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RRS DISCOVERY

CRUISE 120

9 MAY – 1 JUNE 1981

BIOLOGICAL AND PHYSICAL INVESTIGATIONS OF THE OCEANIC FRONT TO THE SOUTH-WEST OF THE AZORES

CRUISE REPORT NO 124

1981

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

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RRS DISCOVERY

CRUISE 120

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Biological and Physical Investigations of the Oceanic Front to the South-West of the Azores

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Institute of Oceanographic Sciences,
Wormley, Godalming,
Surrey GU8 5UB

CONTENTS

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E.M. Bowen	Chief Officer
S. Sykes	2nd Officer
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T.A. Rees	2nd Engineer
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R. Overton	Purser and Catering Officer

OBJECTIVES

The cruise was designed to make further physical and biological investigations of a large meander in the frontal system separating east Atlantic from west Atlantic water in the vicinity of 32°N, 32°W. On Cruise 119 batfish and XBT data had suggested that this meander was in the process of forming a detached eddy and on Cruise 120 it was hoped to obtain further batfish profiles of this area.

The biological investigations were mainly centred on an investigation of the effect of the front on primary production, nutrient distribution and the fine-scale vertical distribution of zooplankton. Subsidiary experiments to be carried out were investigations on the zoogeographic distribution of Calanus helgolandicus in the area SW of the Azores (IMER), physiological studies of plankton luminescence and, if time permitted, a survey of the effect of a shallow sea-mount on chlorophyll production.

NARRATIVE

The ship sailed from Ponta Delgada, Sao Miguel, Azores at 09.30 on the 9th of May, 1981 and set course for 35°N 28° 30'W, which was intended to be the first of a series of stations and XBT launches along 28° 30'W down to a latitude of 31°N. We arrived at this position at 0804 on the 10th and began the first station (10357). Two CTD dips to 300m were made to obtain continuous profiles of temperature, salinity, chlorophyll fluorescence and oxygen concentration. Bottle samples were also taken for analysis of chlorophyll and nitrate concentrations. At 1330 an RMT 1+8 combination net was launched to provide live animals for physiological experiments. At 1600 two 30ℓ water samples were obtained from a depth of 75m to provide material for the primary production experiments. Finally at 1650 an IMER Longhurst net was trawled between the surface and 560m and back. This combination of samplers was used a number of times on the cruise and will be referred to as a 'standard' station, although the depths of the nets and bottle samples were varied according to information obtained from the CTD profile.

Before proceeding to the next station the P.E.S. Fish was launched and the surface water pump was started to feed sea water to the thermosalinograph and fluorometers. XBTs were launched on the even hours and the position of all the

XBT launches on the cruise is given in table 2. At 2230 a gale warning was received and the master recommended a course alteration to 225° to avoid the expected passage of the storm centre.

At 0800/11-V course was altered to 180° and at 1230 the ship hove to for station 10358, which consisted of a CTD dip and 30ℓ water samples for productivity experiments. This station was completed at 1348 and a southerly course was resumed. The 16°C isotherm sank from 145m at station 10357 to 270m at 10358. It had been found on Cruise 119 that a good criterion for the front between eastern Atlantic water (EAW) and western Atlantic water (WAW) was the 16°C isotherm crossing 200m. Using this criterion the front was crossed somewhere between XBT nos. 8 and 9. At 0024/12-V the ship hove to for station 10359 where a standard set of samples was obtained.

It was then decided to launch the batfish for a survey of the meander observed on Cruise 119. However it was found that the hydraulic ram on the batfish sheave had seized and after several hours trying unsuccessfully to free it, it was decided to remove it and use the alluminium sheave attached directly to the HIAB crane. This arrangement worked successfully but when the batfish cable had been streamed out it was realised that the control box for the batfish capstan had failed. After further repair work the batfish was finally launched at 1330. A course of 250° was held until 1722/12-V when course was altered to 326° in order to traverse the main axis of the meander observed on Cruise 119. Before altering course the 16°C isotherm was at 300m but thereafter it rose steadily passing through 200m at 2150. From this time until 2133/13-V a steady course was held and the 16°C isotherm lay between 144m and 205m. At 2133 course was altered to 234° in order to cross the front which was expected to lie to the west. The depth of the 16°C isotherm began to decrease and passed through 200m between 0200/14-V and 0300/14-V. This course was continued until 0800 by which time the 16°C isotherm had dropped below 300m. The batfish was brought inboard at 0914 and a standard set of stations (10360) in WAW was begun and completed at 2208/14-V.

A course was then set at 054° for a standard station in the frontal region between WAW and EAW, as determined from the previous batfish section. At 0806/15-V the frontal position was reached and the station (10362) was completed at 0544/16-V. For this station and all succeeding stations the procedure for obtaining the 30ℓ water samples for productivity experiments was modified.

Using the midships hydraulic winch a CTD profile was made to determine the depth of the sub-surface chlorophyll maxima and then the 30ℓ Niskin bottle was sent down to the same depth using the electric winch. If more than one 30ℓ sample was required the depth of the chlorphyll maximum was checked using the CTD system. A 0 to 1000m oblique combination net was also made at this station and it was decided to add this sample to the standard series of samples when time permitted.

Course was then set to 34°N 32°50'W for a standard station in EAW. This position was reached at 0809/16-V and the station (10364) completed by 1600/16-V. The ship then returned to the boundary position where a further series of samples were obtained (10365) finishing at 0445/17-V. We then returned to the station in WAW in order to obtain a 0-1000m oblique combination net sample.

It was then decided to launch the batfish in order to survey the western boundary of the meander in more detail and the launch was completed at 1448/17-V. A course was first set at 090° and then after crossing the front this course was held for two hours before altering course to 196° at 0143/18-V in order to cross the front to the south of the first crossing. This zig-zag process was continued in order to trace the course of the front southwards. At 1100/18-V the front was crossed going west to east and it was decided to continue in an easterly direction to traverse the whole meander. The front was crossed on the eastern side of the meander at 2230/18-V.

On Cruise 119 we had obtained evidence that after making a large meander centred around 32°N 32°W the front then veered eastwards till about 30°W and then headed south again. It was therefore decided to investigate this more fully by continuing the batfish run eastwards to the Cruiser Bank seamount, which would also provide an opportunity of investigating the effect of a seamount on biological productivity. From 2230/18-V the 16°C isotherm was below 200m indicating WAW and the front was next crossed at around 1150/19-V at around 32°N 28°30'W.

After crossing the front we continued eastwards across Cruiser Bank where a shallowest depth of 258m was recorded. At 1640/19-V course was altered to 221° to head round to the south of the Bank and at 2031 the course was altered to make a south-north traverse of the Bank. This traverse showed some interesting features in the density and chlorophyll fluorescence sections and it was decided to bring in the batfish and make a number of CTD dips southwards across the bank and so the batfish was recovered at 0130/20-V. However, at this stage it was decided for logistic reasons to carry out some tests on the Bank of an RMT 1+8 net fitted with a near bottom echo-sounder. Two hauls were made and the echo-sounder worked successfully to within 33m of the bottom. A CTD profile and a set of 30ℓ water samples were then made on the northern edge of the Bank (10368) and then a course was made for an area of intense vertical mixing and increased surface fluorescence levels observed during the batfish traverse. Unfortunately on returning to this position the CTD profile (10369#1) showed no signs of vertical mixing or high surface chlorophyll. It was then decided to steam southwards and stop for a station if high surface chlorophyll fluorescence was observed. Despite crossing some very intriguing fronts with strong surface convergence no areas of high surface chlorophyll were found and so after making one more CTD dip the search was abandoned.

