 to produce a basic navigation file which was then used as input to navexec1, the resulting file was merged with the ADCP data. Prior to departing the dock side navigation data were collected in order to estimate the scatter of the GPS positional fixes with time.

Calibration

During the early hours of jday 284 a calibration run was made by the ship; this consisted of 8 x 20 minute legs performed as a zigzag course at 8 knots, the mean course was easterly with each successive leg perpendicular to the previous.

The misalignment angle was calculated to be 6.6322 degrees with a standard deviation of 0.36 degrees, whilst the amplitude scaling factor, A was calculated at 1.0137 with a standard deviation of 0.0073. Throughout the majority of the calibration run pdop remained between 2 and 3, only rising above 4 sporadically during one of the legs.

Mark Hartman
Southampton Oceanography Centre

Longhurst Hardy Plankton Recorder.

Objectives
It was intended that samples would be taken at locations sampled on previous cruises to provide a seasonal comparison of zooplankton species composition and distribution. These locations would also be sampled during the day and night to enable diurnal vertical migration studies.

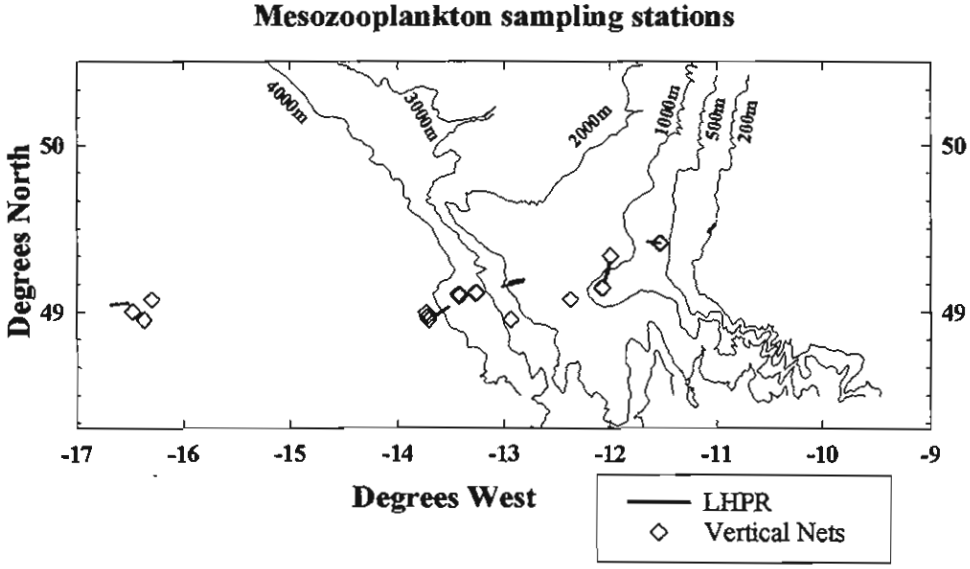

Figure 8: Locations of stations for sampling of mesozooplankton.

Methods
The LHPR was fitted with depth, temperature, conductivity and flow sensors. A fluorometer was not fitted, however, a turbidity meter was adapted and used on some of the hauls. In order to achieve the required sampling interval of one sample every ten meters, the gauze advance was set to two minutes with a cable pay-out rate of ten meters per minute and a ship speed of between three and four knots. Samples were

only taken on the descent phase of the haul, once on deck the gauze sandwich was removed and immediately immersed in 4% buffered sea water formalin. Samples to be cut and processed on return to the laboratory.

Sampling Problems

The first three hauls experienced no difficulties, however, the fourth haul was abandoned because the wind-on spool failed to advance. It was thought that this resulted from a poorly fitting spool. During the fifth haul, which was successfully completed, the gauze advance switched from on to off on a number of occasions, which were manually corrected. This worsened on the sixth haul which was subsequently abandoned. The fault was identified as the 4013 flip-flop (IC4) on the sensor cylinder modem card and this was replaced. Further problems were encountered with the cored cable, the terminations had to be replaced on two occasions. Plans for one deployment had to be abandoned because the swivel connecting the cable to the LHPR leaked and this was subsequently replaced. After the seventh and successful haul, during a force ten gale, the sensor cylinder suffered some damage whilst lashed to the deck, the temperature sensor connection was broken. This necessitated a lengthy repair in which the cylinder head had to be re-machined to allow a new and larger connection to be fitted. Three subsequent hauls were successfully completed.

Table 6:

Station	Pos.	Haul	Profile ID	Date	Start Time	Latitude	Longitude	Turbidity Meter	
					GMT				
12792#2	Omex 2	D217A	AL	29.09.95	09:42	49 10.81 N	12 49.85 W	Fitted	Good
12792#7	Omex 2	D217B	AM	29.09.95	22:10	49 11.37 N	12 49.13 W	Fitted	Good
12798#5	Omex 1	D217C	AN	04.10.95	14:27	49 24.67 N	11 32.45 W	Fitted	Good
12804#3	Omex 3	D217D		06.10.95	20:35	49 01.46 N	13 31.31 W	Fitted	Fail
12804#4	Omex 3	D217E	AP	06.10.95	22:31	49 01.46 N	13 31.31 W	Fitted	Good
12808#3	Omex H	D217F		09.10.95	20:51	49 00.08 N	16 47.20 W	Fitted	Fail
12810#2	Omex H	D217G	AQ	10.10.95	09:40	49 03.05 N	16 31.35 W	Fitted	Good
12823#2	Omex 1A	D217H	AR	15.10.95	14:02	49 17.69 N	12 00.51 W	Not fitted	Good
12824#1	Omex 1A	D217I	AS	16.10.95	21:57	47 17.80 N	12 00.36 W	Not fitted	Good
12839#1	200m line	D217J	AT	20.10.95	14:10	49 31.36 N	11 01.21 W	Not fitted	Good

Conclusions
Samples were successfully taken at all Omex sites except Omex 4, for comparison with previously collected data (*Figure* 8). Day and night samples were also obtained from Omex 1A and 2 so that some vertical migration studies can be made.

Acknowledgements
We are grateful to all of the crew for their assistance in launches and recovery and to Stirling Jordan and Rhys Roberts for the winch operations. Special thanks are due to Stirling, Gary White and Steve Keene for fixing the many problems.

***Jacqueline Hunter* * & *Sonia Batten* #**
* Southampton Oceanography Centre
# Sir Alister Hardy Foundation for Ocean Science

Vertical Net Hauls

Objectives

In order to calculate estimates of mesozooplankton biomass for the OMEX area from Continuous Plankton Recorder (CPR) samples, it was necessary to obtain specimens that were not 'squashed' i.e. undamaged by the sampling technique. Samples from both day and night were necessary, taken on a transect across the continental shelf edge. Analysis could not be carried out on board and so the samples were preserved immediately after collection.

Methods

Vertical hauls were taken with a 200μm mesh WP-2 net from depths of approximately 100 metres, unless time was limited in which case the depth was restricted to 50m. Once on board the sample was carefully washed from the cod-end and preserved with a solution containing formalin, propylene phenoxytol and propane-1,2-diol. The solution was buffered with borax and the resulting concentration of sea-water diluted formalin was approximately 4%. This solution is the same as that used to preserve CPR samples so that shrinkage resulting from preservation would be comparable between the WP-2 and CPR samples.

Table 7: List of samples taken

Station	Nominal OMEX Station	Date	Time GMT	Position	Depth
12792#5	2	29-9-95	17:34	49 07 N, 13 16 W	50m
12798#2	1	4-10-95	11:25	49 25 N, 11 32 W	100m
12804#5	4	7-10-95	01:30	49 57 N, 13 43 W	130m
12806#3	3	7-10-95	13:15	49 06 N, 13 25 W	120m
12808#2	H	9-10-95	20:10	49 00 N, 16 28 W	110m
12815#2	4	13-10-95	00:30	48 58 N, 13 43 W	110m
12817#4	4	13-10-95	12:10	49 00 N, 13 44 W	100m
12821#7	1a	15-10-95	07:45	49 20 N, 12 00 W	100m
12824#3	1a	17-10-95	01:30	49 07 N, 12 05 W	130m
12834#1	f	19-10-95	13:15	48 57 N, 12 57 W	80m
12835#1	h	19-10-95	19:50	49 04 N, 12 23 W	100m
12837#1	1	20-10-95	02:55	49 25 N, 11 32 W	100m

A sub sample of the hauls from OMEX 4 and 1a were examined briefly under the microscope. The samples were dominated by small copepods, *Centropages typicus* was particularly abundant and the following taxa were also observed:
Oithona spp., Acartia spp., Calanus spp. (stages to 1 to 4), Corycaeus spp., Foraminifera, Radiolaria, Chaetognatha

Acknowledgements
I am grateful to Roger Harris for the loan of the WP-2 net.

