I.O.S.

RRS FREDERICK RUSSELL

CRUISE 6/84

7 – 13 APRIL 1984

BENTHIC BIOLOGY OF THE PORCUPINE SEABIGHT

CRUISE REPORT NO. 162

1984

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

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INSTITUTE OF OCEANOGRAPHIC SCIENCES

WORMLEY

RRS FREDERICK RUSSELL

Cruise 6/84

(IOS Cruise 519)

7 - 13 April 1984

Benthic biology of the Porcupine Seabight

Principal Scientist

M.H. Thurston

CRUISE REPORT NO. 162

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ITINERARY

Depart Falmouth 0700GMT 7 April 1984

Arrive Falmouth 1915GMT 13 April 1984

SCIENTIFIC PERSONNEL

D.S.M. Billett	IOS Wormley	
A.J. Gooday	"	
R.S. Lampitt	"	
G.R.J. Phillips	"	
R.C.T. Raine	University College, Galway	
A.L. Rice	IOS Wormley	
M.H. Thurston	"	(Principal Scientist)
J. Watson	SMBA Dunstaffnage	

SHIP'S PERSONNEL

P.H.P Maw	Master
P.J. MacDermott	Chief Officer
T.J. Morse	Second Officer
T.A. Rees	Chief Engineer
N.A. Wilson-Deroze	Second Engineer
A. Greenhorn	Third Engineer
G.A. Pook	Bosun
G.H. Gerome	Seaman
S.J. Maughan	Seaman
G.H. Owen	Seaman
R.P. Sullivan	Seaman
C. Trim	Seaman
R.W. Hitt	Cook/Steward
R.K. Tucker	Steward
N.H. Heartfield	Steward

OBJECTIVES

1. To obtain values for the sediment community oxygen demand in cores obtained by, and incubated in, the SMBA multiple corer.

2. To obtain a series of SMBA multiple core samples at 500m intervals from 500m to 4500m for meiofaunal abundance and diversity studies.

3. To obtain a series of SMBA multiple core samples at 1300m for further studies of the vertical distribution of foraminiferans and komoki.

4. To obtain SMBA multicore samples at 1300m for diversity and small scale distribution of harpacticoid copepods.

5. To obtain a series of SMBA multiple core samples for further study of horizontal distributions of foraminiferans, xenophyophores and komoki.

6. To deploy a string of sediment traps designed to provide data on vertical fluxes of organic material into the deep sea.

7. To grapple for Bathysnap deployed on Cruise 517 (Challenger 6/83), and which subsequently failed to release.

8. To deploy Bathysnaps to record arrival on the bottom of phytodetritus following the spring phytoplankton bloom.

9. To perform photosledge hauls on the *Pheronema* ground at 1300m.

10. To take epibenthic sledge hauls at 1300m for *Pheronema* and *Dorhynchus* and on the upper slope for *Munida*.

11. To monitor phytoplankton abundance using a continuously running fluorometer.

12. To obtain echosounder records for future incorporation onto bathymetric charts.

NARRATIVE

Scientific personnel joined RRV Frederick Russell and completed most gear stowage on 6 April. The ship departed Falmouth at 0700/07 (all times GMT). Light airs and calm sea were encountered during passage towards the position of the proposed first station close to 51°N 13°W. This position was reached at 1150/08. Releases were wire-tested to 1800m prior to commencing station work. The SMBA multiple corer was deployed twice to provide water and fauna samples. The first respirometer dip sampled the bottom at 1815 and was then hauled off 100m and left to incubate for 12 hours. Minor delays had occurred during the afternoon: winch and pinger problems having to be overcome.

The multiple corer was brought inboard at 0643/09, and the ship put on course for the Bathysnap laid on Challenger Cruise 6/83. Problems with the winch control mechanism delayed further work before noon. The grappling rig was prepared but the winch was not servicable until 1330, and then two men were required to operate it - one in the control cabin and the other on the winch itself. The unreleased Bathysnap had been located during the morning, so once the winch was available grappling started immediately. Attempts to retrieve Bathysnap continued without success until 1850, less than an hour before sunset. Once the grappling gear had been recovered and removed from the drum, further attempts were made to rectify the winch fault. These were unsuccessful. As it was possible to work the winch with two men, a multiple corer drop was undertaken at 2153/09. This was followed immediately by a second drop for respirometry studies. Results from the 12 hour drop made on 8 April suggested that a longer incubation time was required, so this deployment was suspended for 18 hours. Further unsuccessful attempts were made to trace the fault in the winch control system. The corer was recovered at 1820/10.

