JR19:

RRS James Clark Ross
Antarctic Peninsula Pacific Margin
Marine Geology
March 1997 - April 1997

British
Antarctic
Survey

Cruise Report

RRS *James Clark Ross*

Cruise JR19
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Marine Geology
Antarctic Peninsula Pacific Margin

BAS Reference No. **April 1997**

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JR19 CRUISE REPORT

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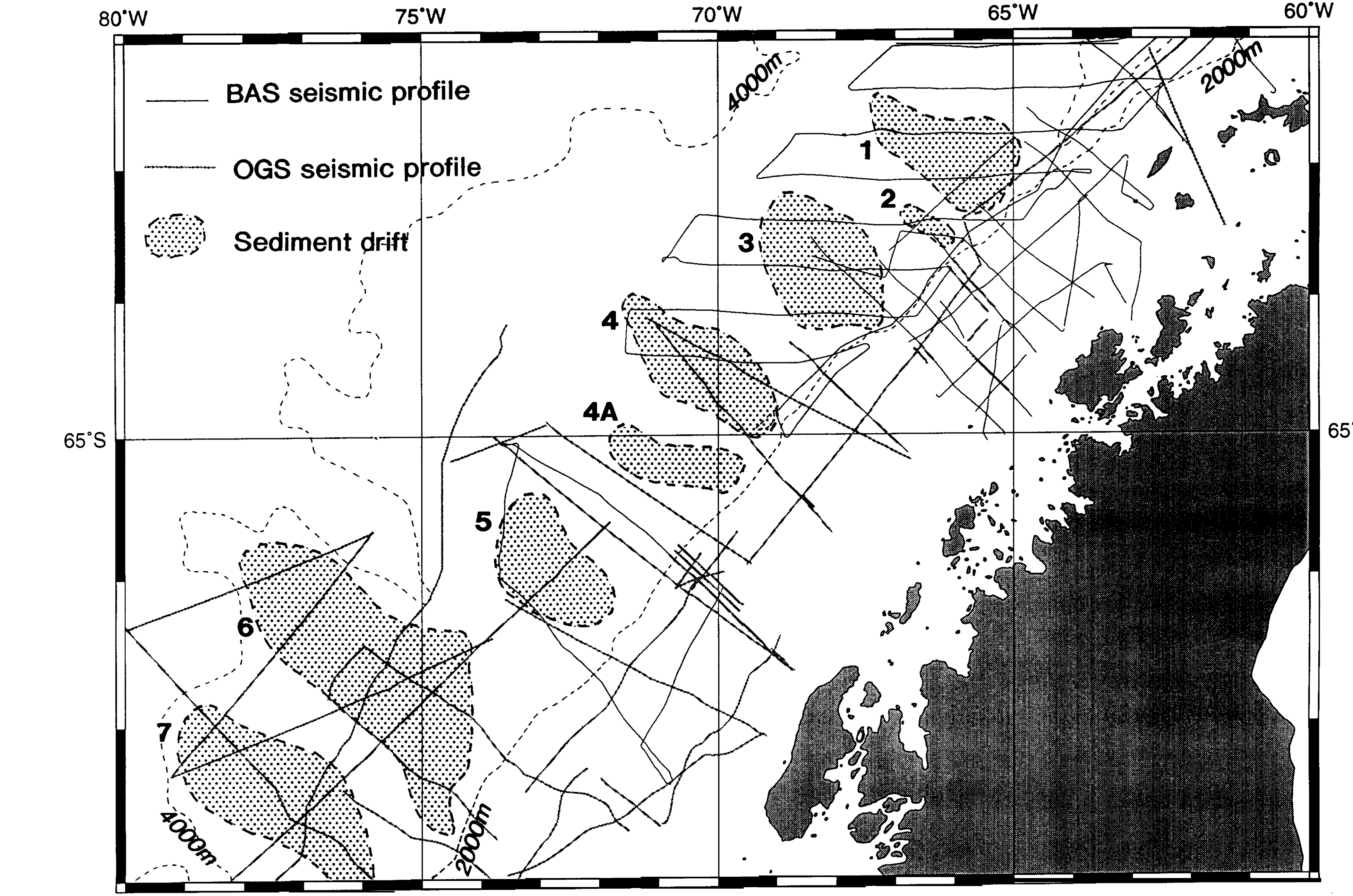
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70°W
65°W
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1. INTRODUCTION (CJP)

Cruise JR19 was originally planned to use the BAS Long Piston Corer to investigate sedimentation processes and the palaeoclimatic record on the continental rise west of the Antarctic Peninsula. Early in the planning stage it became clear that the LPC would not be available, but that we could use the RVS piston corer. The cruise was scheduled at the end of the season to fit in with a logistics run to Rothera, to deliver aviation fuel.

The main objective was to collect cores and 3.5 kHz profiles from a number of sediment drifts on the continental rise. This area is the focus of international collaboration in the form of (a) the SEDAN0 programme of the Osservatorio Geofisico Sperimentale (OGS), Trieste, Italy; (b) Ocean Drilling Program (ODP) Leg 178, scheduled for Feb-Apr 1998. Secondary objectives included comparison of ship-mounted and towed magnetometers, and plankton sampling from surface water.

1.1 Coring

Bathymetric and seismic data on the Peninsula margin show a style of deposition quite different from the common lower-latitude pattern of slope aprons and submarine fans. At least nine large sediment drifts occur on the rise from 63°-69'S (Rebesco *et al.,* 1996; Fig. 1). They are separated from the shelf and slope by a zone of non-deposition at the base of the slope, and from each other by large turbidity-current channels which extend NW across the rise. Seismic sequences are remarkably correlatable from drift to drift. The upper parts of the seismic sections are interpreted as hemipelagic sediments originating as the fine-grained fraction of turbidites from the margin, which are entrained in bottom currents and deposited where currents slacken over the drifts (Rebesco *et al.,* in press).

SEDANO-1 core data from Drift 7 in the SW show that most terrigenous sediment supply occurred during glacial maxima when ice sheets were grounded to the shelf edge (Camerlenghi *et al.,* in press). Biogenic supply occurred during interglacials when sea ice cover was reduced. Grain-size data show little evidence for cyclic changes in bottom-current strength, in marked contrast to the Weddell Sea and Scotia Sea (Pudsey and Camerlenghi, in prep.). Sedimentation rates range from 3 to 6 cm/ka on top of the drift. On the steep SW and SE sides of Drift 7 a hiatus is present below Stage 5 (Last Interglacial) sediments, allowing recovery of the Lower Pleistocene in short cores.