Sonia Batten
Sir Alister Hardy Foundation for Ocean Science

Particulate material studies:

Particle distribution and flux at the continental margin

Within the OMEX sampling box on the Goban Spur 3 moorings carrying sediment traps are currently deployed at the continental margin at and adjoining the Goban Spur (*Figure 9*)

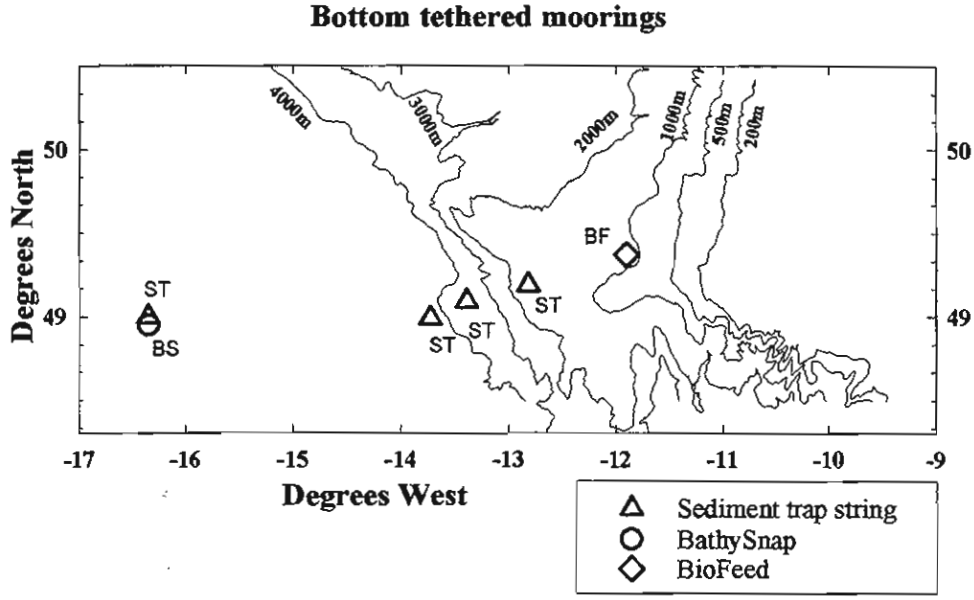

Figure 9: Locations of bottom tethered moorings; Sediment traps, BathySnap and Biofeed.

Table 8: Details of OMEX moorings on the Goban Spur

MOORING	LATITUDE	LONGITUDE	WATER DEPTH (M)	DEPTH (M)	INSTRUMENT
OMEX 2	49°11.20'N	12°49.18'W	1445 m	595	Sed. trap
				618	RCM
				1052	Sed. trap
				1076	RCM+Transm.
OMEX 3	49°05.0'N	13°25.8'W	3650 m	556	Sed. trap
				580	RCM
				1465	Sed. trap
				1489	RCM+Transm.
				3260	Sed. trap
				3284	RCM+Transm.
OMEX 4	48°59.51'N	13°45.22'W	4485 m	3800	Sed. trap
				3820	RCM

These have been in place since July 1993 and were redeployed during this cruise till May 1996, when they will be recovered for the last time. During this cruise we were

able to recover and redeploy all three moorings. With one exception, the sediment traps delivered a full set of samples and a complete series of current meter and transmissometer data is available for the period between September 1994 and September 1995. The lines and instruments on OMEX 2 and 3 were seen to be covered with growth of bryozoans, barnacles and anemones during recovery. There was also some growth seen on the interior of the trap funnels, that is presumed to have affected collection of material in the sediment traps and could account for the fact that the late summer samples contain almost no particulate material. Severe corrosion was seen in a number of shackles, and during recovery of OMEX 3 one of these separated and it was only due to the skill and experience of the officers and crew of the Discovery that we were able to recover the remaining instruments which had drifted away from the recovery site.

Current meter records show differing patterns of water flow at the moorings OMEX 2 and OMEX 3 and are consistent with the predominantly along-slope direction at OMEX 2 and off-slope direction at OMEX 3 that have been registered since 1993. Periods of higher attenuation are seen in the transmissometer records mainly during winter and late summer and are thought to relate to events during which suspended material is laterally transported along and across the slope.

A number of deep (to 20 m above bottom) CTD casts were conducted in two parallel transects up-slope of the moorings in order to obtain a picture of the distribution of suspended particles in water flowing over the trap positions. In addition to the transmissometer that was mounted to the CTD an optical backscatter nephelometer was attached. Both instruments give near-continuous data on the distribution of suspended particles, the former by measuring light attenuation over a 1 m path length, the latter by detecting the optical backscatter of a light beam.

Most noticeable in the nephelometer and transmissometer profiles was the occurrence of an increased particulate load at depths of sharp salinity gradient associated with water of Mediterranean origin between 900 and 110 m (*Figure* 10)

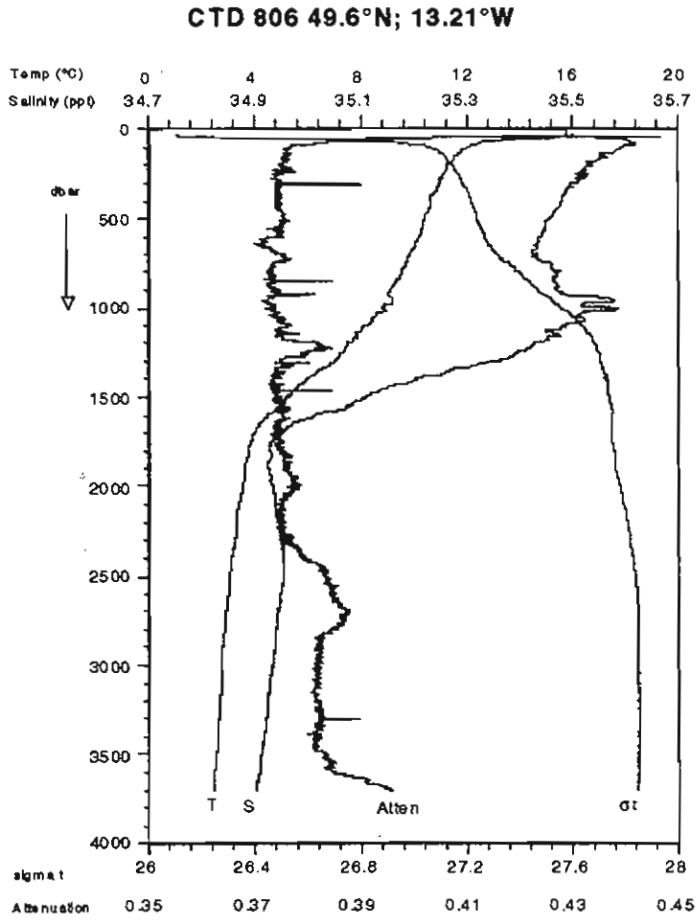

Figure 10 CTD Profile 12806#1 in a water depth of 3674m.

Water samples were taken from the CTD rosette at particulate maxima and minima as seen from the transmission and backscatter profiles. Samples were filtered on board and will be used for the analysis of dry weight, particulate organic carbon and nitrogen, particulate biogenic silicate and microscopy. A marine snow camera attached to the CTD (see Lampitt, this report) will yield data on the distribution and concentration of large particles and hopefully provide a more complete picture of total particle distribution within the area.

A number of intermediate and benthic nepheloid layers were seen, decreasing in intensity with distance from the shelf break. Interestingly, although the fine vertical structure of particle distribution was clearly parallel in the profiles recorded by the transmissometer and nephelometer (*Figure* 11), differences in particulate characteristics (size and form) between surface waters, intermediate waters and in the benthic nepheloid layer are reflected in differences in the slope of transmission to optical backscatter (*Figure* 12).

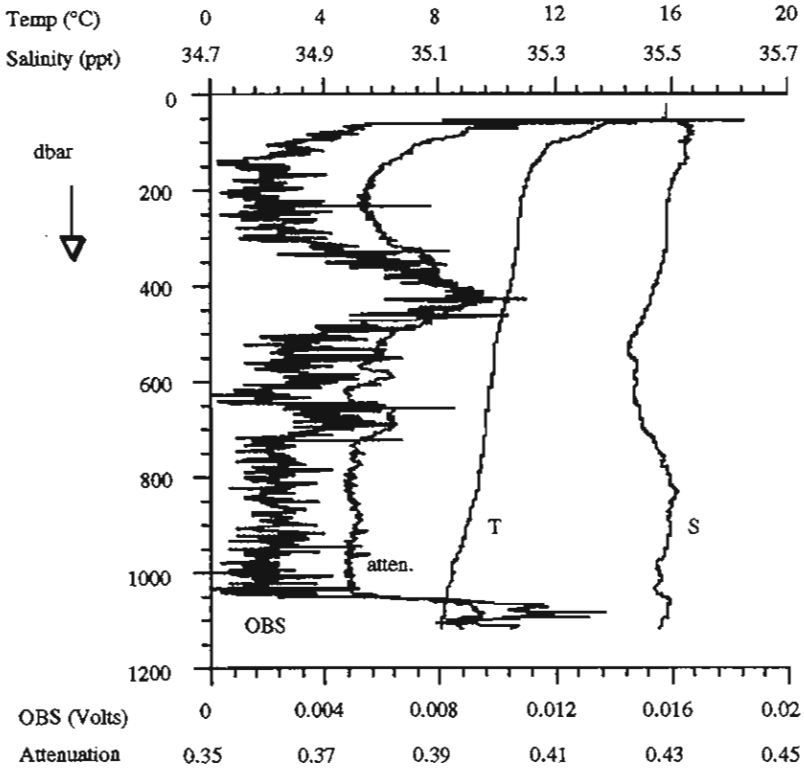

Figure 11 *CTD Profile 12822#1 at 49°20.16N; 11°59.28W, water depth 1125m, showing a number of intermediate nepheloid layers and a well developed benthic nepheloid layer.*