At 1428/20-V the RMT 1+8 was launched for another bottom echo-sounder test which was also successful. A course of 170° was then set south of the Bank to search for a possible plume effect produced by the Bank and some further frontal features were crossed. A CTD dip was begun at 1900/20-V but electronic problems in the CTD telemetering caused this to be abandoned.

In view of the temporary problems with the CTD and the fact that no plume had been observed it was decided to finish the survey of Cruise Bank and return to the main meander and to survey the front from the position of the original standard frontal station (10362) northwestwards towards the Mid-Atlantic Ridge. Accordingly a course of 194° was set at 1930/20-V with XBT launches scheduled every two hours.

At 0900/21-V the ship hove to in order to change the P.E.S. fish which had been producing noisy records. Also the closing cod-end device was tested on the electric winch but failed to work successfully.

At 0650/22-V we arrived at the front in the vicinity of 33°35'N, 33°38'W. A 0-300m CTD, some 30ℓ water samples, and a vertical plankton net sample were made followed by an RMT1+8 net for live material (10371). At 1416/22-V the batfish was launched and a zig-zag course was made to trace the direction of the Front to the north-west. The front was crossed at 0030, 0412 and 0748 on the 23-V. At 1155/23-V the batfish was brought inboard briefly in order to take some 30ℓ water samples for productivity experiments and the batfish was re-launched at 1328.

As the front now seemed to be trending westwards it was decided to save time by altering course to reach the nearest point on the Mid-Atlantic Ridge. During this leg the 16°C isotherm was always above 150m indicating EAW. At 0056/24-V the batfish was recovered just to the west of the Ridge in the vicinity of 35°29'N, 35°31'W. As the batfish was being recovered the thermosalinograph indicated a sharp rise in salinity indicative of the frontal region. It was decided to trawl the Longhurst-Hardy net to the west of the front in WAW and this was followed by a RMT1+8 0-1000m oblique to provide further material for IMER.

The ship then returned to the frontal position for a CTD dip and to obtain some 30ℓ water samples (10373). The CTD was then transferred to the electric winch so that it could be used in conjunction with the Pugh underwater pump system. Water from the pump was passed through the Turner Designs fluorometer and the HIAC particle counter and a profile was made down to 100m.

A course of 270° was then made to a position about 10 miles west of the front (WAW) and a CTD dip, a further Longhurst sample and a 0-1000m RMT1+8 oblique were carried out (10374). It was then decided to make an XBT survey of the area to the SW of the front between about 35°30'W and the original front station at 34°30'W. This XBT survey was begun at 2210/24-V but at 0200/25-V the XBT launcher failed to operate and, after some fruitless attempts to repair it, it was decided to abandon the XBT survey and proceed to the original frontal station position (10362) to carry out a day-night mini-series. At 0440/25-V a course was set to cross the front at a latitude somewhere between stations 10372 and 10373 and the thermo-salinograph indicated the front was crossed at about 0750. At 0940/25-V the ship hove to for a CTD profile, some 30ℓ water samples, an RMT1+8 materials haul plus another unsuccessful trial of the closing cod-end device. This work was completed at 1430/25-V and a course of 122° was set for the main frontal station. At 15.00 a large school of sperm whales and dolphins were sighted basking on the surface. The estimated number was 20-30.

At 1850/25-V the thermo-salinograph record indicated that we had passed through the front again and had entered WAW. During the day the XBT launcher had been repaired and so at 0000/26-V a short XBT survey was begun to determine the exact position of the front. This was completed at 0400/26-V and the frontal mini-series begun (station 10376). All the nets in this series were trawled in a direction parallel to the estimated position of the front in this area. During this station further water samples were taken for productivity experiments and the closing cod-end device was tested successfully. On the 29/V the deep (0-6000m) CTD was fitted to the hydraulic winch and a 0-2000m CTD profile was made. The station was completed at 0406/30-V and course was set for Ponta Delgada which was reached early in the morning of 1/vi.

EQUIPMENT (M.J.R. Fasham)

(a) IOS Batfish and shallow CTD systems

The IOS batfish was fitted with a Neil Brown Instruments shallow (0-328m) CTD with an Oxygen sensor and a Chelsea Instruments in situ fluorometer. Apart from some temporary trouble with the batfish capstan controller the system worked perfectly throughout the cruise.

During the batfish runs, 43 surface samples were taken to calibrate the CTD conductivity sensor and most of the calculated conductivity ratios lay in the range 1.0052-1.0055. When the batfish was not being used the CTD and fluorometer were removed and connected to the midships hydraulic winch for 0-300m profiles. Using bottle samples it was then possible to calibrate the Chelsea Fluorometer against chlorophyll values. 76 calibration points were obtained during the cruise which yielded a calibration equation of $\log_e C = 1.481V-5.513$ where C is the chlorophyll concentration in mg m^{-3} and V is the voltage output of the fluorometer in volts.

On station 10356#5 five oxygen samples were taken to calibrate the oxygen sensor. The resulting calibration was $O_{cal} = 0.866\ O_{ctd} + 1.477$ where O_{cal} is the calibrated oxygen concentration (ml/ℓ) and O_{CTD} is the oxygen concentration calculated using the oxygen algorithm derived by R. Pollard on Cruise 119 for the 1134 computer.

(b) Plessey Light Meters

At the beginning of the cruise the 1134 batfish system programs that calculated calibrated surface irradiance were finally debugged and regular daily plots were obtained. By comparing these results with the standard solarimeter it was realised that the calibration for the Plessey surface light meter (unit B) was wrong. In order to resolve this problem a cross calibration was made on the 11th of May between the surface and the underwater Plessey light meter (unit A) sitting on the deck. Unit A had been calibrated twice since it was purchased and the calibration constants obtained each time were very similar. It was therefore assumed that A was correctly calibrated and so by comparing readings from the two units during a late afternoon and early evening period the calibration of B was adjusted to be the same as A.

(c) 1134 Batfish Computer System

This system functioned very well during the cruise. The system was down from about 1200/26-V to about the same time on the next day when the system kept hanging up due to lack of 'pool' space. Eventually it was realised that this was due to the HIAC particle counter being left connected to the computer without its servicing subroutine being in the sampling system.

A number of small modifications were made to the navigation suite of programs and navigation data was calculated during the whole cruise whether the batfish was operating or not.

PRIMARY PRODUCTION EXPERIMENTS (T. Platt, B. Irwin, P. Lindley).

We examined the variations between samples in the parameters of the curve relating photosynthesis and light for phytoplankton (the light-saturation curve). Experiments were made using the ^{14}C method in temperature-controlled, artificial light incubators. Each light-saturated curve was based on some 30 data points. At the high end of the light gradient, intensities were high enough to cause photoinhibition of photosynthesis. The data will be fitted to mathematical models of the light-saturation curve. We also measured chlorophyll concentration, protein, RNA, DNA, particulate carbon, hydrogen and nitrogen and the inorganic nutrients phosphate, nitrate, silicate and ammonia. Preserved samples were taken for identification and enumeration of phytoplankton species. The samples studied were drawn by Niskin bottles, usually from the fluorescence sub-surface maximum, as located by a fluorometer attached to the CTD.