Preparation of the sediment trap array had been completed during the latter part of the multicorer drop, and deployment commenced at 2044/10. At 2131, with four traps connected into the rig, and while transferring tension from hanging-off pennant to the rig itself, the winch jammed in the 'heave' position. Trap 4 ran up to the A-frame block and shattered, and the braided line of the rig parted at the end of the splice away from the eye. The deployed part of the rig was still attached to the hanging-off pennant, so, after shackling on buoyancy, this section was released at 2233/10.

In view of the dangerous state of the winch, Captain Maw decided that it should not be used until repairs could be affected by the manufacturers. Disappointing though it was to terminate the cruise with so little of the programme completed, I was in complete agreement with this decision. The ship was hove to for the night.

Camera and flash problems involved a telephone call to I.O.S. during morning of 11 April. Two shallow hydrocasts for phytoplankton abundance were taken, starting at 1110/11. Camera modifications and tests were completed, and the Mk 5 Bathysnap was rigged during the afternoon. Bathysnap was launched but within minutes, it was realized that the lens cap had not been removed. The instrument was recovered and relaunched, finally reaching the bottom at 1558/11.

All that remained to do was to deploy another Bathysnap in deep water, and so course was set for a position of 49°10'N 14°10'W and a depth of 4500m, arriving at 0320/12. Delays were suffered due to malfunction of the flash unit, but Bathysnap was finally released at 0941/12 and bottomed at 1144/12, whereupon a course was set for Falmouth. Continuing fine weather and light airs resulted in an easy passage. The ship tied up at Falmouth at 1915/13.

Continuing problems with the winch control system, culminating in the incident on the evening of 10th April, resulted in a cruise that was very disappointing from a scientific point of view. Only three of the objectives of the cruise were completed successfully, i.e. the fluorometer work, the echosounding and the deployment of two Bathysnaps. Some respiration data were obtained together with a few multiple corer samples from 2000m, and a shortened sediment trap rig was deployed at the same station. No sledge hauls could be done, nor was it possible to use the multiple corer at any other depths. The attempt to grapple for the Bathysnap near the 2000m station was unsuccessful.

What little work that was completed owed much to the unstintingly given help and cooperation of Captain Maw and his officers and crew. Many thanks to them all.

Michael H. Thurston
14 April 1984

10 kHz ACOUSTIC COMMAND AND MONITORING SYSTEMS

Ship limitations

Acoustically the Russell is extremely noisy. At 10 kHz the noise was positively identified as originating from the ship's propeller; with the ship stationary in flat calm weather the IOS Mk III precision echo sounder plus hull transducer was unuseable at settings below -24 dB with the propeller running (fully feathered), but fully useable at 0 dB with the propeller stopped (declutched); this performance was confirmed using the IOS Mk IV Command System Deck unit operating with (a) a hull transducer single element, (b) a PES single element and ceramic ring mounted in a 'Dolphin' towed from the stern but (c) a 6 dB improvement was obtained towing the Dolphin from a davit at the normal PES fish position forward. Underway the situation improved slightly but settings less than -18 dB were unuseable. I have since been advised that the situation may be slightly improved by varying the ship's engine speed by up to 20%. Deep ocean echo sounding (4000 to 6000 metres) is normally carried out using the -18 and -12 dB attenuator settings; mooring, acoustic navigation and benthic towed samplers regularly require use of the -6 and 0 dB settings; therefore in my opinion the Russell is not suitable for deep ocean (greater than 2000 metres) applications requiring the use of 10 kHz acoustics.

10 kHz pinger used on SMBA corer

The first corer deployment used a standard pinger but until the propeller was declutched its signals were invisible. A second pinger was modified to transmit double the power with double the pulse length; this produced a bottom echo which was just visible at 200 metres above the seabed using Mufax settings of -18 dB and 2.8 milliseconds. Luckily the weather allowed the propeller to be declutched for the critical periods of corer operation as the usual alternative technique using the winch dynamometer strain gauge was unavailable.