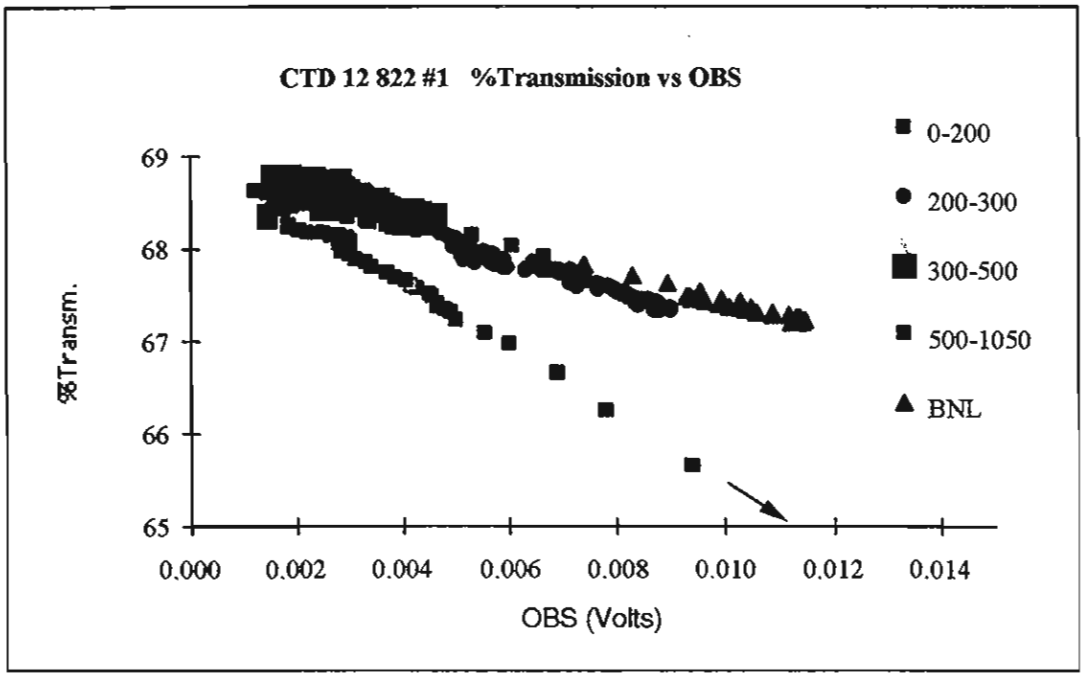

Figure 12 *Plot of transmission vs. optical backscatter for the CTD profile above (Figure 11).*

Acknowledgements: We would like to express our gratitude to Captain Harding, the officers and crew of the Discovery for their professional and expert assistance on board, especially during mooring discovery and deployment. We are also grateful to the principal scientist Richard Lampitt for the opportunity to participate in the cruise.

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Particle Flux on the Porcupine Abyssal Plain (PAP)

As part of a long term study of the trends in particle flux over the PAP, the intention was to recover and redeploy the sediment trap mooring which had been in place since 12th September 1994 deployed on *Meteor* cruise 30. The mooring could not unfortunately be recovered (see below) with the loss of 3 Parflux sediment traps, 2 recording current meters, 24 buoyancy spheres, two release transponders, 4000m of mooring line with probably a large and important collection of samples and data.

By good fortune, it was possible to deploy a similar mooring (*Figure 9*) with the equipment available on board, the intention being to recover it on a *Poseidon* cruise in May 1996. This cruise was unfortunately cancelled soon after the end of D217 and the mooring will not now be recovered until September 1996. The Sampling schedule is shown in Table 9

Table 9:

Event	Opening time	Interval
		days
1	12/10/95	10
2	22/10/95	20
3	11/11/95	20
4	01/12/95	30
5	31/12/95	30
6	30/01/96	20
7	19/02/96	20
8	10/03/96	20
9	30/03/96	10
10	09/04/96	10
11	19/04/96	10
12	29/04/96	10
13	09/05/96	10
14	19/05/96	Close

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Moorings

Four sediment trap mooring recoveries/deployments were scheduled to take place during the cruise (*Figure 9*). All were to be carried out from the afterdeck using the IOSDL Double Barrel Capstan (DBC) with the line leading over a wide throated sheave attached to the port aft crane.

Mooring on the Porcupine Abyssal Plain (Station H). Recovery was to take place 9-10-1995. The mooring was interrogated using a MORS TT301 deck unit interfaced to an IOSDL waterfall display. Repeated attempts were made to switch on the pinger on each of the release units with no success. After confirmation of the deployment position, the ship was positioned two cables downwind of the site and with lookouts stationed on the bridge, the releases were fired. No replies were received and the mooring failed to appear on the surface. Attempts to interrogate and fire the release were then made using the overside transducer but again with no success. A one nautical mile box search was then carried out around the mooring position and the releases interrogated while the ship steamed at four knots. Final attempts were made to fire the releases at the site before it was abandoned. Both releases were sent the "off" code prior to departure but no acknowledgements were received.

The acoustic releases ser No 218 and 219 fitted to this mooring had a window code which needed to be opened prior to sending the pinger "on" code. This is the first occasion this option has been requested although it has been normal practice to specify a window prior to the release code on recent units. The latter presents no problems as once the pinger is switched on, opening the release window can be detected and confirmed on the waterfall display unit by the pinger switching off for the window duration. The former, however, relies on confirmation on the MORS deck unit and in deep water this can be unreliable. It is recommended that for future units that the window command is specified only for the release code and under no circumstances for the pinger.

Wire tests of MORS releases 282 and 283 were carried out on a deep CTD prior to the attempted mooring recovery. The failure to recover the releases from the station H mooring left a shortfall in hardware to tandem the release units and it was decided to deploy the replacement with a single unit Ser No 282.A replacement mooring for station H was deployed on 11-10-1995 using components taken as spares. Mooring operations commenced 5 Nm downwind of the site at 1526 GMT with the Ship steaming at 1 knot. The top buoyancy was slipped over the side and line tension taken on the DBC, the line was then paid out and stopped off as required to insert instrumentation. The anchor was lowered on a slip hook and dropped at 1911 GMT. Descent was monitored using the release pinger and the mooring finally touched bottom at 2008 + 30 secs GMT. when the pinger was switched off and confirmed on the waterfall display unit. Deployed position 48° 59.98N 16° 21.11W in a water depth of 4812 uc meters.

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Marine Snow Distribution

Large particles (>0.5mm diameter) commonly referred to as Marine Snow are likely to be of considerable importance in the downward flux of material. Their distribution in the water column was assessed using an *in situ* photographic technique. About 40L of water are photographed using orthogonal illumination from a high speed strobe. The device is attached to the CTD frame so that contemporaneous data are obtained on a range of other water column properties. 23 deployments of the camera system were made (Table 10) and although there were some significant equipment failures on some of these, a good collection of photographs were obtained. Most of the films were developed on board ship.

Table 10:

MSP ID	Station No.	Date	Turn On Time	Blank Frame Time	In Water Time	f stop	Frame int. (sec)	Depth of Cast (m)	Depth of Water (m)	Position North	Position West
90	12797#1	04/10/95	06:47:00	06:50:00	06:55:10	11	15	100	694	49.40	-11.55
91	12798#1	04/10/95	09:07:00	09:09:00	09:13:24	11	15	655	666	49.41	-11.53
92	12799#1	04/10/95	20:15:00	20:17:45	20:21:51	11	15	1085	1111	49.31	-12.19
93	12800#1	05/10/95	04:55:00	04:57:00	05:00:10	11	15	100	1418	49.19	-12.81
94	12801#1	05/10/95	11:31:00		11:36:47	11	11.882	1506	1600	49.19	-12.84
95	12803#1	06/10/95	09:23:00	09:24:45	09:27:52	11	15	3630	3661	49.09	-13.39
96	12805#1	07/10/95	04:55:00	04:57:45	05:00:53	11	15	100	3661	49.08	-13.39
97	12806#1	07/10/95	08:00:00	08:01:15	08:07:09	11	15	3635	3674	49.10	-13.41
98	12807#1	09/10/95	05:15:00	05:17:30	05:20:28/48	11	15	100	4813	48.99	-16.47
99	12808#1	09/10/95	08:04:00	08:06:30	08:11:50	11	30	3600	4810	48.99	-16.48
100	12809#1	10/10/95	04:58:00	05:01:03	04:14:47	11	15	100	4810	49.01	-16.48
101	12814#2	12/10/95	18:26:00	18:28:45	18:32:00	11	15	100	4479	48.98	-13.74
102	12815#1	12/10/95	19:44:00	19:46:00	20:11:01	11	30	4000	4479	48.97	-13.75
103	12817#1	13/10/95	07:30:00	07:00:39	07:43:51	11	15	100	4483	49.00	-13.74
104	12821#1	15/10/95	04:55:00	04:58:48	05:06:10	11	15	100	1128	49.34	-12.00
105	12829#1	18/10/95	13:22:00	13:24:00	13:26:42	11	15	1521	1525	48.89	-12.37
106	12830#1	18/10/95	18:33:00	18:35:00	18:37:40	11	30	2577	2700	48.80	-12.84
107	12831#1	19/10/95	22:22:00	22:25:00	22:27:50	11	30	3610	3624	48.75	-13.00
108	12832#1	19/10/95	04:19:00	04:21:30	04:24:47	11	30	1460	1501	49.01	-12.62
109	12833#1	19/10/95	10:04:00	10:07:30	10:10:59	11	30	3490	3499	48.93	-13.05
110	12834#3	19/10/95	14:33:00	14:42:00	14:43:48	11	30	2478	2489	48.95	-12.95
111	12835#2	19/10/95	20:07:00	20:11:00	20:18:24	11	30	1131	1147	49.07	-12.38
112	12836#1	20/10/95	00:02:00	00:04:30	00:06:43	11	30	780	789	49.18	-11.82
113	12837#5	20/10/95	04:13:00	04:15:45	04:18:24	5.6	15	643	668	49.41	-11.53

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Barium chemistry

The last decade significant attention was paid to water column and sediment barium biogeochemistry, because of increasing evidence that oceanic barite is a useful tracer of export production and paleo-production.

While the relationship between Ba-barite and productivity is now rather well established, our knowledge about the mechanisms of barite formation in the surface waters is far from complete. Evidence is increasing, however, that barite formation is closely associated with formation and decay of bio-aggregates. Therefore, it was decided to investigate (using SEM-EMP methodology) on presence of enhanced

barium concentrations and of barite micro-crystals in water column macro-aggregates, as sampled with the Marine Snow sampling device; the "Snatcher".
"Snatcher" samples were recovered from depths where aggregate concentrations were presumably highest (bottom of mixed layer) (Table 11). Such depths are generally shallower than the depth of maximum particulate Ba concentration (usually between 200 m and 500 m) and which is thought to reflect the site where part of these aggregates disintegrate, releasing there barite micro-crystals load. Material was collected from the bottom plate of the "Snatcher" by pipette, put onto 0.4 μm Nucleopore filters under gentle suction rinsed with MilliQ water and dried for 8hrs at 50° C.
To follow the vertical distribution of the Ba as associated with small sized particulates we also sampled for TSM using Niskin bottles (Table 12). Known volumes were filtered onto 0.4 μm Nucleopore filters rinsed with MilliQ water and dried for 8hrs at 50° C. These samples will be mineralised and analysed for total Ba and bio-Ba. It is hoped that results will enhance our understanding of the barite formation process in the water column.

Table 11: Material collected with the Marine Snow Catcher ("Snatcher")

Station	Date	Depth	Water Depth
12817#6	13/10/95	60	4490
12821#4	15/10/95	60	1123
12821#5	15/10/95	55	1123

Table 12: Material collected with the CTD rosette sampling bottles

Station No.	Date	Degrees North		Degrees West		Water Depth
12817#1	13/10/95	48	59.74	13	44.54	4482
CTD Bottle No	Depth	Volume Filtered (Litres)				
1	100	10				
3	90	10				
5	80	10				
7	70	10				
9	60	5				
11	50	5				
13	40	5				
15	35	5				
17	30	5				
19	20	3.5				
21	10	2.75				

Station No.	Date	Degrees North		Degrees West		Water Depth
12819#1	14/10/95	49	11.35	12	48.37	1411
CTD Bottle No	Depth	Volume Filtered (Litres)				
22	100	4				
1	60	4				
3	57	4				
6	50	4				
7	43	2				
12	20	4				

Station No.	Date	Degrees North		Degrees West		Water Depth
12821#1	15/10/95	49	20.32	11	59.85	1129
CTD Bottle No	Depth	Volume Filtered (Litres)				
3	100	4				
6	55	4				
9	50	4				
10	45	4				
11	40	2				
19	20	2				
5	60	4				
4	80	4				

Station No.	Date	Degrees North		Degrees West		Water Depth
12837#5	20/10/95	49	24.40	11	31.60	1501

CTD Bottle No	Depth	Volume Filtered (Litres)
17	643	4
19	400	2
20	150	2
21	120	2
22	100	4
23	75	4
24	50	3
6	25	3

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Benthic Studies

Objective 1: Carry out *in situ* organic enrichment experiment (BIOFEED, Benthic In situ Organic Food Enrichment Experimental Deployment)

The multiple corer was deployed (12795#1) in the vicinity of the OMEX 1000m station (*Figure* 13). This deployment yielded eleven badly disturbed cores which were discarded and the corer immediately redeployed (12795#2). The second deployment produced eleven good cores, sufficient to initiate the BIOFEED project.

Four control and four treatment cores were selected at random, based on their numbered positions on the multiple corer head. Frozen inoculates of phytoplankton (cultures supplied by LUDO) were then introduced to the tops of the treatment cores. All eight cores were then secured, in random positions, to the core carrier on the DEMAR (amphipod trap) frame and the mooring deployed buoyancy first (Figure 9). The cores were resubmerged some 79 minutes after arriving on deck, the frame landed on the seabed 133 minutes after the multiple corer collected the samples.

The BIOFEED mooring was identical to that used for conventional DEMAR deployments and equipped with an IOS CR200 acoustic release unit rigged to fire two pyroleases.

The three remaining cores from deployment 12795#2 were used to determine the viability of meiobenthos. Live extraction of one core onboard yielded live nematodes, copepods, ostracod and polychaetes; these were still alive after six days at a pressure of 1atm and 12°C. The two other cores will be returned to NHM / SOC for longer term observation.

The BIOFEED mooring was released at 0840 on 20 October, some 19.75 days after landing on the seabed. The mooring was recovered without incident and the cores placed in the cold room by 1000. The control cores appeared unchanged. The treatment cores had a very obvious green surface layer, overlying a thin but distinct black sediment layer. During sectioning the cores smelled distinctly of hydrogen sulphide. These observations suggest that significant organic enrichment had occurred and produced a typical response.

The eight cores were sectioned in 1cm layers to 5cm depth and homogenised to produce one meiobenthos sample and one organic chemistry sample from each section.

Objective 2: Obtain and process, using the homogenisation technique, six multiple corer samples from the Porcupine Abyssal Plain DEEPSEAS programme station (48° 50' N 16° 30' W).

The multiple corer was deployed (12811#1) and five hours later (as a result of the winch only running at 33m/min) a perfect set of twelve long (33-35.5cm) undisturbed cores were obtained (*Figure* 13). Six of the cores were homogenised using the protocol developed over a number of previous cruises and as described above in the BIOFEED section. Two cores were cut for standard organic chemistry samples and two cores kept for live observations (NHM / SOC).

Objective 3: To deploy a long-term Bathysnap mooring in the vicinity of the Porcupine Abyssal Plain DEEPSEAS programme station (48° 50' N 16° 30' W).

Bathysnap was deployed (12812#3) at 48° 58.00' N 16° 20.03' without incident, having flashed on deck at 1410, 1634, and 1858 on 11 October 1995 (Figure 9).The mooring was of the standard design and carries a radio beacon (156.575 MHz) but no strobe. The release is MORS RT661CS s/n 63 in an IOS pressure case and designed to fire one pyrolease. (Release codes: pinger 62AD, window 62A1 wait 15s active 60s, release 6211, off FR1-FR2-pinger 62A3.

Objective 4: To carry out further box coring and a photosledge run at the xenophyophore site on the Goban Spur (nominal position: 49° 37.4' N 13° 07.3' W).

Sledge operations were cancelled as a result of camera / flash problems. The box corer was deployed six times (12817#1, #2, #3, 12820#1, #2, #3) collecting three good samples despite the heavy swell conditions (*Figure* 13) . Successful deployments were sampled as follows: 12817#1, surface pick for macroscopic protozoans (frozen -50°C), top 10cm sieved out on 0.5mm mesh (formalin); 12820#1, surface pick for macroscopic protozoans (frozen -50° C), top 5cm sieved out on 0.5mm mesh (formalin); 12820#2, no obvious macroscopic protozoans, top 5cm sieved out on 0.5mm mesh (formalin).