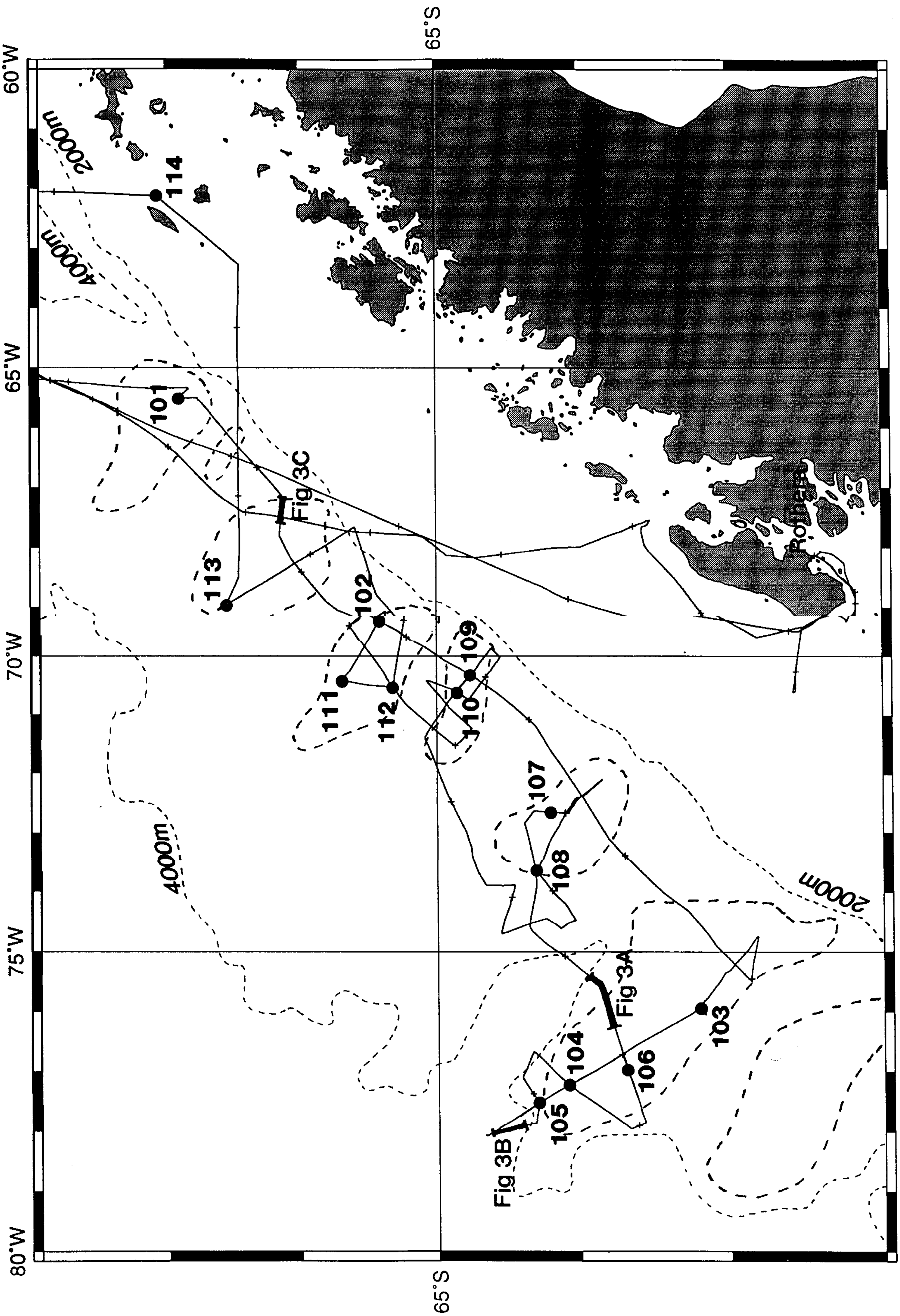
JR19 was planned to extend core coverage to deeper in the section and to additional drifts, with the following specific aims:

(i) confirm the cyclicity in sediment supply predicted by the model of Larter and Barker (199 1) and Rebesco et al. (in press).

(ii) identify, in apparently continuous sections on top of drifts, any equivalent of the pre-Stage 5 hiatus seen on Drift 7.

(iii) investigate the intriguing similarity of the seismic stratigraphy for distances of hundreds of km along the margin. The relative importance of downslope and alongslope processes needs to be assessed.

← Figure 1. Location of seismic profiles (single-channel and multichannel) acquired by BAS and OGS, which were available for planning this cruise. Outlines and numbering of sediment drifts, and bathymetry, from Rebesco *et al.* (in prep).


60°W
65°W
70°W
75°W
80°W
65°S
65°S
2000m
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114
101
Fig 3C
113
102
109
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Fig 3A
103
104
106
105
Fig 3B

(iv) test whether changes in the source along strike (from fore-arc sediments in the SW to arc volcanics and plutonics in the NE) are reflected in the composition of drift sediments, Any differences between coarse fraction (ice-rafted) and fine fraction (current transported) will be of use in identifying sources.
(v) use 3.5 kHz profiles together with core data to inform the choice of continental rise sites by ODP. At present a number of alternative sites have been identified using multichannel seismic profiles; high-resolution data will refine the selection of two of them.

Cruise tracks were planned to complement existing multichannel seismic (MCS) profiles on the drifts, acquired by BAS/University of Birmingham and OGS in earlier seasons (Fig. 1).

1.2. Magnetics

BAS's new Shipborne Three-Component Magnetometer is currently under evaluation. JR19 offered the opportunity to compare its performance with that of a standard towed-fish magnetometer at significantly higher latitudes than on previous cruises.

1.3. Plankton sampling

The Bellingshausen Sea is a poorly-known area in terms of plankton, and it is useful to collect and filter surface-water samples to compare the assemblage with that found in sediment traps and cores. In addition, we undertook to collect planktonic foraminifera for part of a plankton DNA study by colleagues at the University of Edinburgh (Darling *et al.,* 1996). Samples were collected north and south of the Polar Front using the ship's uncontaminated seawater supply. Sea surface temperature was recorded continuously using the Ocean Logger.

1.4 Itinerary

JR19 was to have been followed by a short dredging cruise, JR20. After a very slow passage to Rothera in consistently bad weather, and the planned fuel and cargo transfers, we left the base one day late. Well before reaching the first core site, we were recalled to Rothera for a medevac, and had to proceed at full speed to Port Stanley to land the casualty. It was decided at BAS HQ to re-schedule JR19 and cancel JR20. JR19 (part II) therefore left Stanley on March 19th, 1997. We were able to spend 9.5 days in the work area south of 62°S before returning in good order on April 3rd. The only damage to equipment was the coring wire being stranded by the traction winch. This necessitated cutting off the outboard 3000m, leaving us with only 3500m of usable wire. 14 cores totalling 123m were obtained, which after laboratory study will enable objectives (i) to (v) to be achieved. All the planned water sampling was done and useful magnetic data acquired. A summary track chart is shown in Fig. 2 .

← Figure 2. Summary track chart showing core sites and positions of profiles in Fig. 3.

2. NARRATIVE (CJP)

The scientific party for JR19 arrived on board the *JCR* at FIPASS, Port Stanley, on the morning of March 6th. Mobilisation of the coring equipment was already in progress on deck, all the gear having arrived safely from various sources. A potential problem for corer recovery was recognised. The piston corer hangs from a pennant shackled to the main warp, and after triggering this 22m pennant must be recovered before the core head can be landed in the bucket. The shackle and wire terminations would not pass over the profiled sheaves and down the spurling pipe, so an auxiliary winch would be required. On Discovery, where this corer is commonly used, there is a suitable auxiliary winch on the midships gantry, but the *JCR's* gantry winches are too small. The next day it was decided to use one of the mooring winches as an auxiliary, so that we could proceed with 3- and 4-barrel corer deployments as planned. (See equipment report).

The remaining personnel from JR18 disembarked early on March 8th (Julian day 067) and the ship sailed at 0650. The magnetometer was streamed, PES and 3.5 kHz profiler turned on, uncontaminated seawater supply and ocean logger turned on, and scientific watches set. Unfortunately no data except raw GPS could be logged initially, because a Level B rebuild had not been completed during the 3-day port call; disc replacement and formatting were not finished until 1630, when logging started. The STC Magnetometer was also out of action as it required a new power supply.