Various manipulations were made on the samples before or after the ^{14}C measurements. For example, we ran the experiments at three other temperatures besides that from which the sample was drawn, with a view to seeing the short-term response of the light-saturation parameters to changes in temperature. Twelve such experiments were done. In half of them the cells were fractionated according to size at the end of the experiments. The object here was to determine the relative contribution of the ultraplankton to the photosynthesis and to compare its temperature coefficient with that of the larger cells.

We also examined the time course of ^{14}C uptake over periods up to 36 hours, with size-fractionation of the cells. Eight such experiments were done. In a further three experiments, the time course was perturbed by a step change in light intensity.

At two stations the photosynthesis parameters were measured at each of three depths. Some preliminary measurements were made with the DCMU-induced fluorescence as an indicator of photosynthetic activity. Six vertical profiles of DCMU-induced fluorescence were obtained and seven time courses.

Finally, chlorophyll bleaching at high intensities of both natural and artifical light was measured. One experiment was done in which the adjustment in photosynthesis parameters of a dark-adapted population to high light levels was followed over 8 hours.

LONGHURST HARDY PLANKTON RECORDER (R. Williams, D. Conway)

The Double Longhurst system, fitted with 56µm and 280µm mesh nets in a Lowestoft 30" frame, was deployed for 8 double oblique hauls to 600m and one to 1000m. The total number of samples collected in the ascent hauls and processed into tubes was 736. Settled volumes were measured on samples collected from the 280µm net and the results showed an even distribution of zooplankton biomass from the surface to the maximum depth sampled in the day hauls with an increase in biomass in the upper 100m in the night hauls.

Cursory examination of the hauls revealed similar species composition and vertical structure. Smaller copepods were evident in the upper 100m associated with the chlorophyll maxima; species such as *Oncaea*, *Acartia* and *Nannocalanus minor* These were replaced from 100-300m by a broad band of omnivorous/carnivorous species (Euphausiids, Chaetognaths and larger copepods) and from 300-600m the fish *Cyclothone braueri* was abundant together with Decapods and the copepods *Pleuromamma robusta* *P. abdominalis* and *P. xiphias* and species of the *Euchaetidae*.

The species which we were particularly interested in Calanus helgolandicus was represented in the hauls examined by small populations of Stage V copepodites and adults (male and female). Primarily these populations were observed below 350m and it was evident from their full oil sacs (their wax ester energy store) that the species had been actively feeding for prolonged periods. It is hoped that examination of the samples from the fine mesh (56ym) system will reveal the distribution of the younger copepodites and their nauplii stages although some difficulty is anticapated in this work because of the large population of Calanus gracilis which co-occur with C. helgolandicus.

Gear problems - a combination of poor paper transport in the recorder control unit of the fine-mesh system and gauze advance in the cod-end of LHPR 8 resulted in the samples being rejected for this haul. An electrical failure in coarse-mesh recorder control unit in the early part of LHPR 9 resulted in no gauze advance and therefore no coarse mesh samples being taken. In the other 16 hauls all functions of gauze advance, and records of water flow, temperature and depth were good.

PHYTOPLANKTON, CHLOROPHYLL AND NUTRIENTS (K. Jones)

Vertical profiles of dissolved nitrate, phytoplankton chlorophyll-a and pheopigments in the upper 300m of the water column were determined from water bottle samples at a total of 14 stations in East and West Atlantic water and at the boundary of the two (See Table 1). At selected stations water samples were preserved for phytoplankton identification and enumeration to identify the dominant organisms constituting the chlorophyll maxima and also to determine whether community differences between East and West Atlantic water existed.

In the absence of an autoanalyser, dissolved nitrate was determined manually. A system using a multichannel peristaltic pump and reduction columns containing cadmium wire allowed up to eight samples to be processed simultaneously. Chlorophyll-a and pheopigments were measured fluorometrically after extraction into acetone from particulate material retained on glass fibre filters (GF/C grade). The possibility of underestimation of chlorophyll due to loss of small size fraction particles through filters of this grade was investigated comparing results obtained using GF/C filters with those obtained with the finer GF/F filters. No significant losses were detected in the samples investigated.

Chlorophyll measurements on samples taken at discreet depths together with underwater fluorescence measurements at those depths were used to calibrate the underwater fluorometer used with the CTD and Batfish.

At all stations except two, nitrate concentrations in the upper 40m of the water column were less than 0.4μg-atℓ^{-1}. Exceptions to this were found at St. 10360 where concentrations reached 0.9-1.0μg-atℓ^{-1} and St. 10362, at the boundary where they were 1.0-1.8μg-atℓ^{-1}. At the latter station upwelling may have caused surface enrichment.

Deep (300m) nitrate concentrations were generally higher in Eastern Atlantic Water (10-13μg-atℓ^{-1}) than in Western Atlantic water (7-10μg-atℓ^{-1}). For water of a given temperature below the euphotic zone, however, western water was richer in nitrate than eastern water. Thus nitrate/temperature diagrams could be used to distinguish the two water types.

Chlorophyll measurements on discrete samples in general confirmed fluorescence profiles recorded using the underwater fluorometer. Sub-surface chlorophyll maxima occurred at all stations at variable depths between 40 and 120m. Peaks of greatest magnitude occurred in the boundary region where highest chlorophyll concentrations in discrete samples reached 0.56μgℓ^{-1} at 45m at St. 10376. Short term variations in the depth of the chlorophyll peak were evident from underwater fluorescence measurements and may have caused under estimation of the size of the chlorophyll maxima in profiles determined from discrete samples.

Pheopigment peaks occurred at or slightly below the chlorophyll maxima. At some stations pheopigments constituted as much as two thirds of the total pigment present indicating high detrital levels.

Chemical, physical and physiological measurements made during this cruise will be used to predict water column chlorophyll distributions which can be compared with measured distributions of chlorophyll in East and West Atlantic water.

Table 1. Stations sampled for chlorophyll, nitrate and phytoplankton

Station	Date	Depth range	DN	Chlor	PC/PN	Phyt.
10357	10/5	0 - 300	X	X		
10358	11/5	0 - 250	X	X		X
10359	12/5	0 - 300	X	X		X
10360	14/5	0 - 300	X	X		X
10362	15/5	0 - 300	X	X		X
10364	16/5	0 - 300	X	X	X	X
10365	16/5	0 -300	X	X		X
10368	20/5	0 - 300	X	X		X
10370	20/5	0 - 300	X	X		X
10371	22/5	0 - 300	X	X		X
10373	24/5	0 - 300	X	X	X	
10374	24/5	0 - 300	X	X	X	
10376	25/5	0 - 300	X	X	X	

BATFISH RESULTS (M.J.R. Fasham)

(a) Relationship between chlorophyll biomass and the front.