Bathysnap and Sediment Trap Acoustics

Due to a permanent staff shortage all three acoustic releases used on these moorings had to be overhauled at sea. All three required adjustment and should have then been tested at 0°C and left running for a week to check the stability of the adjustment. These checks had last been carried out twelve months ago and so on this occasion I was happy that the performance over the next twelve months would not deteriorate to an unuseable level; however if they have not been retested by the equivalent cruise next year and alternative units are not available these moorings will not be relayable. This is going to be a recurrent problem and will inevitably lead to wasted ship time and experiment modifications.

CR 2383 and CR 2401 had their bandwidths and firing circuits checked using the hydrowinch at a depth of 1800 metres. Both were used to fire retractor units, two of which were plastic coated as an experiment aimed at removing the scratching problem. All the tests were successful and the units were laid on the sediment trap and 'tripod type' Bathysnap moorings; the retractors used however had 1 each of plain and anodised pistons per rig (as the plastic coated pistons had not yet completed long term soak tests). The first lay of the 'tripod type' Bathysnap had to be aborted after deployment when it was realised the lens cap was still on the camera; the recovery was perfect; the retractors and ballast frame were quickly replaced and the mooring redeployed without incident.

G.R.J. Phillips

IOS CAMERA PROBLEMS

Due to a misunderstanding the Bathysnap cameras had been equipped with a maximum frame interval of 4 hours instead of the 8 required; this was quickly rectified by a simple PCB mod. using the circuit diagram and a short phone call (not really necessary). One of the flash units had been modified by a special circuit designed to prevent battery depletion through capacitor leakage. However, once triggered the unit proceeded to free run at its minimum retrigger interval. The circuit was of prototype veroboard construction and no diagram was available. It took one and a half hours to trace the interconnections and produce a circuit diagram. Several possible problems (typical veroboard - a washer and some solder interconnecting strips, and a resistor lead touching a transistor can) were cleared in an area likely to cause that type of fault. The unit then worked perfectly on the bench but continued to misbehave when assembled; it was eventually traced to the connection of the underwater connector to the circuit - even in the absence of its mate; it was eventually cured by attaching a 0.01μF capacitor across the triggering input terminals.

G.R.J. Phillips.

DRAGGING FOR LOST BATHYSNAP

The Bathysnap that had refused to return on cruises in 1983 was located in its nominal position without serious problem (other than ship's noise). The acoustic command unit was still operating as normal so it was taken through its release sequence several times but still remained firmly anchored. Its position was carefully established using doppler shift and all dragging operations were carried out with respect to the acoustic signal. The technique used has been successful several times in the past. A weighted ground line was laid alongside the mooring and its leading end swept in a semi circle (with its rear end fixed at the centre of the circle), the leading end being kept on the seabed. Because of the large distances and arcs the ship needs to travel in to smoothly sweep the ground line its length should be about the same as the water depth, 2000 metres (to allow for problems and increase the flexibility of ship handling). Unfortunately only 500m of ground line was available. A pinger was used to monitor the height above the seabed of the leading end but unfortunately failed quite shortly after deployment. However, careful checks on the Bathysnap acoustics and very frequent calculations on the three dimensional maths of the situation gave us confidence that we were making a sensible attempt at recovery of the Bathysnap. A sudden surge (fast payout from stationary) by the winch implied we snagged something although with no strain gauge to monitor the load it could just have been the faulty winch. Six hours were spent on the operation and one complete sweep was accomplished but Bathysnap was not recovered. A mathematical study of the drag line dynamics suggested small errors in navigation without the benefit of other information (front end height and wire tension) could easily result in movement of the rear end of a drag line this short. An additional problem was the high ship noise which resulted in a maximum range of 3km slant range being obtained which restricted the amount of wire that could be paid out from the ship and therefore the smoothness of the sweep.

G.R.J. Phillips.

DREDGE WINCH OPERATIONS AND PROBLEMS

The dynamometers either were not working from start or failed very early on. The trawl sheave was used for counting but no strain reading was available. This was very inconvenient during coring operations. I was not involved with early attempts to sort out the winch problems.

During the first multiple corer operation to 2000m, the winch would not stop reliably. It was tested with the clutch out when the gear was inboard and appeared OK.