During the passage south to Rothera we suffered from persistently bad weather, and the ship made her slowest passage to date. The wind ranged from W to SSW in direction and force 6 to 8 in strength, all the way from Burdwood Bank to the north end of Adelaide Island. It was necessary to come off the straight line track and head up into the wind to reduce the rolling (which attained over 30” at times). A new power supply was fitted to the STCM, but it was impossible to fit the aerial on deck in those conditions. Plankton sampling was carried out at stations north and south of the Polar Front (see section 3), though picking foraminifera was very difficult with the ship rolling so much. On a radio sched with the *OGS Explora* on March 1 lth, we were informed that enough cores had been collected in the southern end of our survey area (Drift 7) that we no longer needed to go there. This potentially saved some of the time that we had already lost on the passage.

Early in the morning of March 1 lth (072) the magnetometer was recovered at the entrance to Matha Strait at the north end of Adelaide I. However the ship then encountered a lot of ice and very poor visibility, so it was judged safer to run down west of the island and approach Rothera from the south. At last the weather had moderated, and once into Laubeuf Fjord the sun even came out intermittently. On *the* way in *we* were buzzed by one of *Endurance's* helicopters, the *Endurance* having left about an hour before we arrived. We moored at Biscoe Wharf at 1700.

The following day was a busy one for ship and base. 550 tons of aviation fuel were pumped ashore, and a quantity of petrol drums and 4 empty containers unloaded. A large amount of waste cargo was loaded into the lower hold. Meanwhile most of the scientific party took shore leave. At 1530 a squall from the south made the ship cease working cargo and prepare to leave. Those scientists still ashore in the snow were rapidly brought back by skidoo. The wind then eased, and the ship was able to load 12 containers. At 1800 the wind again increased from the south and we sailed in a hurry at 1815, sadly without being able to host the base winterers' dinner.

We headed west at cruising speed for the first core site. Just off the southern end of Adelaide Island we encountered a mass of old pack and bergy bits, so detoured round the ice to the north. The magnetometer was streamed at 2330. Meanwhile a recreational ski-ing accident had occurred on Reptile Ridge and the casualty was being brought back to base for examination. At 0200 the *JCR* was requested to return to Rothera for a medical evacuation. Luckily the weather was now fine and settled, and was to remain that way for the next 4 days. We secured again at 0900 and our doctor went ashore to assist. The casualty was craned aboard on his stretcher and we sailed for Port Stanley at 1040, at full speed, which in those calm conditions was over 15 knots.

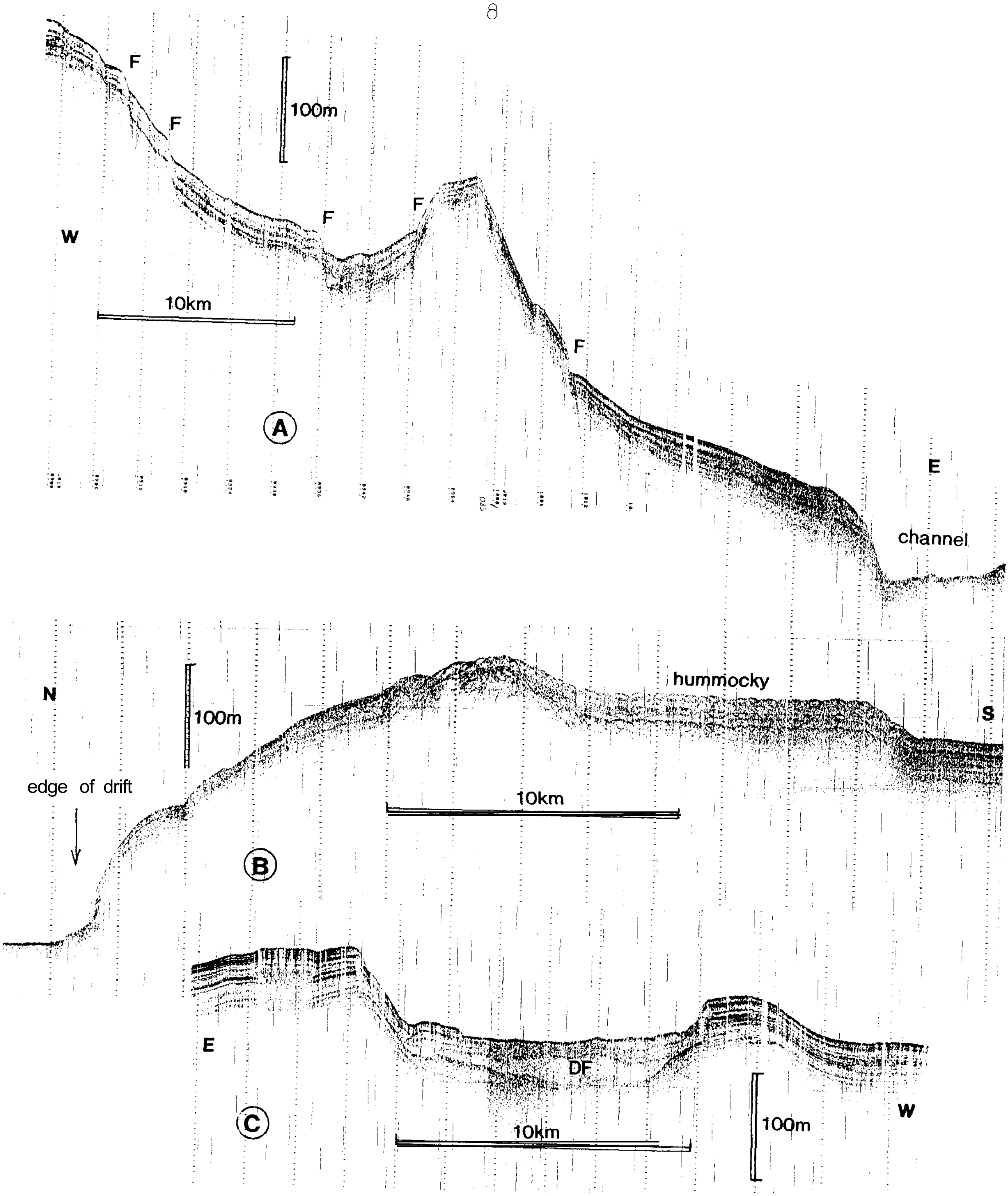
At BAS HQ the decision was made (i) for the *JCR* to medevac all the way to Stanley (rather than arrange for assistance by any other ship) and (ii) to reschedule JR19 at the expense of the following cruise, JR20. While all the scientists were prepared to stay on for an extra 10 days, none of the 4 technicians was keen. However, after communications with BAS HQ and with families on Monday March 17th, all except Dave Richmond agreed to stay. We tied up alongside FIPASS at 1145 on March 18th after a Blue Riband crossing of Drake Passage in amazingly good weather. The casualty was taken to hospital, and the ship discharged the containers.

Next day the waste cargo was discharged and bunkers taken. We sailed on JR19 (part II) at 1900 on March 19th. This time the crossing of Drake Passage to near Anvers Island (see track chart) took only 2.5 days and we were able to steam in a straight line. On the way south we passed and spoke with the *Almirante Irizar,* northbound for Buenos Aires. The cruise track in the work area had been re-planned to begin with a long survey line across all the drifts (1, 3,4,4B, 5 and 6) on which we wished to core, as far as the inboard end of Drift 6 at 67°S, 75°W. We would then work back northwards, surveying in detail and coring as we went.

We arrived at Drift 1 in the morning of March 22nd (081) for a practice core, PC1 01. Like all practice stations, even with people who have done coring before. it went slowly and rather untidily. The use of the mooring winch as an auxiliary proved to be satisfactory; however, it was necessary to transfer back to the main warp to get the corer into the bucket. as the auxiliary sheave was not directly above the bucket and it pulled the core head too far aft. We recovered 6.6m of mud in a 3-barrel(9m) corer. The station took a total of nearly 6 hours: 4.5 hours coring followed by 1.5 hours rebuild time. It was generally more convenient to stay on station to dismantle and rebuild the corer than to do this under way, except in very calm conditions.