Throughout the whole area the Chlorophyll a distribution showed a sub-surface maximum at around 80m with surface values generally less than 0.1 mg m^{-3} Chl a The chlorophyll levels in the sub-surface maximum were consistently lower in WAW (0.1 - 0.2 mg m^{-3}) than in EAW (0.4 - 0.5 mg m^{-3}). Furthermore the chlorophyll biomass in the frontal zone was even higher with values up to 0.7 mg m^{-3} being observed. On all the crossings of the front the salinity data showed that interleaving of the two water masses was occurring at the front and on a couple of sections there was some evidence of overturning. If this is a regular occurrence it would bring fresh nutrients up from below the pycnocline which would explain the higher biomass in the front.

(b) Cruiser Bank results

On the first west-east traverse of the bank the batfish results showed that the Bank produced short wavelength (3-4 n.m.) features in the σ_t surfaces. These waves were also observed in the other variables but the chlorophyll concentration in the sub-surface chlorophyll maximum remained virtually constant throughout the traverse ($\sim$0.2 mg m^{-3}). On the south-north traverse the picture was very different. South of the Bank the σ_t surfaces showed large excursions of up to 100m suggesting some sort of wake effect. Over the southern edge of the Bank there was a deep mixed layer and the sub-surface chlorophyll maximum virtually disappeared. In constrast the surface chlorophyll values were higher in this area of apparent increased vertical mixing than on either side. On the north edge of the bank this deep mixed layer was not found but the chlorophyll concentrations in the sub-surface maximum showed an increase to 0.4 mg m^{-3}.

It was decided to bring in the batfish and return to the zone of increased mixing to study it in more detail and to obtain a nutrient profile. Unfortunately, after carrying out some net trials, it was some sixteen hours before we returned to this position and there was now no sign of the area of increased surface chlorophyll concentration either at this position or further south.

PHYSIOLOGICAL EXPERIMENTS (P. Herring)

A series of experiments on the physiology of the luminescence of a variety of mesopelagic animals were carried out. These experiements are described more fully in the Cruise 121 cruise report.

Table 2. Summary of XBT data

XBT No.	DATE DAY NO.	TIME	LAT °N	LONG °W	DEPTH OF ISOTHERMS (m) 15°C	16°C
1	10/v-130	2002	34 48	28 39	177	147
2		2202	34 31	28 38	162	141
3	11/v 131	0008	34 16	28 48	127	105
4		0200	34 5	29 1	141	110
5		0406	33 53	29 16	168	128
6		0600	33 41	29 30	141	118
7		0800	33 27	29 45	200	171
8		1000	33 8	29 44	261	184
9		1200	32 48	29 45	371	300
10		1208	32 46	29 45	324	269
1		1500	32 33	29 45	326	261
12		1700	32 13	29 45	336	290
13		1900	31 53	29 45	343	300
14		2100	31 34	29 45	286	212
15		2300	31 14	29 45	367	310
16	12/v-132	0022	31 0	29 44	348	289
17	20/v-140	1939	31 35	27 54	341	241
18		2100	31 40	28 7	286	241
19		2305	31 47	28 29	279	229
20	21/v-141	0100	31 54	28 49	314	250
21		0302	32 2	29 9	356	274
22		0501	32 11	29 31	317	261
23		0700	32 19	29 52	354	288
24		1139	32 31	30 17	307	254
25		1302	32 37	30 32	332	271
26		1502	32 45	30 54	321	250
27		1710	32 51	31 17	307	243
28		1903	32 55	31 34	302	246
29		2100	33 1	31 55	297	210
30		2303	33 9	32 17	238	186
31	22/v-142	0056	33 16	32 39	172	165
32		0258	33 25	33 1	160	116
33		0503	33 30	33 23	211	126
34		0554	33 32	33 31	256	169
35		0633	33 35	33 38	289	224
36	25/v-145	2359	33 39	33 59	384	316
37	26/v-146	0054	33 34	33 51	356	281
38		0128	33 34	33 44	374	297
39		0159	33 34	33 38	348	257
40		0229	33 34	33 32	345	263
41		0259	33 35	33 26	282	220
42		0329	33 35	33 20	277	197
43		0400	33 35	33 15	238	167

ABBREVIATIONS USED IN STATION LIST

CTD	Neil Brown conductivity - temperature - depth probe
LHS2	IMER Longhurst-Hardy plankton net
LMD	Plessey underwater irradiance meter
MS	Rosette multi-sampler
RMT1	$1m^2$ rectangular midwater net
RMT8	$8m^2$ rectangular midwater net
RMT1M-n	nth net of $1m^2$ rectangular midwater combination net
RMT8M-n	nth net of $8m^2$ rectangular midwater combination net
WB30	30ℓ Niskin bottle

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10357 # 1	10/ 5	35 0.2N 35 0.1N	28 29.9W 28 29.5W	CTD MS UFL LMD	0- 300	0951-1111	WB @ STANDARD DEPTHS	3513
10357 # 2	10/ 5	35 0.8N 34 59.9N	28 29.2W 28 31.7W	RMT 1 RMT 8	610- 910	1400-1500 DAY	MATERIALS HAUL FLOW DIST. 3.06 KM.	
10357 # 3	10/ 5	34 59.6N 34 59.7N	28 33.0W 28 33.3W	WB 30	75- 75	1600-1629	2 CASTS	
10357 # 4	10/ 5	34 59.4N 34 57.9N	28 34.0W 28 38.4W	LHS2	0- 574	1652-1807 DAY	COARSE NET 43S, FINE NET 41S	3610
10358 # 1	11/ 5	32 44.4N 32 44.4N	29 46.1W 29 45.7W	CTD MS UFL LMD	0- 300	1231-1308	WB @ STANDARD DEPTHS	3231
10358 # 2	11/ 5	32 44.5N 32 44.5N	29 45.6W 29 45.5W	WB 30	100- 100	1319-1325		3229
10358 # 3	11/ 5	32 44.5N 32 44.5N	29 45.5W 29 45.4W	WB 30	100- 100	1334-1346		3229
10359 # 1	12/ 5	31 0.2N 31 2.5N	29 44.2W 29 47.4W	LHS2	0- 606	0040-0155 NIGHT	COARSE NET 46S, FINE NET 44S	4302
10359 # 2	12/ 5	31 4.2N 31 7.3N	29 47.8W 29 48.7W	RMT 1 RMT 8	50- 760	0251-0414 NIGHT	MATERIALS HAUL FLOW DIST. 5.65 KM.	
10359 # 3	12/ 5	31 8.5N 31 8.5N	29 48.9W 29 48.6W	CTD MS UFL LMD	0- 300	0540-0620	WB @ STANDARD DEPTHS	4299