Next deployment of corer tested hauling at 500m and 1000m appeared OK - rest of haul OK.

The third haul of the multiple corer sampled at 2000m then was left to soak for 12 hours 100m above the seabed. When the gear was recovered the winch was hauled on the 'automatic speed control', but when disengaged at 300m it "indicated it had stopped but the winch carried on for a while before stopping". With hindsight it looks as though the pot self centred but the hydraulics stuck in heave for a while longer. Completion of recovery was carried out on the manual control in the cab but speed was slow even at full power, both on heave and payout.

Laying of the drag wire was commenced. The winch speed appeared slow, then jumped to fast but stopped when control was released. The rest of the work was carried out using the manual lever on the side of the winch (electronics still connected in). During dragging operation the winch gave a very loud bang and suddenly paid out 30 to 40m very quickly but then stopped. Total time for drag was 6 hours inboard to inboard. The engineering team then asked for my assistance to check the electronics. The handbooks spent several pages praising the servo system and then gave minimal instructions on setting up the control cards. I set up the cards as instructed with several engineers providing a communication chain to the cab control. There was no improvement. As there was pressure to get on with the science I then searched the manual for instructions on manual control. I could find none so I left the Servo Enable switch in position 2 (on) as it had been used before.

The next experiment was a 2000m corer with an 18 hour soak at 100m off the seabed. We decided to resume investigation using a declutched barrel in the morning. The first thing we tried was substituting the identical electronic control cards from the trawl winch system. After careful adjustment the result was the same. These new cards were then used for all subsequent work. The relays were similarly exchanged, again with no improvement. I checked the input from the cab control pot - centre ~+3.8V:-3.8V, one way +4.8:-2.6V, other way +2.6:4.8V which appeared OK. I also checked the input from the manual lever feedback pot. It seemed off balance and in the opposite sense to the control pot with centre reading of -5.0:+2.5 and giving -7:0.5 one way but not moving the other way. This pot had been removed for checking by the engineers and may not have been returned correctly. There are 3 holes in the pot for securing and a square shaft for driving it which produces a large number of permutations. I selected the one that gave the best balanced zero position output -3.8:+3.8V. We then repeated the tests - no improvement. I changed the sense of the pot - the system performed exactly as before?? with no improvement or change. During all tests the servo valves (mounted by the electronics cabinet) could be heard to operate although one sounded different from the other. During the tests I got the impression that by switching the Servo Enable switch to position 1 (off or calibrate), that I had disabled the manual lever. I left the switch in position 2 and we decided to carry on using the manual lever.

The multple corer was recovered and the sediment trap mooring rope laid up on the dredge winch. The deployment was then commenced. As the fourth trap was being incorporated into the rig it appears that the earlier problem of full power producing slow speed and then leaping to full speed recurred, dragging the instrument into the block. I was on deck rigging the fifth trap when I saw the winch driver fighting with the lever and concluded that the control hydraulics were stuck. I judged it unsafe to attempt to reach the electronics controls as it meant passing very close to the rope warp. The warp then parted enabling me to get to the electronics and move the switch to position 1. When I came out of the fan trunk the winch had stopped. After calming down we deployed the mooring (half the length originally intended) using the capstans.

In my opinion (a) the hydraulic servo mechanism even if electrically isolated (the engineers confirmed it could be) could be capable of jamming the manual control lever and (b) there was no failsafe way of stopping the winch. We asked RVS to check with the manufacturers because of the high risks involved. This they seemed relectant to do preferring to advise us to make tests we had already attempted. Further winch operations were deemed highly hazardous. The scientific programme was reduced to those operations which did not require the dredge winch, and the cruise was terminated early.

Further note:- When the servo system is fully operational again a neat way of implementing an emergency stop might be to replace the Servo Enable switch with a relay carrying its own power supply - it could be initiated using a bypassing push-button (start up) and all the emergency stops would simply be in series with its power supply.

G.R.J. Phillips.

PHYTOPLANKTON SAMPLING

A continuous flow fluorometer (Turner Model III) was attached to the ship's non-toxic sea-water supply to monitor the biomass of phytoplankton in surface waters during the cruise. Since the fluorometer was not calibrated, samples were taken for the determination of chlorophyll concentration. The fluorescence increased greatly during the cruise. Maxima were observed at the shelf break and at the mouth of the Seabight in a water column depth of 3200m. This latter peak exceeding the highest scale on the fluorometer suggesting that the phytoplankton biomass exceeded 10 mg Chla m^{-3} in this area.