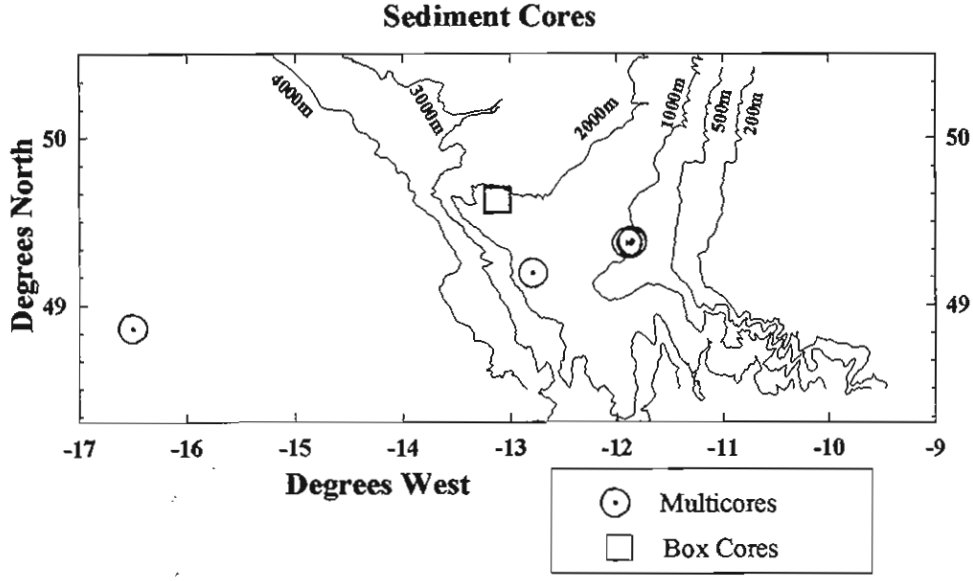

Figure 13: Locations of sediment core collections.

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Stations list for Discovery Cruise 217

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Activity	Sounding at Start Time (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
12791 #1	x	28/09/95	271	19:22	20:18	49 39.80	10 0.22	CTD	132	100	99	
12792 #1	2	29/09/95	272	06:36	09:0.6	49 11.36	12 47.70	Recover ST mooring	1392			
#2	2			09:42	12:18	49 10.82	12 49.87	LHPR	1496	410	406	
#3	2			18:43	17:01	49 6.70	13 14.61	Snatcher	3474	50	50	
#4	2			17:05	17:28	49 6.85	13 13.52	Apstein net	3489	50	50	
#5	2			17:34	17:51	49 6.81	13 15.62	WP2	3506	50	50	
#6	2			18:04	18:16	49 6.82	13 16.09	Snatcher	3517	30	30	
#7	2			22:10	00:44	49 11.36	12 48.96	LHPR	1441	409	405	
12793#1	3	30/09/95	273	05:45	07:00	49 5.08	13 24.54	CTD	3663	1011	1000	
#2	3			07:45	07:50	49 5.48	13 26.80	GO-Flo	3654	10	10	
#3	3			08:16	08:20	49 5.48	13 26.80	GO-Flo	3655	10	10	
#4	3			09:03	14:46	49 5.32	13 22.82	Recover ST mooring	3657			
#5	3			16:52	20:36	49 1.17	13 24.04	GO-Flo	3617	3000	2953	
12794#1	2	01/10/95	274	04:24	06:23	49 11.68	12 48.29	CTD	1406	1315	1299	No Bottles
#2	2			06:54	07:11	49 11.54	12 48.74	GO-Flo	1428	50	50	
#3	2			07:19	07:23	49 11.42	12 48.66	GO-Flo	1429	40	40	
#4	2			07:29	07:33	49 11.40	12 48.59	GO-Flo	1427	30	30	
#5	2			07:36	07:43	49 11.35	12 48.64	GO-Flo	1430	25	25	
#6	2			07:47	07:51	49 11.30	12 48.62	GO-Flo	1429	20	20	
#7	2			07:56	08:04	49 11.24	12 48.58	GO-Flo	1431	10	10	
#8	2			08:08	08:10	49 11.17	12 48.49	GO-Flo	1429	0	0	
#9	2			08:13	08:23	49 11.16	12 48.48	GO-Flo	1429	75	74	
12795#1	1a			12:40	13:52	49 22.90	11 50.80	Multicorer	1062			Failed
#2	1a			14:01	15:06	49 22.40	11 51.50	Multicorer	1071			11 out of 12 success
#3	1a			17:00	00:00	49 22.44	11 54.01	Deploy BIOFEED	1100		1101	
12796#1		03/10/95	276	13:12	13:44	49 32.70	9 8.40	CTD	153	105	104	Test
12797#1	1	04/10/95	277	06:52	07:16	49 24.23	11 32.99	CTD	694	103	102	
12798#1	1			09:13	10:45	49 24.70	11 31.68	CTD	666	660	653	
#2	1			11:09	11:19	49 24.70	11 32.44	WP2	685	100	99	
#3	1			11:38	12:50	49 24.64	11 32.45	WP2/c	686	690	683	
#4	1			13:23	13:30	49 24.30	11 33.20	Snatcher	702	42	42	
#5	1			14:27	16:35	49 24.70	11 32.50	LHPR	687	412	408	
12799#1	1a			20:21	22:08	49 18.75	12 11.20	CTD	1111	1091	1079	
12800#1	2	05/10/95	278	05:00	05:30	49 11.37	12 48.28	CTD	1412	105	104	
#2	2			07:02	07:07	49 11.20	12 49.20	Drifting incubator	1434	50	50	
#3	2			08:24	10:20	49 11.22	12 49.30	Deploy ST Mooring	1346		1445	Position listed is final pos.
12801#1	2			11:35	13:42	49 11.46	12 50.42	CTD	1504	1515	1496	
12802#1	2			14:53	15:21	49 11.70	12 51.50	CTD	1544	105	104	
12803#1	3	06/10/95	279	09:27	13:09	49 5.47	13 23.37	CTD	3660	3707	3643	
12804#1	3			14:00	14:30	49 4.90	13 24.10	CTD	3654	105	104	
#2	3			15:01	18:06	49 5.40	13 23.30	Deploy ST Mooring	3557		3658	Position listed is final pos.
#3	3			20:35	00:53	49 4.05	13 24.30	LHPR	3638			Malfunction
#4	3			22:31	00:53	49 1.46	13 31.35	LHPR	3678	368	364	Malfunction on upcast
#5	~3	07/10/95	280	01:19	01:40	48 57.00	13 42.70	WP2	4487	130	129	

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Activity	Sounding at Start Time (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
12805#1	3	07/10/95	280	05:07	05:39	49 4.90	13 23.40	CTD	3653	103	102	
#2	3			06:10	06:16	49 4.07	13 23.42	GO-Flo	3636	30	30	
#3	3			06:20	06:26	49 4.08	13 23.46	GO-Flo	3638	30	30	
#4	3			06:32		49 3.99	13 23.47	GO-Flo	3637	30	30	Misfire
#5	3			06:37	06:41	49 4.01	13 23.30	GO-Flo	3637	30	30	
#6	3			07:00	07:06	49 3.79	13 23.70	Drifting incubator	3633	50	50	
12806#1	3			08:07	11:49	49 5.68	13 24.33	CTD	3674	3701	3637	
#2	3			12:50	13:00	49 5.60	13 25.20	Apstein Net	3665	50	50	
#3	3			13:05	13:15	49 5.70	13 25.50	WP2	3669	120	119	
#4	3			13:29	13:51	49 6.20	13 25.00	WP2	3677	150	149	
12807#1	H	09/10/95	282	05:18	05:54	48 59.50	16 28.10	CTD	4812	103	102	
#2	H			06:14	06:19	48 59.81	16 28.24	GO-Flo	4811	10	10	
#3	H			06:23	06:26	48 59.66	16 28.38	GO-Flo	4811	10	10	
#4	H			07:16	07:23	48 59.60	16 29.60	Drifting incubator	4810	50	50	
12808#1	H			08:10	10:17	48 59.55	16 28.85	CTD	4809	4891	4794	
#2	H			19:56	20:11	49 0.10	16 28.43	WP2	4810	110	109	
#3	H			20:51	21:01	48 59.19	18 28.30	LHPR	4809			Malfunction
12809#1	H	10/10/95	283	05:10	05:45	49 0.62	16 28.60	CTD	4811	105	104	
12810#1	H			08:50	09:17	49 2.83	16 30.59	CTD	4808	105	104	Hysteresis test
#2	H			09:40	11:56	49 3.07	18 31.39	LHPR	4809	396	392	
12811#1	H			15:12	20:19	48 51.70	16 29.90	Multicorer	4810			
12812#1	H	11/10/95	284	14:43	15:02	49 4.00	16 17.30	Vertical net	4524			
#2	H			15:28	19:11	48 59.98	16 21.11	Deploy ST Mooring	4375		4846	Position listed is final pos.
#3	H			20:44	22:22	48 57.25	16 21.17	Deploy Bathysnap	4811		4845	
#4	H			22:38	22:43	48 57.16	16 21.35	Vertical net	4810			
#5	H			22:47	23:06	48 57.10	16 21.44	Vertical net	4810			
								ADCP calibration by Ziz-Zag				
12813#1		12/10/95	285	07:00	13:58	48 59.50	14 54.50	Seasoar	4665			
12814#1	4			14:37	17:47	48 59.50	13 44.10	Recover ST mooring	4485			
#2	4			18:30	19:03	48 58.75	13 44.60	CTD	4481	105	104	
12815#1	4			20:11	23:49	48 58.34	13 44.77	CTD	4479	4556	4469	
#2	4	13/10/95	286	00:10	00:22	48 58.00	13 43.30	WP2	4487	110	109	
#3	4			00:24	00:27	48 57.90	13 43.20	Vertical net	4487			
12816#1	4			05:22	05:47	48 59.30	13 44.00	CTD	4488	105	104	
#2	4			06:02	06:07	48 59.16	13 43.92	GO-Flo	4488	10	10	
#3	4			06:12	06:16	48 59.13	13 43.93	GO-Flo	4487	10	10	
12617#1	4			07:42	08:33	48 59.74	13 44.54	CTD	4482	103	102	
#2	4			10:02	11:23	48 59.59	13 44.09	Deploy ST Mooring	4485		4510	Position listed is final pos.
#3	4			11:46	11:50	48 59.56	13 43.84	Apstein net	4486	50	50	
#4	4			11:56	12:10	48 59.60	13 43.83	WP2 net	4488	100	99	
#5	4			12:32	12:52	48 59.70	13 43.80	Snatcher	4487	50	50	Failed
#6	4			13:20	13:25	48 59.90	13 43.20	Snatcher	4490	60	59	
#7	4			13:47	14:10	49 0.20	13 43.00	Snatcher	4491	70	69	
12818#1	Xeno 1			18:23	19:50	49 37.52	13 7.01	Box core	1785			
#2	Xeno 1			21:38	23:14	49 37.40	13 7.38	Box core	1770			
#3	Xeno 1			23:20	00:56	49 37.38	13 7.51	Box core	1784			
12819#1	2	14/10/95	287	05:20	05:50	49 11.35	12 48.37	CTD	1411	105	104	
#2	2			07:28	08:37	49 11.29	12 47.57	Multicorer	1390			
12820#1	Xeno 1			12:30	13:48	49 37.30	13 7.10	Box core	1779			
#2	Xeno 1			15:25	16:53	49 37.10	13 6.90	Box core	1765			
#3	Xeno 1			19:13	20:39	49 37.22	13 7.40	Box core	1765			