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10359	12/ 5	31 8.4N	29 48.4W	WB 30	30- 90	0652-0718	3 CASTS TO 30,75 & 90M.	4297
# 4		31 8.5N	29 48.3W					
10360	14/ 5	33 0 1N	34 25.5W	WB 30	30- 150	0933-1015	3 CASTS TO 30,110 & 150M.	3841
# 1		33 0.2N	34 25.3W					
10360	14/ 5	33 0.3N	34 24.8W	LHS2	0- 574	1038-1203	COARSE NET 59S, FINE NET 53S	3841
# 2		33 2 5N	34 19.8W			DAY		
10360	14/ 5	33 1.7N	34 21.5W	RMT 1	895-1010	1303-1503	MATERIALS HAUL	3866
# 3		32 59.3N	34 26.0W	RMT 8		DAY	FLOW DIST. 6.61 KM.	
10360	14/ 5	32 58.7N	34 27.4W	CTD	0- 300	1600-1640	WB @ STANDARD DEPTHS	3866
# 4		32 58.5N	34 27.7W	MS				
				UFL				
				LMD				
10360	14/ 5	32 58.4N	34 28.3W	CTD	0- 300	1729-1754	WB @ STANDARD DEPTHS	3865
# 5		32 58.3N	34 28.6W	MS				
				UFL				
				LMD				
10360	14/ 5	33 3.7N	34 24.4W	RMT 1	898-1000	2026-2126	MATERIALS HAUL	
# 6		33 5.2N	34 22.2W	RMT 8		DUSK	FLOW DIST. 3.15 KM.	
10361	15/ 5	33 23.9N	33 47.1W	RMT 1	100- 300	0201-0301	MATERIALS HAUL	
# 1		33 25.4N	33 45.5W	RMT 8		NIGHT	FLOW DIST. 3.73 KM.	
10361	15/ 5	33 26.7N	33 43.8W	RMT 1	890-1000	0409-0609	MATERIALS HAUL	
# 2		33 29.6N	33 40.2W	RMT 8		NIGHT	FLOW DIST. 6.29 KM.	
10362	15/ 5	33 34.9N	33 32.8W	CTD	0- 300	0819-0858	WB @ STANDARD DEPTHS	3346
# 1		33 34.4N	33 32.5W	MS				
				UFL				
				LMD				

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10362 # 2	15/ 5	33 34.0N 33 33.7N	33 32.4W 33 32.1W	CTD MS UFL LMD	0- 90	0926-0953	WB @ STANDARD DEPTHS	3332
10362 # 3	15/ 5	33 33.6N 33 33.4N	33 32.1W 33 31.9W	WB 30	60- 60	0958-1016	2 CASTS TO 60M.	3332
10362 # 4	15/ 5	33 33.5N 33 37.0N	33 31.4W 33 23.1W	LHS2	0- 640	1037-1253 DAY	COARSE NET 49S, FINE NET 43S	3332
10362 # 5	15/ 5	33 35.3N 33 34.4N	33 32.0W 33 32.0W	CTD WB 30 UFL LMD	0- 100	1416-1530	3 CASTS TO 49,56 & 57M. - CTD YO-YO	3351
10362 # 6	15/ 5	33 33.1N 33 29.4N	33 31.1W 33 29.2W	RMT 1 RMT 8	5-1000	1559-1711 DAY	OBLIQUE HAUL FOR IMER FLOW DIST. 3.99 KM.	
10362 # 7	15/ 5	33 27.4N 33 35.7N	33 28.0W 33 31.2W	RMT 1 RMT 8	1010-1500	1911-2311	MATERIALS HAUL FLOW DIST. 13.39 KM.	
10363 # 1	16/ 5	33 46.2N 33 48.9N	33 10.4W 33 4.4W	RMT 1 RMT 8	500- 700	0239-0509 NIGHT	MATERIALS HAUL FLOW DIST. 9.75 KM.	
10364 # 1	16/ 5	34 0.2N 34 0.0N	32 50.0W 32 49.9W	CTD MS UFL LMD	0- 300	0809-0859	WB @ STANDARD DEPTHS	3561
10364 # 2	16/ 5	33 59.8N 33 59.7N	32 49.8W 32 49.8W	CTD MS UFL LMD	0- 300	0935-1000	WB @ STANDARD DEPTHS	3561
10364 # 3	16/ 5	33 59.7N 33 59.7N	32 49.8W 32 50.0W	CTD WB 30 UFL LMD	0- 100	1010-1054	2 CASTS TO 61 & 59M. - CTD YO-YO	3561

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10364 # 4	16/ 5	33 59.9N 34 3.7N	32 50.3W 32 56.2W	LHS2	0- 616	1110-1300 DAY	COARSE NET 41S, FINE NET 39S	
10364 # 5	16/ 5	34 4.1N 34 6.0N	32 56.8W 32 59.7W	RMT 1 RMT 8	5-1000	1320-1427 DAY	OBLIQUE (EAW) FLOW DIST. 3.16 KM.	
10365 # 1	16/ 5	33 32.3N 33 32.2N	33 32.5W 33 32.4W	XX	0- 150	2043-2053 DUSK	FINE MESH NET - VERTICAL HAUL	3330
10365 # 2	16/ 5	33 32.1N 33 31.5N	33 32.3W 33 32.1W	CTD WB 30 UFL LMD	0- 70	2104-2151	3 CASTS TO 43M. - CTD YO-YO	3330
10365 # 3	16/ 5	33 32.1N 33 30.0N	33 32.3W 33 30.9W	CTD MS UFL LMD	0- 300	2104-2300	WB @ STANDARD DEPTHS	3300
10365 # 4	16/ 5 17/ 5	33 29.0N 33 22.9N	33 30.0W 33 24.5W	RMT 1 RMT 8	5-1010	2324-0123 NIGHT	OBLIQUE (FRONT) FLOW DIST. 8.40 KM.	
10365 # 5	17/ 5	33 20.2N 33 23.5N	33 21.9W 33 24.7W	LHS2	0- 670	0237-0442 NIGHT	COARSE NET 48S, FINE NET 41S	
10366 # 1	17/ 5	33 0.3N 33 0.2N	34 24.8W 34 24.8W	XX	0- 150	1108-1115 DAY	FINE MESH NET - VERTICAL HAUL	3635
10366 # 2	17/ 5	33 0.2N 33 0.3N	34 25.4W 34 30.9W	RMT 1 RMT 8	5-1000	1136-1327 DAY	OBLIQUE (WAW) FLOW DIST. 6.68 KM.	
10367 # 1	20/ 5	32 15.0N 32 12.4N	27 59.1W 27 58.2W	RMT 1 RMT 8	655- 895	0311-0411 NIGHT	MATERIALS HAUL FLOW DIST. 4.13 KM.	1865
10367 # 2	20/ 5	32 7.3N 32 3.8N	27 58.5W 28 0.6W	RMT 1 RMT 8	150- 350	0612-0744 DAWN	ALTIMETER TRIAL FLOW DIST. 5.28 KM.	

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10368 # 1	20/ 5	32 7.1N 32 7.2N	27 58.0W 27 57.8W	CTD MS UFL LMD	0- 300	0926-0955	WB @ STANDARD DEPTHS	1083
10368 # 2	20/ 5	32 7.2N 32 7.2N	27 58.0W 27 57.9W	CTD WB 30 UFL	110- 110	0928-1009	3 CASTS TO 110M.	1101
10369 # 1	20/ 5	31 57.1N 31 57.0N	27 58.5W 27 58.5W	CTD UFL	0- 260	1201-1222		272
10370 # 1	20/ 5	31 51.4N 31 51.4N	28 0.1W 27 59.7W	CTD MS UFL LMD	0- 300	1340-1413	WB @ STANDARD DEPTHS	370
10370 # 2	20/ 5	31 52.0N 31 54.4N	27 59.5W 27 59.3W	RMT 1 RMT 8	230- 270	1438-1539 DAY	ALTIMETER TRIAL - RMT8 CATCH MINUTE FLOW DIST. 4.30 KM.	
10371 # 1	22/ 5	33 34.7N 33 33.7N	33 38.8W 33 38.5W	WB 30	79- 79	0720-0800	3 CASTS TO CA. 79M.	3234
10371 # 2	22/ 5	33 33.6N 33 33.0N	33 38.5W 33 38.1W	CTD MS UFL LMD	0- 300	0804-0832	WB @ STANDARD DEPTHS	3234
10371 # 3	22/ 5	33 31.8N 33 31.7N	33 37.4W 33 37.4W	XX	0- 125	0951-0955 DAY	FINE MESH NET - VERTICAL HAUL	3276
10371 # 4	22/ 5	33 30.8N 33 27.3N	33 35.5W 33 28.0W	RMT 1 RMT 8	40- 780	1050-1345 DAY	MATERIALS HAUL FLOW DIST. 12.30 KM.	
10372 # 1	23/ 5	34 5.5N 34 5.9N	34 37.6W 34 36.6W	WB 30	67- 67	1239-1312	3 CASTS TO CA. 67M.	3315