Seven 7.1ℓ water bottles were deployed between 10 and 100m. Samples were taken for phytoplankton taxonomy and chemical analyses. These samples will be useful as a comparison with phytodetritus found on the sea floor, to be sampled on Discovery Cruise 147.

D.S.M. Billett.

PARTICLE FLUX IN THE WATER COLUMN

Previous years' results on the seasonal supply of phytodetritus to bathyal and abyssal depths underlined the need to quantify the vertical flux of this material at different times of the year.

Six sediment traps were to be deployed on a single mooring at the 2000m station at depths from 200m to 1900m. The traps are cylindrical with a mouth opening of 40cm diameter ($0.13m^2$ area) and a height of 120cm. A steep sided funnel inside the cylinder concentrates falling material into a sample cup containing 60 mls chloroform as preservative. A closing mechanism was designed such that the sample cup should be isolated by a valve during its recovery and thus prevent sample washout at the sea surface. The cylinders are maintained up-current of the nooring line by a large fin. The mooring has six 17" glass buoyancy spheres at the top and 250kg of anchor chain ballast at the bottom.

The ballast weight and three traps were suspended outboard when the winch jammed in the 'heave' position and the fourth trap was destroyed. The mooring had to be terminated at this level so the buoyancy package was attached and the abbreviated rig deployed.

It is hoped that this mooring will be recovered and redeployed to give average flux rates for four periods (of about 45 days each), from April until the end of October.

R.S. Lampitt.

BATHYSNAP

Bathysnap IV which was deployed in April 1982 in 2010m (51719#1) did not respond to accoustic commands on Challenger Cruise 518. Frederick Russell went to the station and as the equipment was still on the seabed, an attempt was made to retrieve it by grappling. This was unsuccessful due in part to the rather short grappling wire available.

Two other Bathysnap modules were, however, successfully deployed at 2025m (Mk V) and 4525m (Mk III) to examine the appearance and disappearance of phytodetritus. These should continue to take photographs at 8 hour intervals until October.

R.S. Lampitt.

SEDIMENT COMMUNITY OXYGEN CONSUMPTION AND WATER/SEDIMENT FLUXES

It was intended to measure sediment community oxygen consumption at one or two sites in the Porcupine Seabight during this cruise. The technique involves use of the SMBA multiple corer, and is a single point rate determination of the in situ uptake of oxygen from overlying water by the sediment in enclosed core tubes. To obtain a rate measurement, normal coring is carried out and the overlying water from the cores siphoned off for analysis. The mean of these measurements was recorded as the "time-zero" level. The corer is then lowered, allowed to take a set of cores, and then raised 50-100m above the bottom. The cores are then left to incubate at what are essentially in situ conditions for 12 to 18 hours. Monitoring was carried out by means of a precision depth recorder to ensure that the coring assembly did not foul the bottom during this period. At the termination of the incubation period, the corer was recovered, and the overlying water removed and analysed to provide the final oxygen concentration. Oxygen determinations were carried out by a precise Winkler technique (Bryan et al., 1976 J. exp. mar. Biol. Ecol., 21, 101-197).

The first station where sediment community oxygen consumption was to be measured was the IOS 2000m station (Station 51901; 1998m). After two deployments of the corer for "time zero" measurements, 57901#1, 51901#2), the corer was lowered and, after taking a set of cores, was suspended for 12 hours (51901#3). Results from this experiment showed that a more satisfactory accuracy could be achieved by increasing the incubation time, thus the corer was suspended again, this time for 18 hours, after a third time-zero measurement (51901#4; 51901#5). Results obtained from these experiments are shown in Table 1. A mean figure for sediment community oxygen uptake at Station 51901 was in the order of 65 mg $0_2 . m^{-2} . day^{-1}$. Considerable variability in rates of oxygen uptake between cores was noted.

The sediment cores from these experiments were retained for biomass measurements, in order to relate exygen consuption to meiofaunal and macrofaunal abundance and biomass. This will be done in collaboration with Dr. Richard Warwick (IMER).