Steaming to the southern end of the line on Drift 6, against a fresh SW wind, took until the morning of March 24th (083). We collected PC102 on the way as it was a defined ODP site. Some of our sites (Table 1) were predetermined ODP sites that had been picked on OGS seismic lines; the others were selected using 3.5 kHz data collected on this cruise and on JR04. PC103 at the proximal (SE) end of Drift 6 went much more smoothly than the first two stations.

The pattern of survey on each drift over the next few days was to run a dip line (NW-SE) followed by a couple of strike lines (NE-SW) to supplement existing seismic data, then to select two or more core sites (Fig. 2). We aimed to get at least one proximal and one distal site on each drift. On Drift 3 we already had data from proximal sites, so only one distal core was required. Because of rather low recovery to begin with, we addressed the question of the length of the free-


F
F
100m
W
F
F
10km
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channel
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100m
hummocky
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edge of drift
10km
B
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DF
C
10km
100m
W

fall coil of wire. From core 109 onwards we increased the length from 7m (book value) to 9m, and obtained much better recovery (see coring report). The piston corer was used at 4-barrel length at most stations. Cores 105 and 112 were 2-barrel gravity cores, 105 in the expectation of firm sediment and 112 because of deteriorating weather (SW force 6). In general the weather was very good, particularly in the afternoon of March 25th (084) when the sea was almost glassy (and full of icebergs and chinstrap penguins). Icebergs were common south of 65°S, but none forced relocation of any core site. We ran the STCM all the time, and streamed the RVS magnetometer on the long passages between sites.

The most interesting shipboard result was the recognition of very widespread mass-wasting processes on the drifts. Large-scale listric normal faults had been seen on the OGS seismic profiles, and our 3.5 kHz data showed large numbers of small-offset normal faults in the upper 50m of the proximal part of Drift 6; also, much of the outer part of the drift consists of hummocky sediments affected by mass flow or water escape processes (Fig. 3). ODP site selection should take cognizance of this. Drifts 5,4B and 4 showed a similar pattern, with well-laminated sediments restricted to the proximal, shallowest part of each drift. Only on the long dip line on Drift 3 did we observe a steady thinning of the upper sediment section from SE to NW.

Early in the morning of March 27th (086) a potentially very serious situation was averted. On recovery of core 107 a riding turn had been created on the storage drum. While this part of the wire was being monitored during deployment of core PC108, it was noticed that the wire had partly stranded. Luckily the broken part was still on the drum, with 2700m of wire out in 3600m of water. The wire was immediately hauled and the corer recovered on board safely. We then began the long and arduous task of pulling out 3000m of wire and flaking it in a big coil on the after deck. The powered rollers were some help, but most of the work was handraulic. The wire was cut, reterminated and the Tellurit splice tested to 4 tons, and we were ready to proceed. We did not know exactly how much wire was left on the drum, but expected about 4000m as it was 7000m when new and this is the first time it has been significantly shortened.

Core PC 108 was in 3600m of water (corrected depth) and was the deepest we could now attempt. With the corer in the seabed we had only 115m of wire left on the drum, about 1/3 of the bottom layer. This is **known as coring to the bitter end.** Thus, unfortunately, we were unable to obtain any cores from the abyssal plain beyond the drifts as this would have required another 300m of wire.

Another winch crisis occurred on the recovery to deck of GC112, at midnight on March 29th. With the core head just in the bucket, the winch refused to veer but would only haul slowly. This was also the case for local (winch-room) control. The core head was within about 0.5m of the gantry sheave when control was regained, by shutting the system down and re-starting it.

← Figure 3. 3.5 kHz profiles illustrating mass-flow processes on the sediment drifts.
A. Small normal faults (F), NE side of Drift 6
B. Hummocky topography thought to result from mass-flow or water-escape processes, distal margin of Drift 6.
C. Debris flow (DF) within acoustically laminated sediments, near E side of Drift 3.

We finished PC 113 on Drift 3 in the afternoon of Easter Sunday, March 30th (089). Since we still had time in hand and the weather was good, it was decided to run east to Smith Island and core at a shallow site in Boyd Strait. This had been in the original JR19 programme as a practice site, but we missed it first time because of being forced so far west by the weather. The scientific value of the site is that it should contain ash layers from Deception Island, as well as the ash layers of Marie Byrd Land origin which occur widely in the sediment drifts. It will be very useful to link the Deception and MBL tephrostratigraphies in one core.

During the pull-out of GC114 it was realised what may have broken the wire. Pull-outs are done using 6 driven drums, then when the corer is clear of the bottom the rest of the hauling is done on 5 drums. The 6th drum was not turning, so that the wire was being dragged round it under conditions of maximum outboard tension. This caused the loud grating noise which was noticed and diagnosed immediately at this station. The noise had also occurred at stations 105 and 107.

Although Smith Island was veiled in typical South Shetlands mank while we were on station (and provided a very useful lee from a strong westerly wind), after we set off northwards for home the sun came out and the island was revealed in its snowbound glory. A fine Antarctic finale to a very successful cruise.

We made very good progress for the first two days of the return trip across Drake Passage until the morning of April 2nd (092) when we were slowed to 7-8 knots by headwinds. Although it moderated later in the day, we arrived too late to tie up that night. The magnetometer was recovered, the echo sounders switched off, and we anchored in Port William at 2330. A force 9 southerly gale prevented the ship from going alongside for most of the next day, and we did not secure at FIPASS until 1930. Demobilisation was completed on April 4th.

3. CORING EQUIPMENT (A T)

3.1 Introduction

The RVS coring equipment was installed on *the RRS James Clark Ross* while alongside at FIPASS between 6th and 8th March 1997. The following equipment was required.

R VS Equipment

1 off Corer handling bucket
2 off Corer davits
15 off 3m Barrels c/w stand
8 off Barrel Connectors
4 off Pistons
10 off Cutters
2 off Corer bombs c/w stand
50 off 3m liners
100 off end caps for liners
3 off Piston wires
1 off Pinger
12 off Catchers