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Activity	Sounding at Start Time (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
12821#1	1a	15/10/95	288	05:05	05:43	49 20.32	11 59.85	CTD	1129	105	104	
#2	1a			06:04	06:09	49 19.92	11 59.87	GO-Flo	1124	10	10	
#3	1a			06:12	06:16	49 19.87	11 59.82	GO-Flo	1124	10	10	
#4	1a			06:36	06:54	49 19.85	11 59.76	Snatcher	1123	60	59	
#5	1a			07:07	07:20	49 19.66	11 59.84	Snatcher	1122	55	54	
#6	1a			07:30	07:36	49 19.68	11 59.82	Apstein Net	1121	50	50	
#7	1a			07:38	07:46	49 19.77	11 59.78	WP2 net	1121	100	99	
12822#1	1a			08:16	09:38	49 20.07	11 59.32	CTD	1124	1117	1104	
12823#1	1a			10:19	10:45	49 20.46	11 59.53	CTD	1129	105	104	
#2	1a			14:02	15:30	49 17.60	12 0.50	LHPR	1088	215	213	
#3	1a			16:30	17:30	49 11.80	12 2.70	Seasoar	967			No cond., broken stabiliser
12824#1	1a	16/10/95	289	21:57	00:28	49 17.81	12 0.36	LHPR	1094	405	401	
#2		17/10/95	290	01:20	01:25	49 8.20	12 4.40	WP2 net	930			
#3				01:30	01:35	49 8.20	12 4.40	WP2 net	929	130	129	
#4				01:39	01:51	49 8.10	12 4.50	WP2 net	929			
12825#1				04:58	00:00	49 18.20	12 30.20	CTD	1189	105	104	
#2				06:04	06:10	49 18.63	12 30.53	GO-Flo	1196	10	10	
#3				06:12	06:15	49 18.63	12 30.53	GO-Flo	1198	10	10	
#4				06:17	06:27	49 18.63	12 30.53	GO-Flo	1200	10	10	
#5				06:33	06:36	49 18.63	12 30.53	GO-Flo	1204	10	10	
12826#1				06:50	07:15	49 19.20	12 30.80	CTD	1208	103	102	
				08:29	09:07	49 19.40	12 29.41	SeaSoar	1209			Malfunction (No St. #)
12827#1				12:56	05:12	49 26.00	11 41.00	SeaSoar	892			
12828#1	a	18/10/95	291	09:10	10:28	49 0.78	11 49.49	CTD	1148	1129	1116	
12829#1	b			13:26	15:23	48 53.10	12 21.90	CTD	1525	1519	1500	
12830#1	c			18:37	21:00	48 48.20	12 50.50	CTD	2780	2737	2698	
12831#1	d			22:27	01:45	48 45.09	12 59.77	CTD	3631	3669	3606	
12832#1	g	19/10/95	292	04:26	06:04	49 0.86	12 37.25	CTD	1500	1482	1464	
#2	g			06:52	06:56	49 0.78	12 37.69	GO-Flo	1501	10	10	
#3	g			07:01	07:04	49 0.76	12 37.60	GO-Flo	1504	10	10	
#4	g			07:17		49 0.85	12 37.70	Drifting incubator	1499	50	50	Samples lost
12833#1	e			10:11	13:22	48 55.71	13 2.96	CTD	3499	3553	3493	
12834#1	f			14:05	14:17	48 57.00	12 56.50	WP2 net	2431	80	79	
#2	f			14:20	14:28	48 56.90	12 56.20	Apstein net	2458	60	59	
#3	f			14:39	16:51	48 56.80	12 56.70	CTD	2550	2562	2524	
12835#1	h			19:42	19:57	49 4.34	12 22.69	WP2	1149	100	99	
#2	h			20:19	21:47	49 4.41	12 22.70	CTD	1148	1140	1127	
12836#1	i	20/10/95	293	00:07	01:18	49 10.60	11 49.20	CTD	789	770	762	
12837#1	1			02:53	03:07	49 24.70	11 31.60	Vertical net	662			
#2	1			03:29	03:35	49 24.00	1 31.50	GO-Flo	663	10	10	
#3	1			03:38	03:42	49 24.60	11 31.50	GO-Flo	665	10	10	
#4	1			03:50	03:55	49 24.60	11 31.50	GO-Flo	666	10	10	
#5	1			04:18	05:32	49 24.40	11 31.60	CTD	668	650	843	No Salinity
#6	1			06:49	06:57	49 23.37	11 32.12	Drifting incubator	673	50	50	
12838#1	1			11:35	11:52	49 24.71	11 31.93	CTD	675	102	101	
12839#1	"200m"			14:10	15:17	49 31.40	11 1.20	LHPR	192	173	171	