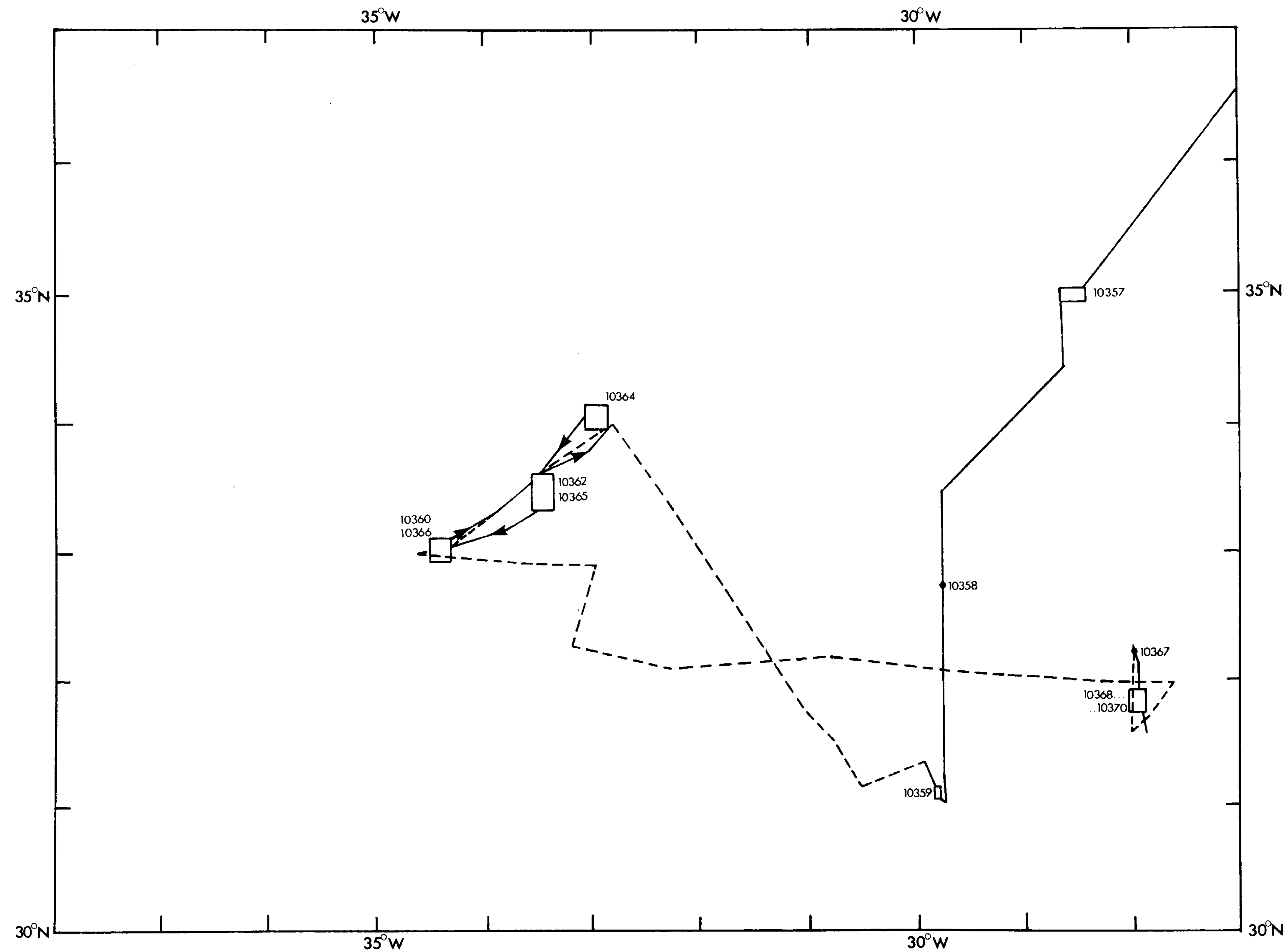
STN.	DATE 1981	POSITION LAT LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10373 # 1	24/ 5	35 26.9N 35 31.7W 35 24.7N 35 42.9W	LHS2	0- 596	0112-0330 NIGHT	COARSE NET 47S, FINE NET 41S	2200
10373 # 2	24/ 5	35 24.4N 35 42.2W 35 22.7N 35 35.3W	RMT 1 RMT 8	5-1020	0405-0609 NIGHT	OBLIQUE HAUL FOR INER FLOW DIST. 7.66 KM.	
10373 # 3	24/ 5	35 21.7N 35 32.9W 35 20.5N 35 27.9W	RMT 1 RMT 8	5- 495	0712-0858 DAWN	MATERIALS HAUL FLOW DIST. 7.16 KM.	
10373 # 4	24/ 5	35 21.0N 35 28.8W 35 20.6N 35 28.5W	CTD WB 30 UFL LMD	0- 100	1000-1040	3 CASTS TO CA.86M.	1937
10373 # 5	24/ 5	35 20.6N 35 28.5W 35 20.3N 35 28.4W	CTD MS UFL LMD	0- 300	1041-1109	WB @ STANDARD DEPTHS	1937
10373 # 6	24/ 5	35 19.3N 35 28.1W 35 18.7N 35 27.8W	CTD UFL FL LMD	0- 100	1235-1322	PUMP PROFILE - PARTICLE COUNTING	1988
10374 # 1	24/ 5	35 16.8N 35 46.2W 35 16.2N 35 46.0W	CTD MS UFL LMD	0- 300	1531-1619	WB @ STANDARD DEPTHS	3236
10374 # 2	24/ 5	35 15.8N 35 46.4W 35 14.2N 35 55.0W	LHS2	0- 638	1646-1850 DAY	COARSE NET 48S, FINE NET NO SAMPLES	3195
10374 # 3	24/ 5	35 13.8N 35 56.6W 35 12.6N 36 3.0W	RMT 1 RMT 8	5-1000	1930-2117 DUSK	OBLIQUE FLOW DIST. 6.59 KM.	
10375 # 1	25/ 5	34 30.4N 35 26.1W 34 25.7N 35 31.3W	CTD WB 30 UFL LMD	0- 100	0941-1028	3 CASTS TO 60-65M.	2459