JCR fixed equipment

Midships Gantry
30 tonne Traction winch
Ship hydraulic system

3.2 Installation

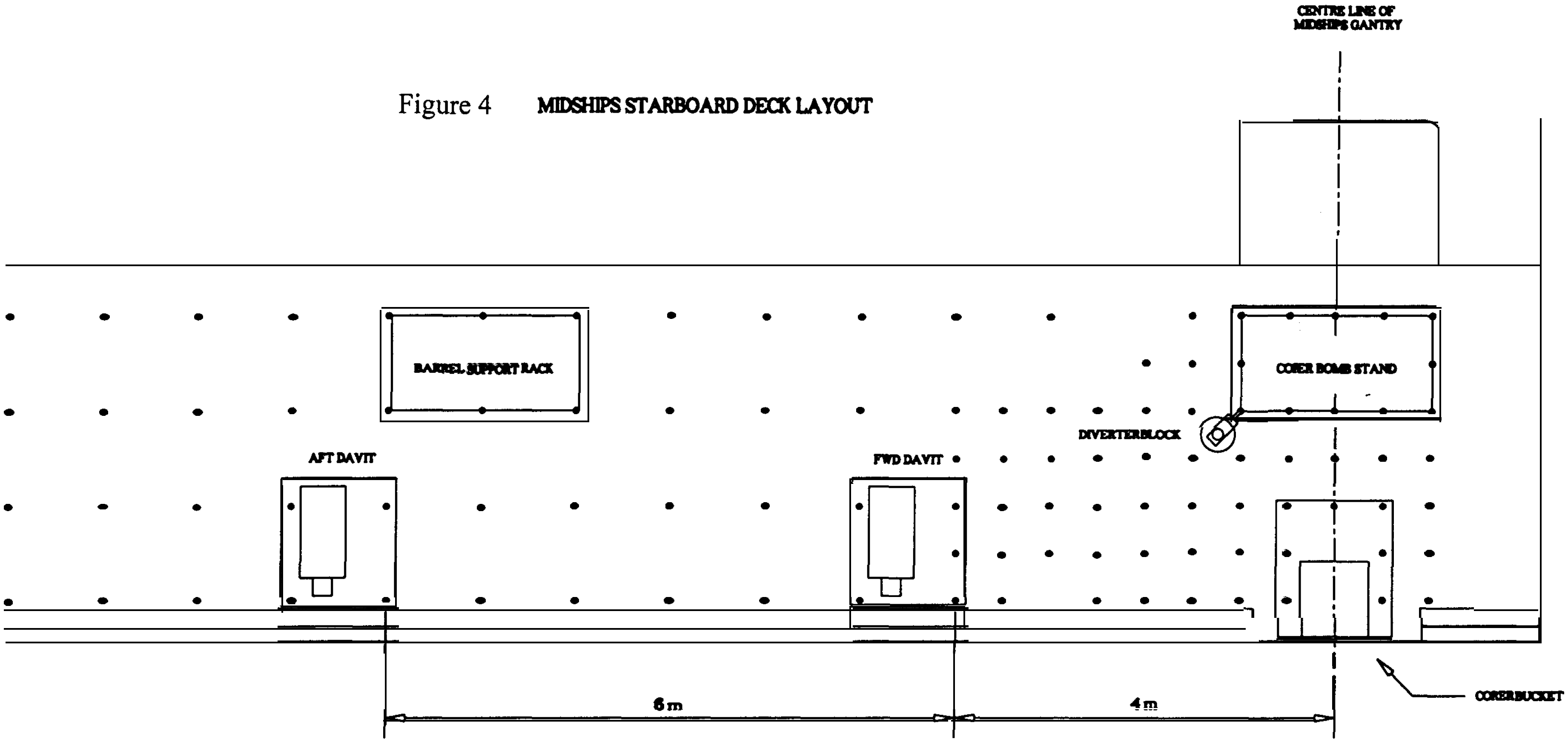
Preliminary installation went well, with all of the equipment in position and bolted down by the end of the first day (Fig. 4). All the hydraulics were plumbed in and tested successfully on the following day.

Due to an oversight, we had no auxiliary winch to recover the corer pennant wire after triggering. On *Discovery,* where this corer is commonly used, there is a suitable auxiliary winch on the midships gantry, but the *JCR's* gantry winches are too small. It was decided to use one of the mooring winches as an auxiliary, so that we could proceed with 3- and 4-barrel corer deployments as planned.

A block was attached to the base plate of the corer bomb stand, which was bolted to the deck directly under the midships gantry. This was load tested to over 5 tonnes and provided an adequate factor of safety, to recover the 1.25 tonne corer. The block was positioned to divert the recovery wire along the starboard deck via two turning bollards, to the aft starboard mooring winch. The mooring winch could then be used to take up the pennant wire, so that the main coring warp could be removed and reconnected directly to the corer head. This allows the core head to be located correctly in the corer bucket. The corer cannot be recovered to the bucket on the auxiliary wire, because the auxiliary sheave on the gantry is about 0.5m aft of the centreline, rather than directly over the bucket.

Corer assembly and all other outstanding items were completed while underway to Rothera.

Figure 4 **MIDSHIPS STARBOARD DECK LAYOUT**



3.3 Assembly and Disassembly Procedure

3.3.1 Main corer.

Initial setup

1) Corer bucket is bolted centrally to the deck in line with the midships gantry.
2) Davits are bolted to the deck in positions suitable for the deployment of either a 9m or 12m corer (Fig. 4).
3) Forward davit must house the controls for the corer bucket, in order to allow the operator to see and control both pieces of equipment simultaneously.
4) Hydraulic supply for the corer bucket and davits are fed from the midships manifold block. The forward davit and corer bucket are connected to supply 2, the aft davit to supply 1.
5) Corer bucket is driven hydraulically to outboard and vertical.
6) The bucket is rotated to the vertical to accept the corer bomb.
7) Corer bomb is lowered into the bucket from above, by use of a crane.
8) The bomb is secured to the bucket using a safety chain, which is passed through the bomb and shackled to either side of the bucket.
9) The corer bomb is rotated to the horizontal in the bucket, so that the head of the bomb is facing forward.
10) Mount barrel connecting flange to base of bomb.
11) Barrel stands are placed along the deck, close to the ship's rail at regular intervals to support the barrels.

Assembly procedure

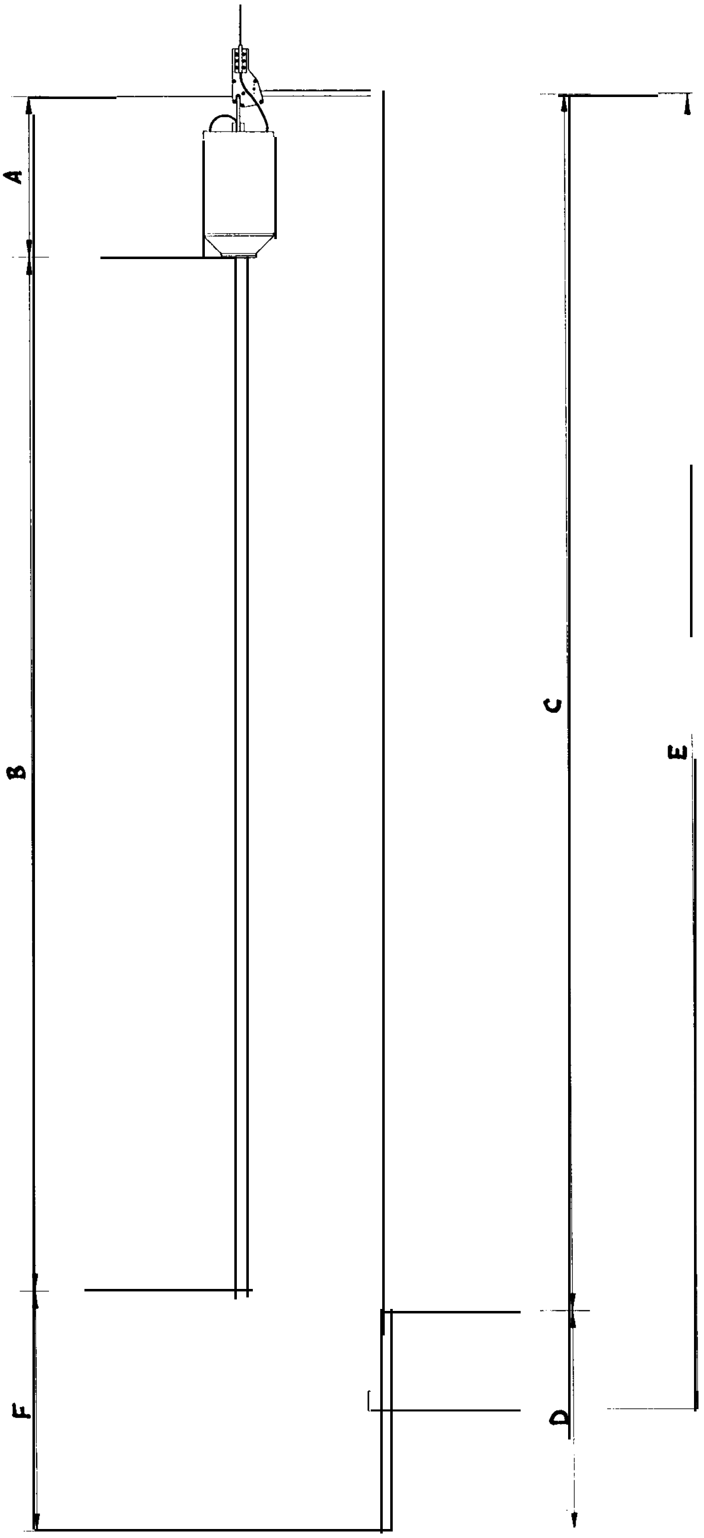
Steps I) to 12) can be carried out under way, in calm weather:

1) Slide first barrel into the connecting flange at the base of the bomb and secure with set screws.
2) Insert a 1/2 m length of liner and chamfer edges (this offsets further liners from the end of connecting barrels, allowing easy removal of liners).
3) Insert full length liner and chamfer edges.
4) Attach barrel connector to barrel and secure with grub screws.
5) Continue with process until desired core length is reached, supporting barrels in stands as necessary.
6) Cut liner in last barrel so that catcher and cutter can be installed (50 mm back from end of barrel).
7) Pass piston wire through core bomb and out of the end of last barrel.
8) Check that the piston is a sliding fit in the liner and adjust fit as required.
9) Attach piston to wire and slide piston up liner at least 100 mm in order that the catcher does not foul the bottom of the piston.
10) Install catcher and cuter in last barrel and secure with set screws.
11) Ascertain free fall wire length; may need to adjust lengths given in table (Driscoll, 1977)
12) Secure each turn of free-fall wire with twine to the head of the core bomb.

Figure 5 **PISTON CORER LAYOUT**

A - Length of bomb **B - Length of barrel** **C - Length of chain**

D - Length of piolet core **E - Trip chain length** **F- Free fall**



The following steps are carried out when the ship is on station ready for deployment:

13) Mount trigger on core bomb and attach hydrostatic release.

14) Secure piston wire in wire clamp on trigger (a small amount of lead is wrapped around the wire to be clamped. This prevents the clamp slipping when the corer weight is taken on the wire).

15) Connect main warp via a 5 tonne swivel to the piston wire.

16) Attach chain loops around the barrels and connect to davit wires.

Disassembly procedure

1) Remove cutter and catcher from barrel.

2) Remove set screws from last barrel connector and remove barrel to barrel stand rack.

3) Push a spare length of liner in to the top of barrel to remove existing liner. Caps should be fitted to liner to preserve the core.

4) Continue to remove barrels and liners until complete core is removed.

Free fall wire calculation

The following table is an extract from Driscoll(1977):

Corer length (m)	Free fall wire (m)	Trip chain length (m)
6.1	3.66	9.15
9.14	5.18	13.71
12.19	6.17	18.29

Free fall wire length = Trip chain length (E) - Corer Length (B) + Wire stretch

Where the wire stretch has been determined from experiments for this coring warp to be 0.61 m and the other measurements are as illustrated in Fig. 5.

3.3.2 Pilot core

Assembly procedure

1) Insert liner into barrel and cut to length in order that the catcher and cutter can be installed (50 mm shorter than barrel length).

2) Insert catcher and cutter into barrel and secure with set screws.

3) Measure trip chain length (50% longer than barrel length less height between underside of pilot core weight and its head - as illustrated in Fig. 5).

4) Connect one end of trip chain via a 3 tonne swivel to the head of the pilot core.

Disassembly procedure

1) Remove cutter and catcher from end of barrel.

2) Remove core liner and fit caps to preserve the core.