The suspended core technique was also used to measure the flux of other dissolved chemicals across the sediment/water interface. Subsamples from overlying water before and after incubation were taken for analysis of nutrients and iodine species (Hilary Kennedy, Cambridge), DOC (Dr. Peter Statham, Southampton) and arsenic (Dr. Alan Howard, Southampton).

RESULTS

a) "Time zero" measurements

Station	Date	No. cores used for analysis	Dissolved Oxygen (mg/ℓ)
51901#1	8.IV.84	4	8989
51901#2	8.IV.84	11	9007
51901#4	9.IV.84	12	8990

b) Oxygen comsumption rates

Station	Date	Incubation time (hr)	No. cores recovered	Mean Oxygen consumption rate ($mgO_2.m^{-2}.d^{-1}$)	Range ($mgO_2.m^{-2}.day^{-1}$)
51901#3	8.IV.84	12	9	71	0-192
51901#5	9.IV.84	18	9	66	38-146

R.C.T. Raine, D.S.M. Billett, R.S. Lampitt

MICROBIOLOGY

Samples of superficial sediment were taken from the tops of cores from one drop of the multicorer for microbiological studies. These studies were preserved in 5% formalin and sent to Dr. John Fry at UWISR for analysis. Further sampling was not possible due to the winch problems.

R.S. Lampitt.

MEIOFAUNA

Cores were subsampled for meiofauna (including Foraminifera) using 20ml medical syringes. These had previously been modified by cutting off and bevelling the ends of the barrels to produce a cutting edge, allowing easy penetration of the sediment. When inserting the syringes into the sediment, care was taken not to disturb the flocculent surface layer. The subcores were partly or completely frozen before being extruded and sliced horizontally into 1cm thick layers down to 5cm. Each layer was preserved separately. An almost complete set of subsamples was obtained from two multicorer drops: 51901#2 (11 syringes) and 51901#4 (10 syringes). These will provide information about the horizontal and vertical distribution of meiofauna at 2000m, adding to data already available from 1320m.

The entire upper 10cm of all cores recovered by the multicorer during the two incubation experiments (51901 #3 and 5) and one conventional deployment (51901#1) were preserved. These samples will be analysed for metazoan meiofauna by Dr. R. Warwick at IMER in order to assess the contribution of these organisms to benthic respiration.

A.J. Gooday, M.H. Thurston, J. Watson.