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10375	25/ 5	34 25.7N	35 31.3W	CTD	0- 300	1029-1053		2501
# 2		34 25.5N	35 31.7W	UFL				
				LMD				
10375	25/ 5	34 28.4N	35 23.7W	RMT 1	600- 800	1241-1341	MATERIALS HAUL	
# 3		34 26.7N	35 22.9W	RMT 8		DAY	FLOW DIST. 4.00 KM.	
10376	26/ 5	33 33.5N	33 27.8W	CTD	0- 300	0655-0735	WB @ STANDARD DEPTHS	3138
# 1		33 33.1N	33 27.6W	MS				
				UFL				
				LMD				
10376	26/ 5	33 33.1N	33 27.6W	CTD	0- 50	0740-0814	3 CASTS TO 44-47M.	3138
# 2		33 32.7N	33 27.4W	WB 30				
				UFL				
				LMD				
10376	26/ 5	33 29.8N	33 27.4W	RMT1M-1	5- 40	1156-1256	ABOVE CHLOROPHYLL MAXIMUM	
# 3		33 26.7N	33 26.2W	RMT8M-1		DAY	FLOW DIST. 3.93 KM.	
10376	26/ 5	33 26.8N	33 26.3W	RMT1M-2	40- 60	1256-1456	IN CHLOROPHYLL MAXIMUM (?)	
# 4		33 20.5N	33 23.9W	RMT8M-2		DAY	FLOW DIST. 8.00 KM.	
10376	26/ 5	33 20.6N	33 23.9W	RMT1M-3	60- 200	1456-1656	BELOW CHLOROPHYLL MAXIMUM	
# 5		33 14.5N	33 22.1W	RMT8M-3		DAY	FLOW DIST. 7.55 KM.	
10376	26/ 5	33 11.3N	33 22.7W	CTD	0- 90	1844-1928	4 CASTS TO 86-8M.	3624
# 6		33 10.6N	33 22.5W	WB 30				
				UFL				
				LMD				
10376	26/ 5	33 8.8N	33 22.8W	RMT1M-1	800- 900	2216-2316		
# 7		33 10.6N	33 24.6W	RMT8M-1		NIGHT	FLOW DIST. 2.65 KM.	
10376	26/ 5	33 10.5N	33 24.5W	RMT1M-2	900-1000	2316-0016		
# 8	27/ 5	33 12.2N	33 26.2W	RMT8M-2		NIGHT	FLOW DIST. 3.93 KM.	

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10376	27/ 5	33 12.1N	33 26.2W	RMT1M-3	1000-1100	0016-0116		
# 9		33 14.3N	33 27.7W	RMT8M-3		NIGHT	FLOW DIST. 3.87 KM.	
10376	27/ 5	33 16.9N	33 29.7W	RMT1M-1	500- 602	0303-0403		
# 10		33 18.7N	33 30.6W	RMT8M-1		NIGHT	FLOW DIST. 3.06 KM.	
10376	27/ 5	33 18.7N	33 30.6W	RMT1M-2	602- 705	0403-0503		
# 11		33 20.6N	33 31.8W	RMT8M-2		NIGHT	FLOW DIST. 3.69 KM.	
10376	27/ 5	33 20.6N	33 31.8W	RMT1M-3	705- 807	0503-0603		
# 12		33 22 3N	33 33.3W	RMT8M-3		NIGHT	FLOW DIST. 3.53 KM.	
10376	27/ 5	33 20.1N	33 32.4W	RMT1M-1	500- 605	0808-0938		
# 13		33 16.4N	33 30.6W	RMT8M-1		DAY	FLOW DIST. 5.53 KM.	
10376	27/ 5	33 16.5N	33 30.6W	RMT1M-2	605- 700	0938-1109		
# 14		33 12.9N	33 28.5W	RMT8M-2		DAY	FLOW DIST. 5.75 KM.	
10376	27/ 5	33 12.9N	33 28.5W	RMT1M-3	690- 798	1109-1239		
# 15		33 9.0N	33 26.4W	RMT8M-3		DAY	FLOW DIST. 6.59 KM.	
10376	27/ 5	33 7.5N	33 25.2W	RMT1M-1	200- 300	1348-1518		
# 16		33 9.7N	33 24.4W	RMT8M-1		DAY	FLOW DIST. 5 53 KM.	
10376	27/ 5	33 9.7N	33 24.4W	RMT1M-2	300- 400	1518-1648		
# 17		33 12.2N	33 23.5W	RMT8M-2		DAY	FLOW DIST. 6.00 KM.	
10376	27/ 5	33 12.2N	33 23.5W	RMT1M-3	400- 500	1648-1818		
# 18		33 14.7N	33 22.6W	RMT8M-3		DAY	FLOW DIST. 5.33 KM.	
10376	27/ 5	33 14.5N	33 22.6W	CTD	0- 300	1907-1944	1 CAST TO 61M.	3614
# 19		33 13.7N	33 22.5W	WB 30				
				UFL				
				LMD				
10376	27/ 5	33 13.2N	33 22.4W	CTD	0- 300	2008-2116	ABORTIVE THERMISTOR CALIBRATION	3614
# 20		33 11.9N	33 22.2W					

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10376	28/ 5	33 2.3N	33 21.8W	RMT1M-1	200- 300	0036-0136		
# 21		32 58.9N	33 21.6W	RMT8M-1		NIGHT	FLOW DIST. 4.15 KM.	
10376	28/ 5	32 59.0N	33 21.6W	RMT1M-2	300- 400	0136-0236		
# 22		32 55.9N	33 21.4W	RMT8M-2		NIGHT	FLOW DIST. 4.17 KM.	
10376	28/ 5	32 56.0N	33 21.4W	RMT1M-3	400- 500	0236-0336		
# 23		32 53.1N	33 20.9W	RMT8M-3		NIGHT	FLOW DIST. 3.66 KM.	
10376	28/ 5	32 51.2N	33 20.6W	CTD	0- 300	0440-0540	THERMISTOR CALIBRATION	
# 24		32 50.1N	33 20.3W					
10376	28/ 5	32 51.6N	33 17.3W	RMT1M-1	1095-1205	0818-0948		
# 25		32 54.9N	33 15.5W	RMT8M-1		DAY	FLOW DIST. 4.91 KM.	
10376	28/ 5	32 54.8N	33 15.6W	RMT1M-2	1205-1305	0948-1118		
# 26		32 58.1N	33 14.6W	RMT8M-2		DAY	FLOW DIST. 5.51 KM.	
10376	28/ 5	32 58.0N	33 14.6W	RMT1M-3	1295-1400	1118-1248		
# 27		33 1.3N	33 13.9W	RMT8M-3		DAY	FLOW DIST. 5.37 KM.	
10376	28/ 5	33 4.0N	33 15.5W	RMT1M-1	795- 900	1503-1633		
# 28		33 6.3N	33 18.6W	RMT8M-1		DAY	FLOW DIST. 5.57 KM.	
10376	28/ 5	33 6.3N	33 18.6W	RMT1M-2	900-1005	1633-1803		
# 29		33 8.2N	33 21.5W	RMT8M-2		DAY	FLOW DIST. 5.21 KM.	
10376	28/ 5	33 8.2N	33 21.5W	RMT1M-3	1005-1100	1803-1933		
# 30		33 9.7N	33 24.1W	RMT8M-3		DAY	FLOW DIST. 5.07 KM.	
10376	28/ 5	33 8.0N	33 25.5W	RMT1M-1	5- 25	2217-2317	ABOVE CHLOROPHYLL MAXIMUM	
# 31		33 8.6N	33 27.1W	RMT8M-1		NIGHT	FLOW DIST. 3.46 KM.	
10376	28/ 5	33 8.6N	33 27.1W	RMT1M-2	25- 130	2317-0017	IN CHLOROPHYLL MAXIMUM (?)	
# 32	29/ 5	33 9.2N	33 28.7W	RMT8M-2		NIGHT	FLOW DIST. 3.48 KM.	