Station list according to activity

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Start Time Sounding (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
PP Measurements											
12793#1	3	30/09/95	273	05:45	07:00	49 5.08	13 24.54	3663	1011	1002	On Deck
12797#1	1	04/10/95	277	06:52	07:16	49 24.23	11 32.99	694	103	102	On Deck
12800#2	2	05/10/95	278	07:02	07:07	49 11.20	12 49.20	1434	50	50	*In situ*
12805#6	3	07/10/95	280	07:00	07:06	49 3.79	13 23.70	3633	50	50	*In situ*
12807#4	H	09/10/95	282	07:16	07:23	48 59.60	16 29.60	4810	50	50	*In situ*
12809#1	H	10/10/95	283	05:10	05:45	49 0.62	16 28.60	4811	105	104	On Deck
12816#1	4	13/10/95	286	05:22	05:47	48 59.30	13 44.00	4488	105	104	On Deck
12819#1	2	14/10/95	287	05:20	05:50	49 11.35	12 48.37	1411	105	104	On Deck
12821#1	1a	15/10/95	288	05:05	05:43	49 20.32	11 59.85	1129	105	104	On Deck
12825#1		17/10/95	290	04:58	00:00	49 18.20	12 30.20	1189	105	104	On Deck
12832#4	g	19/10/95	292	07:17	00:00	49 0.85	12 37.70	1499	50	50	In situ. samples lost
12837#6	1	20/10/95	293	06:49	06:57	49 23.37	11 32.12	673	50	50	*In situ*
Shallow CTD											
12791 #1	x	28/09/95	271	19:22	20:18	49 39.80	10 0.22	132	100	99	
12796#1		03/10/95	276	13:12	13:44	49 32.70	9 8.40	153	105	104	Test
12797#1	1	04/10/95	277	06:52	07:16	49 24.23	11 32.99	694	103	102	On Deck PP incubation
12800#1	2	05/10/95	278	05:00	05:30	49 11.37	12 48.28	1412	105	104	
12802#1	2	05/10/95	278	14:53	15:21	49 11.70	12 51.50	1544	105	104	
12804#1	3	06/10/95	279	14:00	14:30	49 4.90	13 24.10	3654	105	104	
12805#1	3	07/10/95	280	05:07	05:39	49 4.90	13 23.40	3653	103	102	
12807#1	H	09/10/95	282	05:18	05:54	48 59.50	16 28.10	4812	103	102	
12809#1	H	10/10/95	283	05:10	05:45	49 0.62	16 28.60	4811	105	104	On Deck PP incubation
12810#1	H	10/10/95	283	08:50	09:17	49 2.83	16 30.59	4808	105	104	Hysteresis test
#2	4	12/10/95	285	18:30	19:03	48 58.75	13 44.60	4481	105	104	
12816#1	4	13/10/95	286	05:22	05:47	48 59.30	13 44.00	4488	105	104	On Deck PP incubation
12817#1	4	13/10/95	286	07:42	08:33	48 59.74	13 44.54	4482	103	102	
12819#1	2	14/10/95	287	05:20	05:50	49 11.35	12 48.37	1411	105	104	On Deck PP incubation
12821#1	1a	15/10/95	288	05:05	05:43	49 20.32	11 59.85	1129	105	104	On Deck PP incubation
12823#1	1a	15/10/95	288	10:19	10:45	49 20.46	11 59.53	1129	105	104	
12825#1		17/10/95	290	04:58	00:00	49 18.20	12 30.20	1189	105	104	On Deck PP incubation
12826#1		17/10/95	290	06:50	07:15	49 19.20	12 30.80	1208	103	102	
12838#1	1	20/10/95	293	11:35	11:52	49 24.71	11 31.93	675	102	101	
Full depth or deep CTD											**Height above seabed**
12793#1	3	30/09/95	273	05:45	07:00	49 5.08	13 24.54	3663	1011	1002	
12794#1	2	01/10/95	274	04:24	06:23	49 11.68	12 48.29	1406	1315	1303	No Bottles
12798#1	1	04/10/95	277	09:13	10:45	49 24.70	11 31.68	666	660	654	49
12799#1	1a	04/10/95	277	20:21	22:08	49 18.75	12 11.20	1111	1091	1081	130
12801#1	2	05/10/95	278	11:35	13:42	49 11.46	12 50.42	1504	1515	1501	
12803#1	3	06/10/95	279	09:27	13:09	49 5.47	13 23.37	3660	3707	3674	
12806#1	3	07/10/95	280	08:07	11:49	49 5.68	13 24.33	3674	3701	3668	
12808#1	H	09/10/95	282	06:10	10:17	48 59.55	16 28.85	4809	4891	4847	46
12815#1	4	12/10/95	285	20:11	23:49	48 58.34	13 44.77	4479	4556	4515	33
12822#1	1a	15/10/95	268	08:16	09:38	49 20.07	11 59.32	1124	1117	1107	
12828#1	a	18/10/95	291	09:10	10:28	49 0.78	11 49.49	1148	1129	1119	
12829#1	b	18/10/95	291	13:26	15:23	48 53.10	12 21.90	1525	1519	1505	21
12830#1	c	18/10/95	291	18:37	21:00	48 48.20	12 50.50	2780	2737	2712	32
12831#1	d	18/10/95	291	22:27	01:45	48 45.09	12 59.77	3631	3669	3636	22
12832#1	g	19/10/95	292	04:26	06:04	49 0.86	12 37.25	1500	1482	1469	30
12833#1	e	19/10/95	292	10:11	13:22	48 55.71	13 2.96	3499	3553	3521	21
12834#3	f	19/10/95	292	14:39	16:51	48 58.80	12 56.70	2550	2562	2539	16
12835#2	h	19/10/95	292	20:19	21:47	49 4.41	12 22.70	1148	1140	1130	
12836#1	i	20/10/95	293	00:07	01:18	49 10.60	11 49.20	789	770	763	20
12837#5	1	20/10/95	293	04:18	05:32	49 24.40	11 31.60	666	650	644	No sal. 22
LHPR											
12792 #2	2	29/09/95	272	09:42	12:18	49 10.82	12 49.87	1496	410	406	
12792#7	2	29/09/95	272	22:10	00:44	49 11.36	12 48.96	1441	409	405	
12798#5	1	04/10/95	277	14:27	16:35	49 24.70	11 32.50	687	412	408	
12804#3	3	06/10/95	279	20:35	00:53	49 4.05	13 24.30	3638			Malfunction
12804#4	3	06/10/95	279	22:31	00:53	49 1.46	13 31.35	3678	366	365	Malfunction on upcast
12808#3	H	09/10/95	282	20:51	21:01	46 59.19	16 28.30	4809			Malfunction
12810#2	H	10/10/95	283	09:40	11:56	49 3.07	16 31.39	4609	396	392	
12823#2	1a	15/10/95	268	14:02	15:30	49 17.60	12 0.50	1088	215	213	
12824#1	1a	16/10/95	289	21:57	00:28	49 17.81	12 0.36	1094	405	401	
12839#1	"200m"	20/10/95	293	14:10	15:17	49 31.40	11 1.20	192	173	171	

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Start Time Sounding (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
Marine Snow Profiles											
12797#1	1	04/10/95	277	06:52	07:16	49 24.23	11 32.99	694	103	102	MSP 90
12798#1	1	04/10/95	277	09:13	10:45	49 24.70	11 31.68	666	660	654	MSP 91
12799#1	1a	04/10/95	277	20:21	22:08	49 18.75	12 11.20	1111	1091	1081	MSP 92
12800#1	2	05/10/95	278	05:00	05:30	49 11.37	12 48.28	1412	105	104	MSP 93
12801#1	2	05/10/95	278	11:35	13:42	49 11.46	12 50.42	1504	1515	1501	MSP 94
12803#1	3	06/10/95	279	09:27	13:09	49 5.47	13 23.37	3660	3707	3674	MSP 95
12805#1	3	07/10/95	280	05:07	05:39	49 4.90	13 23.40	3653	103	102	MSP 96
12806#1	3	07/10/95	280	08:07	11:49	49 5.68	13 24.33	3674	3701	3668	MSP 97
12807#1	H	09/10/95	282	05:18	05:54	48 59.50	16 28.10	4812	103	102	MSP 98
12808#1	H	09/10/95	282	08:10	10:17	48 59.55	16 28.85	4809	4891	4847	MSP 99
12809#1	H	10/10/95	283	05:10	05:45	49 0.62	16 28.60	4811	105	104	MSP 100
12814#2	4	12/10/95	285	18:30	19:03	48 58.75	13 44.60	4481	105	104	MSP 101
12815#1	4	12/10/95	285	20:11	23:49	48 58.34	13 44.77	4479	4556	4515	MSP 102
12817#1	4	13/10/95	286	07:42	08:33	48 59.74	13 44.54	4482	103	102	MSP 103
12821#1	1a	15/10/95	288	05:05	05:43	49 20.32	11 59.85	1129	105	104	MSP 104
12829#1	b	18/10/95	291	13:26	15:23	48 53.10	12 21.90	1525	1519	1505	MSP 105
12830#1	c	18/10/95	291	18:37	21:00	48 48.20	12 50.50	2780	2737	2712	MSP 106
12831#1	d	18/10/95	291	22:27	01:45	48 45.09	12 59.77	3631	3669	3636	MSP 107
12832#1	g	19/10/95	292	04:26	06:04	49 0.86	12 37.25	1500	1482	1469	MSP 108
12833#1	e	19/10/95	292	10:11	13:22	48 55.71	13 2.96	3499	3553	3521	MSP 109
12834#3	f	19/10/95	292	14:39	16:51	48 56.80	12 56.70	2550	2562	2539	MSP 110
12835#2	h	19/10/95	292	20:19	21:47	49 4.41	12 22.70	1148	1140	1130	MSP 111
12836#1	i	20/10/95	293	00:07	01:18	49 10.60	11 49.20	789	770	763	MSP 112
12837#5	1	20/10/95	293	04:18	05:32	49 24.40	11 31.60	668	650	644	MSP 113
Moorings						NB These are final positions					
12792 #1	2	29/09/95	272	06:36	09:0.6	49 11.36	12 47.70	1392			Recover ST mooring
12793#4	3	30/09/95	273	09:03	14:46	49 5.32	13 22.82	3657			Recover ST mooring
12795#3	1a	01/10/95	274	17:00	00:00	49 22.44	11 54.01	1100		1101	Deploy BIOFEED
12800#3	2	05/10/95	278	08:24	10:20	49 11.22	12 49.30	1346		1445	Deploy ST Mooring
12804#2	3	06/10/95	279	15:01	18:06	49 5.40	13 23.30	3557		3658	Deploy ST Mooring
12812#2	H	11/10/95	284	15:28	19:11	48 59.98	16 21.11	4375		4846	Deploy ST Mooring
12812#3	H	11/10/95	284	20:44	22:22	48 57.25	16 21.17	4811		4845	Deploy Bathysnap
12814#1	4	12/10/95	285	14:37	17:47	48 59.50	13 44.10	4485			Recover ST mooring
12817#2	4	13/10/95	288	10:02	11:23	48 59.59	13 44.09	4485		4510	Deploy ST Mooring
30L GO-Flo											
12793#2	3	30/09/95	273	07:45	07:50	49 5.48	13 26.80	3654	10	10	
12793#3	3	30/09/95	273	08:16	08:20	49 5.48	13 26.80	3655	10	10	
12793#5	3	30/09/95	273	16:52	20:36	49 1.17	13 24.04	3617	3000	2973	
12794#2	2	01/10/95	274	06:54	07:11	49 11.54	12 48.74	1428	50	50	
12794#3	2	01/10/95	274	07:19	07:23	49 11.42	12 48.66	1429	40	40	
12794#4	2	01/10/95	274	07:29	07:33	49 11.40	12 48.59	1427	30	30	
12794#5	2	01/10/95	274	07:38	07:43	49 11.35	12 48.64	1430	25	25	
12794#6	2	01/10/95	274	07:47	07:51	49 11.30	12 48.62	1429	20	20	
12794#7	2	01/10/95	274	07:56	08:04	49 11.24	12 48.58	1431	10	10	
12794#8	2	01/10/95	274	08:08	08:10	49 11.17	12 48.49	1429			
12794#9	2	01/10/95	274	08:13	08:23	49 11.16	12 48.48	1429	75	74	
12805#2	3	07/10/95	280	06:10	06:16	49 4.07	13 23.42	3636	30	30	
12805#3	3	07/10/95	280	06:20	06:26	49 4.08	13 23.46	3638	30	30	
12805#4	3	07/10/95	280	06:32	00:00	49 3.99	13 23.47	3637	30	30	Misfire
12805#5	3	07/10/95	280	06:37	06:41	49 4.01	13 23.30	3637	30	30	
12807#2	H	09/10/95	282	06:14	06:19	48 59.81	16 28.24	4811	10	10	
12807#3	H	09/10/95	282	06:23	06:26	48 59.66	16 28.36	4811	10	10	
12816#2	4	13/10/95	286	06:02	06:07	48 59.16	13 43.92	4488	10	10	
12816#3	4	13/10/95	286	06:12	06:16	48 59.13	13 43.93	4487	10	10	
12821#2	1a	15/10/95	288	06:04	06:09	49 19.92	11 59.87	1124	10	10	
12821#3	1a	15/10/95	288	06:12	06:16	49 19.87	11 59.82	1124	10	10	
12825#2		17/10/95	290	06:04	06:10	49 18.63	12 30.53	1196	10	10	
12825#3		17/10/95	290	06:12	06:15	49 18.63	12 30.53	1198	10	10	
12825#4		17/10/95	290	06:17	06:27	49 18.63	12 30.53	1200	10	10	
12825#5		17/10/95	290	06:33	06:36	49 18.63	12 30.53	1204	10	10	
12832#2	g	19/10/95	292	06:52	06:56	49 0.78	12 37.69	1501	10	10	
12832#3	g	19/10/95	292	07:01	07:04	49 0.76	12 37.60	1504	10	10	
12837#2	1	20/10/95	293	03:29	03:35	49 24.00	1 31.50	663	10	10	
12837#3	1	20/10/95	293	03:38	03:42	49 24.60	11 31.50	665	10	10	
12837#4	1	20/10/95	293	03:50	03:55	49 24.60	11 31.50	666	10	10	