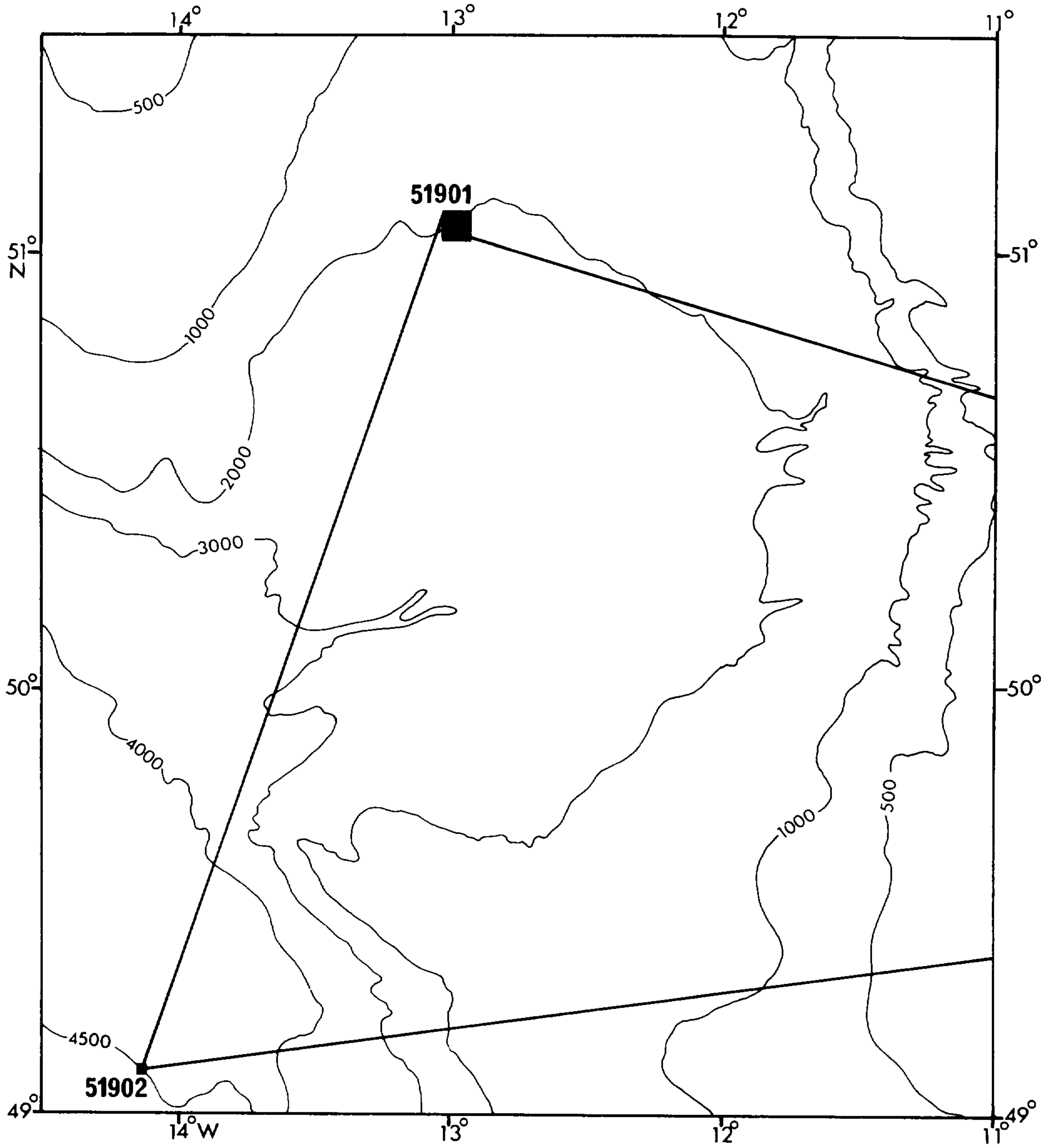
ORNITHOLOGY

Ornithological observations were carried out as and when time permitted. Species diversity and numbers of birds seen were low, being closely comparable with the data obtained during a cruise to the same area in April 1982 (516, Challenger 5/84). Kittiwakes (Rissa tridactyla) were seen most frequently and in greatest numbers. Fulmars (Fulmerus glacialis), Manx shearwaters (Puffinus puffinus, gannets (Sula bassana), great skuas (Catharacta skua) and lesser black-backed gulls were the only other species recorded more than twice in offshore areas. Almost without exception, all gannets were adult. Adult kittiwakes outnumbered juveniles. A significant minority of the adults still showed a degree of shading on the head and nape.

M.H. Thurston.

STATION LIST

STATION	DATE	POSITION N	POSITION W	GEAR	DEPTH (m)	TIME	REMARKS
51901#1	8:4	51°02.3'	13°01.6'	MC	1998	1430	11 cores obtained.
51901#2	8:4	51°03.0'	13°00.1'	MC	2000	1614	11 cores obtained.
51901#3	8:4	51°03.6'	12°59.4'	MCR	2000	1815-0615	9 cores obtained. Suspended for 12 hours for respirometry.
51901#4	9:4	51°02.9'	13°00.4'	MC	1996	2224	12 cores obtained.
51901#5	9:4	51°03.1'	13°00.7'	MCR	1996	2350-1754	9 cores obtained. Suspended for 18 hours for respirometry. 1 core tube lost and 1 damaged due to accidental drop during soak.
51901#6	10:4	51°03.3'	12°57.8'	SEDTR	2005	2245-	3 traps at 100m, 200m, 700m above seabed. To be recovered on Discovery Cruise 147.
51901#7	11:4	51°05.8'	13°01.3'	WB	-	1119-1139	7 litre bottles at 10m, 20m, 30m, 40m, 60m, 80m and 100m.
51901#8	11:4	51°02.3'	12°56.3'	Bsnap	2025	1558-	Mark V to be recovered on subsequent cruise.
51902#1	12:4	49°07.2'	14°08.7'	Bsnap	4525	1144-	Mark III to be recovered on subsequent cruise.


14°
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