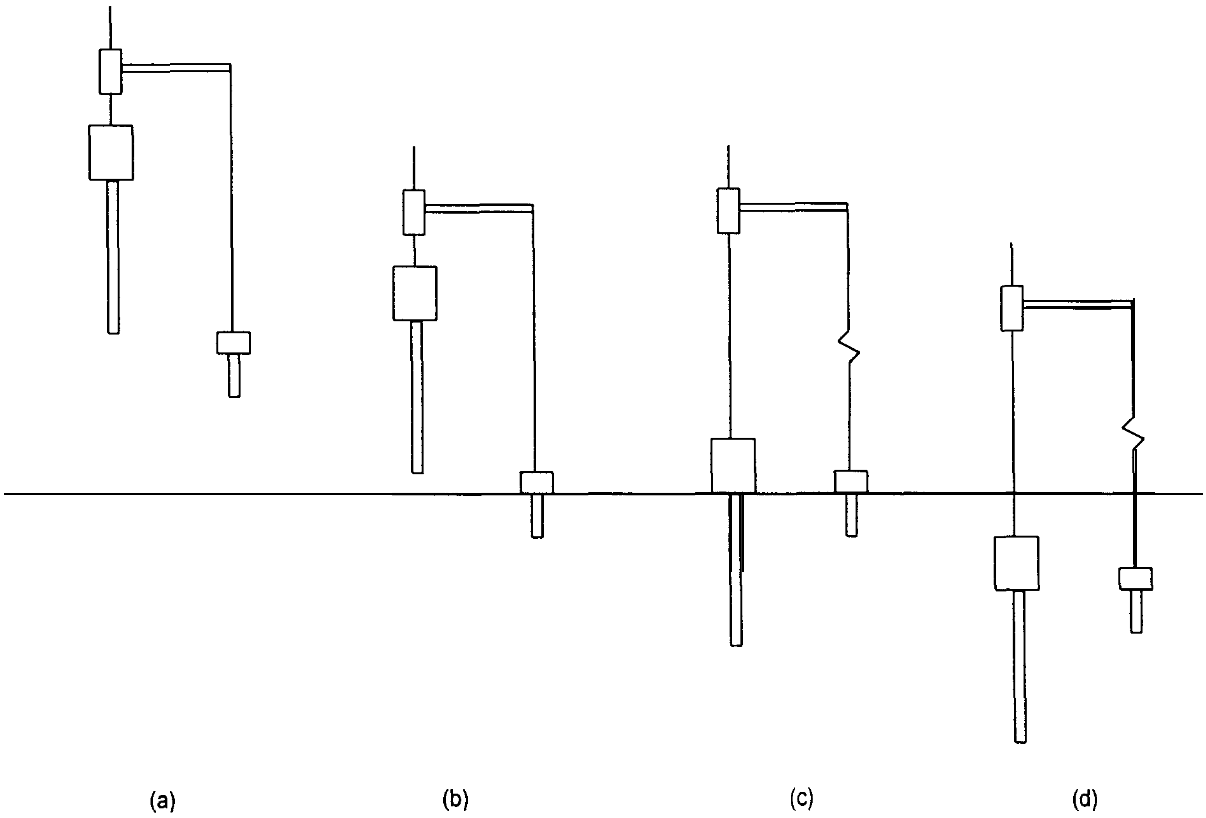
3.4 Deployment and Recovery Procedure

1) Remove all lashings and securing bolts.
2) Take the weight of the barrels on the davits.
3) Lower barrel support stands.
4) Support trigger (by hand) to prevent it fouling the ship's rail during the corer's movement to the vertical.
5) Move davits and corer bucket outboard.
6) Remove corer bucket safety latch.
7) Lower away on davits until the corer is vertical.
8) Latch the corer bucket in the vertical.
9) Slide davit chains down the barrels and retrieve chain and wire.
10) Remove safety chain from corer bucket.
11) Hold the trigger unit vertically on the head of the core bomb.
12) Take the weight of the corer on the main warp and rotate the trigger arm forward in order to attach the the pilot core.
13) Ensure that the wire clamp bolts on the trigger unit are secure (some movement may be gained as the wire diameter is reduced, due to the weight of the corer).
14) Attach trigger chain to side winch on midships gantry and lift the pilot core outboard.
15) Lower trigger chain and attach its top end to trigger arm.
16) Transfer pilot core weight to trigger arm and remove winch cable from it.
17) Deploy corer with midships gantry, zero wire when core head is at the sea surface.
18) Lower corer 50m below sea level and attach pinger.
19) Lower away at 60 m/min until the pinger is 100m above the seabed.
20) Wait a few minutes to allow wire to settle (pinger-seabed distance must remain the same)
21) Lower at 25 m/min until the corer has triggered (shown by the sudden decrease in load on the main warp).
22) Continue to pay out cable for a further 10 m.
23) Haul slowly (8 m/min) until pull-out is complete.
24) Haul to the surface (60 m/min) and remove pinger.
25) Reverse steps 15 and 14 and secure pilot core on deck.
26) Connect auxiliary wire to piston wire and transfer weight to the auxiliary wire.
27) Remove main warp from piston wire.
28) Haul on auxiliary wire via mooring winch until corer bomb is at ship's rail.
29) Reconnect main warp to head of corer bomb.
30) Slacken off auxiliary wire and recover corer through base of corer bucket.
31) Secure safety chain through core bomb to either side of the bucket.
32) Pass davit chains around corer barrels and lower to recovery positions.
33) Reverse steps 8 to 5 and 3 to 1.

3.5 Core site problems

Core 101 This being the first site, a 9 m corer was used. The deployment / recovery procedure was slow and numerous teething problems were encountered. These were resolved and led to the improved deployment / recovery procedure (as detailed above) being implemented for the rest of the core sites.

Figure 6 Schematic diagram of stages in corer entry into seabed. See text for discussion.



Core 102 During lowering, with 1750m of wire out, there was a sharp rise in outboard tension to 4 tonnes followed by an immediate drop to 1.3 tonnes; the tension then returned to 2.4 tonnes (weight of corer plus wire). It was thought this might have been a pre-trigger event, so the corer was recovered to the surface. All was well so lowering was re-started and the station continued.

After cores 101 and 102, the free fall wire length was experimented with in order to improve the core recovery. At most stations it was evident that the core bomb was being buried in the sediment, yet the cores being retrieved were not of the possible maximum length. Only after extending the free fall wire length to 2 m in excess of that recommended, did we achieve cores of 11 m and above (see Table 1).

It is not clear whether this, or a number of other factors (such as piston tightness, liner diameter or sediment type) were responsible for the improved core length. As can be seen in Fig. 6, when the corer is lowered from position (a) to the ideal triggering position (b) the corer will fall the free fall distance while the piston remains at the seabed surface(c).

Shortening the free-fall wire may result in the piston never reaching the seabed, i.e. water is drawn up inside the corer for several metres before mud is recovered. Lengthening the free fall wire would increase the potential distance the core could fall through the sediment before it comes to rest (in stiff sediment, or because it is being restrained by the piston). In this situation it is possible that the sediment would push the piston up the liner, rather than the piston remaining stationary on a taut wire as the corer descends. If the piston is a loose fit in the liner, it may be possible for the sediment to push the piston further up the liner thus giving a longer core sample.

It was also noted at some of the early sites that the sediments were very soft and case (d) could arise, where the pilot core travels farther into the sediment before the trigger is operated.

3.6 Winches and wires (DT, CJP)

The 30-Tonne Traction Winch was used to deploy the coring warp through the Midships gantry. The winch was normally operated at a speed of 60 m/min during corer lowering and raising, using 5 driven drums on the cobra. 6 driven drums were engaged during all pull-outs (8rn/min), and during veering in deep water in moderate weather conditions, when the dynamic load range exceeded 1 tonne. The speed to run the corer into the seabed was 60 m/min for gravity cores and 25 m/min for piston cores. The wire-out meter under-reads by about 1.5% compared with the corrected water depth obtained from the PES and Carter tables, i.e in a corrected depth of 3000 m, only 2955 m of coring wire is required to reach the seabed.

No defects or incidents occurred at core sites PC 10 1, PC 103, PC 104, GC 105, PC 109, PC 110, PC 111 or PC 113. At every station, however, back-tension alarms occurred when the winch was started or stopped (including changing gear). Back tension was frequently more than 1600 kg for several seconds at a time; the alarm value has been set at 1200 kg, which itself is more than the design value of 1000 kg.

During the recovery of core PC 102 a small gauge pipe fractured on storage pump No. 1. The winch was stopped and all pumps stopped. After a short period No. 2 set of pumps were restarted and the winch recommenced recovery of the equipment at half speed. The pipe was repaired and No. 1 set of pumps restarted before the equipment arrived on deck.

At sites GC106 and PC 107 a loud graunching noise was heard above the winch control room during the pull out stage. At PC 107 it was investigated, but no defects were found above the winch control room in any of the above-deck equipment. Later, during winch machinery inspection rounds, it was noticed that several riding turns had occurred in the centre of one layer on the storage drum; this did not affect the recovery.

On deployment at site PC 108, with 2694 m of wire out, a break in one braid of the coring warp was noticed. Luckily the broken section was still on the drum. The winch was immediately stopped and after an initial inspection the corer was recovered to the deck. After consultation with the Master, Chief Officer and Chief Engineer it was decided to remove the outboard part (approximately 3000 m) of the coring warp up to the damaged section. The ship remained on station, while the wire was led aft and pulled out on to the stern deck, using the powered rollers and manual hauling. The broken part came off the drum at 2997 m and came to after-deck level at 3 180 m. The break was cut out and the new end reterminated with a Tellurit splice and load-tested to 4 tonnes. The coring equipment was then redeployed to complete site PC 108, in 3601 m of water (corrected depth). This also gave the opportunity to see the amount of cable we had left; with 3530 m of wire out and the corer in the seabed, 46 turns (115 m) remained on the storage drum.

During the final stage of recovery at site GC 112, while the core head was being guided into the bucket, the traction winch ceased to veer. Any attempt to veer the winch, either from remote (winch-control room) or local control, resulted in it hauling slowly. This was a potentially dangerous situation, with the core head less than 1 m from the top sheave on the midships gantry. The complete winch system was shut down and restarted, after which the winch worked correctly in all control positions.

At site GC 114, the loud graunching noise recurred during pull-out, and it was immediately noticed that when 6-wheel drive was engaged to haul, the sixth wheel was not turning. This meant that the warp was being pulled through the V-profile sheave by the other 5 drums, under conditions of maximum outboard tension. The winch would veer correctly using 6-wheel drive. Local control was selected and the same thing happened. The winch was then switched to four wheel drive and functioned correctly when commanded; it was then switched back to six wheel drive and then operated correctly in haul and veer.

3.7 Conclusions and recommendations

1) **The replacement of the 30-Tonne traction winch must be considered as a matter of urgency.** The breakage of one of the three strands of the coring wire, and the sudden failure of the winch to operate in haul, were both **potentially dangerous situations.** If the wire had broken on deck, serious injury to personnel might have resulted. Neither the wire breakage nor the control failure can be attributed to our use of the coring equipment; they resulted from the poor design of the traction winch system.

2) What particular setup procedures produce the best results in different sediment types is still unclear. It may be that the idealised piston coring method is not actually occurring, and a form of triggered gravity corer is in effect giving the longer core samples.

3) Problems removing the catcher from the pilot core were encountered. This was caused by the difficulty of gripping the catcher, which was inside the end of the barrel. Only by removing the flap valve at the top of the pilot core and pushing the liner out from this end was it possible to remove the catcher.
A simpler means of removing the catcher needs to be looked at.