STN.	DATE 1981	POSITION LAT	LONG	GEAR	DEPTH (M)	FISHING TIME GMT	REMARKS	MEAN SOUND M.
10376	29/ 5	33 9.2N	33 28.7W	RMT1M-3	130- 205	0017-0117	BELOW CHLOROPHYLL MAXIMUM	
# 33		33 10.2N	33 30.2W	RMT8M-3		NIGHT	FLOW DIST. 3.64 KM.	
10376	29/ 5	33 12.1N	33 32.9W	RMT1M-1	1100-1200	0306-0436		
# 34		33 14 2N	33 36.1W	RMT8M-1		NIGHT	FLOW DIST. 4.19 KM.	
10376	29/ 5	33 14.1N	33 36.0W	RMT1M-2	1200-1300	0436-0606		
# 35		33 16.1N	33 39.0W	RMT8M-2		NIGHT	FLOW DIST. 5.42 KM.	
10376	29/ 5	33 16.4N	33 40.1W	CTD	0-2000	0718-0912		3557
# 36		33 14.6N	33 40.4W	MS				
10376	29/ 5	33 16.2N	33 39.7W	RMT1M-1	1400-1500	1044-1230		
# 37		33 19.3N	33 36.9W	RMT8M-1		DAY	FLOW DIST. 5.63 KM.	
10376	29/ 5	33 19.2N	33 37.0W	RMT1M-2	1500-1600	1230-1415		
# 38		33 22.3N	33 34.0W	RMT8M-2		DAY	FLOW DIST. 6.73 KM.	
10376	29/ 5	33 22.3N	33 34.0W	RMT1M-3	1600-1700	1415-1600		
# 39		33 25.3N	33 31.4W	RMT8M-3		DAY	FLOW DIST. 6.69 KM.	
10376	29/ 5	33 26.4N	33 29.3W	LHS2	0- 996	1740-2015	COARSE NET NO SAMPLES, FINE NET 50S	
# 40		33 28.9N	33 20.9W			DAY		
10376	29/ 5	33 23.6N	33 16.3W	RMT1M-1	1300-1400	2304-0024		
# 41	30/ 5	33 20.6N	33 14.5W	RMT8M-1		NIGHT	FLOW DIST. 4.84 KM.	
10376	30/ 5	33 20.7N	33 14.6W	RMT1M-2	1398-1500	0024-0144		
# 42		33 17.9N	33 12.8W	RMT8M-2		NIGHT	FLOW DIST. 5.19 KM.	
10376	30/ 5	33 18.0N	33 12.8W	RMT1M-3	1498-1600	0144-0300		
# 43		33 15.4N	33 11.3W	RMT8M-3		NIGHT	FLOW DIST. 4.38 KM.	


35°W
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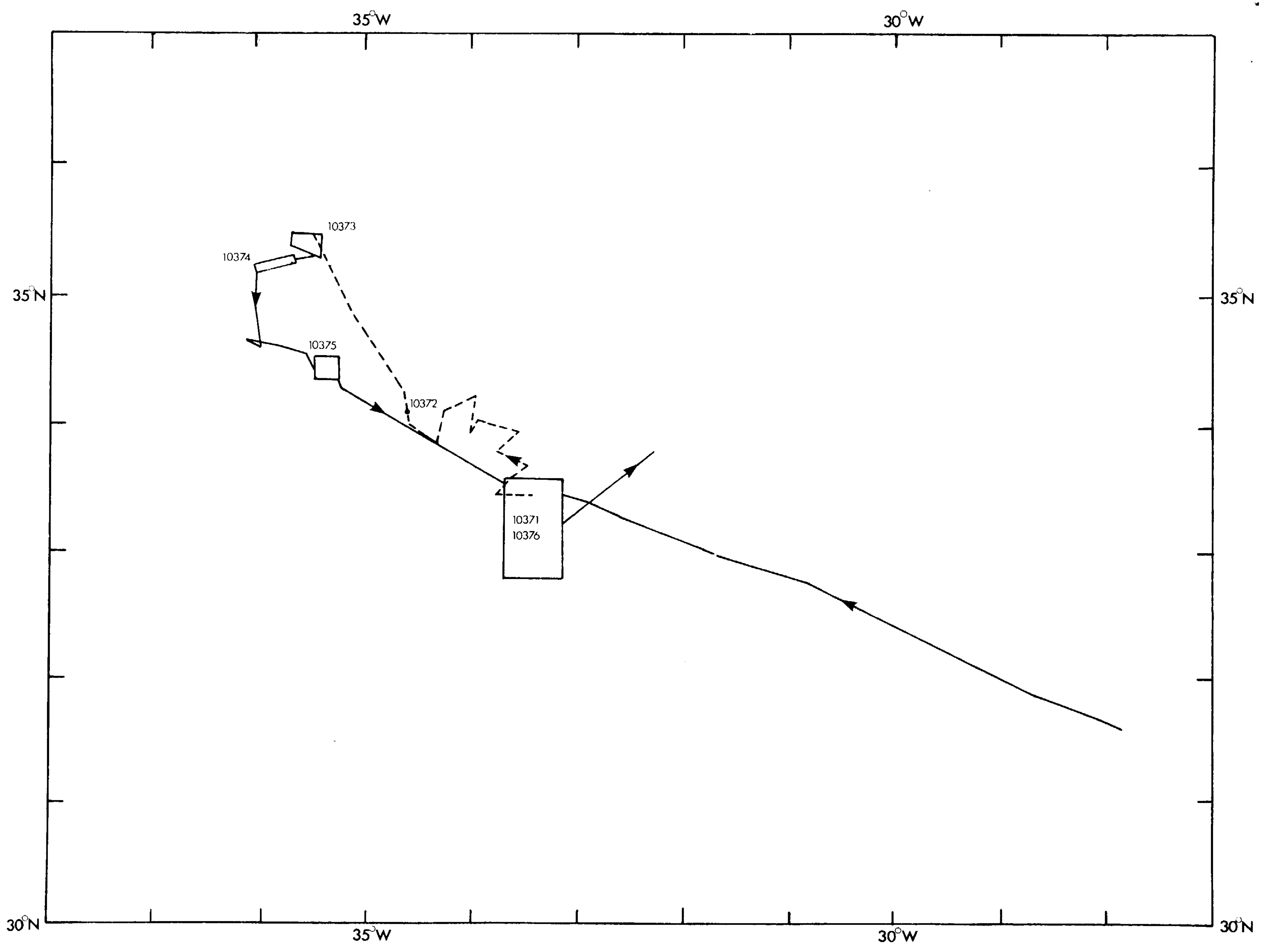
30°W
30°N


35°W
30°W
35°N
35°N
10373
10374
10375
10372
10371
10376
30°N
35°W
30°W
30°N