Station Number	Nominal OMEX Station	Date	Julian Day No.	Time start	Time finish	Start Position Latitude	Longitude	Start Time Sounding (UCM)	Max. Gear Press. (dB)	Max. Gear Depth (m)	Comment
Snatchers											
12792#3	2	29/09/95	272	16:43	17:01	49 6.70	13 14.61	3474	50	50	
12792#6	2	29/09/95	272	18:04	18:16	49 6.82	13 16.09	3517	30	30	
12798#4	1	04/10/95	277	13:23	13:30	49 24.30	11 33.20	702	42	42	
12817#5	4	13/10/95	286	12:32	12:52	48 59.70	13 43.80	4487	50	50	Failed
12817#6	4	13/10/95	286	13:20	13:25	48 59.90	13 43.20	4490	60	59	
12817#7	4	13/10/95	286	13:47	14:10	49 0.20	13 43.00	4491	70	69	
12821#4	1a	15/10/95	288	06:36	06:54	49 19.85	11 59.76	1123	60	59	
12821#5	1a	15/10/95	288	07:07	07:20	49 19.66	11 59.84	1122	55	55	
Sediment Cores											
12795#1	1a	01/10/95	274	12:40	13:52	49 22.90	11 50.80	1062			Failed multicore
12795#2	1a	01/10/95	274	14:01	15:06	49 22.40	11 51.50	1071			11 out of 12 success
12795#3	1a	01/10/95	274	17:00	00:00	49 22.44	11 54.01				Deploy BIOFEED
12811#1	H	10/10/95	283	15:12	20:19	48 51.70	16 29.90	4810			Multicorer
12818#1	Xeno 1	13/10/95	286	18:23	19:50	49 37.52	13 7.01	1785			Box core
12818#2	Xeno 1	13/10/95	286	21:36	23:14	49 37.40	13 7.38	1770			Box core
12818#3	Xeno 1	13/10/95	286	23:20	00:56	49 37.38	13 7.51	1764			Box core
12619#2	2	14/10/95	287	07:28	08:37	49 11.29	12 47.57	1390			Multicorer
12820#1	Xeno 1	14/10/95	287	12:30	13:48	49 37.30	13 7.10	1779			Box core
12820#2	Xeno 1	14/10/95	287	15:25	16:53	49 37.10	13 6.90	1765			Box core
12820#3	Xeno 1	14/10/95	287	19:13	20:39	49 37.22	13 7.40	1765			Box core
Vertical Nets											
12792#4	2	29/09/95	272	17:05	17:28	49 6.85	13 13.52	3489	50	50	Apstein net
12792#5	2	29/09/95	272	17:34	17:51	49 6.81	13 15.62	3506	50	50	WP2
12798#2	1	04/10/95	277	11:09	11:19	49 24.70	11 32.44	685	100	99	WP2
12798#3	1	04/10/95	277	11:38	12:50	49 24.64	11 32.45	686	690	684	WP2/c
12804#5	~3	07/10/95	280	01:19	01:40	48 57.00	13 42.70	4487	130	129	WP2
12806#2	3	07/10/95	280	12:50	13:00	49 5.60	13 25.20	3665	50	50	Apstein Net
12806#3	3	07/10/95	280	13:05	13:15	49 5.70	13 25.50	3669	120	119	WP2
12806#4	3	07/10/95	280	13:29	13:51	49 6.20	13 25.00	3677	150	149	WP2
12808#2	H	09/10/95	282	19:56	20:11	49 0.10	16 28.43	4810	110	109	WP2
12812#1	H	11/10/95	284	14:43	15:02	49 4.00	16 17.30	4524			Vertical net
12812#4	H	11/10/95	284	22:38	22:43	48 57.16	16 21.35	4810			Vertical net
12812#5	H	11/10/95	284	22:47	23:06	48 57.10	16 21.44	4810			Vertical net
12815#2	4	13/10/95	286	00:10	00:22	48 58.00	13 43.30	4487	110	109	WP2
12815#3	4	13/10/95	286	00:24	00:27	48 57.90	13 43.20	4487			Vertical net
12817#3	4	13/10/95	286	11:46	11:50	48 59.56	13 43.84	4486	50	50	Apstein net
12817#4	4	13/10/95	286	11:56	12:10	48 59.60	13 43.83	4488	100	99	WP2 net
12821#6	1a	15/10/95	288	07:30	07:38	49 19.68	11 59.82	1121	50	50	Apstein Net
12821#7	1a	15/10/95	288	07:38	07:48	49 19.77	11 59.78	1121	100	99	WP2 net
12824#2		17/10/95	290	01:20	01:25	49 8.20	12 4.40	930			WP2 net
12824#3		17/10/95	290	01:30	01:35	49 8.20	12 4.40	929	130	129	WP2 net
12824#4		17/10/95	290	01:39	01:51	49 8.10	12 4.50	929			WP2 net
12834#1	f	19/10/95	292	14:05	14:17	48 57.00	12 56.50	2431	80	79	WP2 net
12834#2	f	19/10/95	292	14:20	14:28	48 56.90	12 56.20	2458	60	59	Apstein net
12835#1	h	19/10/95	292	19:42	19:57	49 4.34	12 22.69	1149	100	99	WP2
12837#1	1	20/10/95	293	02:53	03:07	49 24.70	11 31.60	662			Vertical net
Seasoar											
12813#1		12/10/95	285	07:00	13:58	48 59.50	14 54.50	4665			
12823#3		15/10/95	288	16:30	17:30	49 11.80	12 2.70	967			No cond., broken stabiliser
		17/10/95	290	08:29	09:07	49 19.40	12 29.41	1209			Malfunction (No St. #)
12827#1		17/10/95	290	12:56	05:12	49 26.00	11 41.00	892			