4) As the barrels of corer are very close to the ships rail, the support stands which were used were difficult to position on the deck matrix. In future an adjustable stand which could be located on the ship's rail would be a great advantage.

Table 1 Core stations (JAH, AMT)

Core number	Location -	Water depth (corrected)	Time on station	Corer length/ chain length	Free-fall coil	Recovery	Comments
PC 101	63° 05.7'W 65° 30.8'S	2930m	1210-1800/081	9m / 13.7m	6.1m (0.6m extra*)	PC 6.6m TC 1.2m	Drift 1, on CD37-s12
PC 102	64° 35.2'S 69° 24.8'W	2787m	1115-1630/082	12m / 18.3m	7.7m (0.6m extra)	PC 9.4m TC 0.9m	Drift 4, proximal; ODP Rise-05, on IT1 14
PC 103	66° 48.4'S 75° 56.8'W	2941m	1720-2040/083	12m / 18.3m	8m (0.9m extra)	PC 9.4m TC 1.2m	Drift 6, proximal, ODP Rise -03; intersection of IT109/ IT138
PC 104	65° 9.2'S 77° 22.6'W	3832m	0300-0645/084	9m / .13.7m	**7.5** (1.8m extra)	PC 5.6m TC 1.1m	Distal Drift 6, ODP Rise-04, on IT136
GC **105**	65° 42.5'S 77° 31.5'W	3986m	0955-1255/084 3	6 m	--	4.9m	Distal Drift 6
PC 106	66° 18.8'S 76° 58.7'W	3662m	0305-0715/085	12m / 18.3m	6.0m (1.1m less)	PC 9.3m TC 1.0m	Drift 6, central ; on IT138
PC 107	65° 54.0'S 72° 39.9'W	3080m	2210/085- 0230/086	12m / 18.3m	7.0 (0.1 m less)	PC 8.4m TC 1.2m	Drift 5, proximal, on IT130B

Core number	Location	Water depth (corrected)	Time on station	Corer length/ chain length	Free-fall coil	Recovery	Comments
PC 108	65° 42.0'S 73° 38.1'W	3601m	0615-1650/086	12m / 18.3m	7.0 (0. lm less)	PC 9.2m TC O.lm	Drift 5, distal, on D172 Line 20
PC 109	65° 14.5'S 70° 20.0'w	2729m	1255-15501087	12m / 18.3m	9.0 (1.9m extra)	PC 1l.Om (2m fell out on deck) TC 1.2m	Drift 4B, proximal
PC 110	65° 08.8'S 70° 35.3'W	3025m	1640-2000/087	12m / 18.3m	9.0 (1.9m extra)	PC 7.7m TC 1.2m	Drift 4B, distal
PC 111	64° 19.0'S 70° 26.2'W	3357m	1750-2045/088	12m / 18.3m	9.0 (1.9m extra)	PC 11.1m TC1.2m I	Drift 4, distal, on IT114
GC 112	64° 41.03 70° 32.5'W	3337m	0020-0325/089 6	m	--	5.4m	Drift 4, distal, ?mass flow deposits
PC 113	63° 27.3'S 68° 58.O'W	3552m	1655-2000/089	12m / 18.3m	9.0 (1.9m extra)	PC 10.8m TC 1.2m	Distal Drift 3, near CD37-S13
GC 114	62° 56.0'S 62° 07.O'W	772m	1255- 1405/090 6	m	--	3.4m	Boyd Strait, east of Smith Island

* Lengths extra to or less than those given in Driscoll(l977)

Table 2 continued

4. OTHER EQUIPMENT

4.1 3.5KHz Sub bottom profiler (MP)

Attention is drawn to previous JCR cruise reports as all that can be said about this equipment has been said before. This piece of equipment is relatively out-of-date on a modern scientific vessel such as the *James Clark Ross.* It suffers from poor initial design and build quality, incomplete documentation and an incomplete set of spares.

Although in most circumstances the 3.5 kHz produces acceptable analogue data, a number of irritating faults persist. A power amplifier or transducer fault has persisted for several years. The power of the output pulse produced is controlled by a rotary switch on the power amplifier. If the power is increased to -6db or above, a monitoring circuit inside the amplifier shuts the unit down indicating a transducer mis-match. This situation could arise for two reasons: (1) A fault in the mis-match detection circuitry, or (2) A genuine mis-match. The necessary information on the specification of the transducers and the setup of the mis-match circuitry is not available, so a diagnosis is not possible. Due to the importance placed on the equipment an experimental approach has not been adopted, as it would be easy to damage the equipment further. With poor documentation and incomplete spares available this situation may result in the equipment being rendered inoperable, which is obviously undesirable in the middle of an expensive science cruise. For this reason no further attempt has been made to repair the equipment and bring the available power output back up to original specification, for fear of inflicting further damage.

One effect of the complex programming sequences required to optimise the analogue record at different water depths, is that the horizontal scale changes at several of the vertical scale changes: the 6-minute time marks (2.2 km at 12 knots) can vary from 22 to 38mm apart, while the vertical scale remains 305mm : 500m.

Apart from a change of styli in the Raytheon line scan recorder, the 3.5 kHz profiler worked to the limit of its ability for the duration of the cruise. The transducer fish was deployed between core sites 112 and 113, but did not work. Although it could be heard transmitting on deck, it returned no signal at all in the water. It was therefore recovered.

4.2 10 kHz Precision Echo Sounder. (MP)

All the comments levelled at the 3.5 kHz profiler about spares, build quality, documentation and design are also true of the PES only more so. This equipment is more complex and has more controls, therefore it operated in an even more illogical, temperamental manner. Some of the controls interact with each other. For instance the 'Array depth' control has a subtle but definite effect on the sequence of the gating. These two controls should be entirely independent of each other. Again limitations in the documentation and 'fear' of making things worse have prevented investigation.

The above aside, the PES provided a bathymetric record for the duration of the cruise, except for a 2-hour period during the first passage south when the bottom echo was lost in bad weather (aeration under the hull). The hull transducer was used most of the time; the fish was deployed between core sites 101 and 102, and 112 and 113. The cable fairings on both fish are in a very poor state, some sections missing completely. New fairing is needed urgently.

4.3 Ocean Logger

The ocean logger was run all the time we were at sea, recording temperature from the uncontaminated seawater supply. The only problem arose when the No. 2 seawater pump tripped out on day 09 1, and was not noticed for several hours.

4.4 Magnetometers PM)

STCM

One of the aims of JR1 9 was to investigate the performance of the BAS Shipboard Three Component Magnetometer (STCM) at high magnetic latitudes. Unfortunately the instrument suffered a catastrophic failure during the course of cruise JR18 from which it never properly recovered. At the start of JR19, Mark Preston investigated the instrument and found that the stabilised power supply to the fluxgate unit was not working. By replacing this with a standard laboratory power supply it proved possible to get some sort of response. The detector was remounted, during the first call to Rothera, in a new position on the rail immediately above the UIC room. This minimised the distance to the new power supply in the UIC room itself.

Subsequent performance was very variable. Periods of reasonable-looking data which correlated well with the proton magnetometer record were interspersed with long periods of noise (Fig. 8). The vertical (Z) axis appeared to be the most affected. One calibration loop was carried out (day 87,2001-2021) to provide some sort of correction for the detector in its new position. In view of the overall poor performance of the instrument, however, it was not considered worth while expending a lot of time and effort in calibrating it rigorously. The data acquired appear to be of little real value.

A new fluxgate detector unit is needed, and a complete rebuild of the instrument is imperative. The new model must be housed in a permanent mounting, rather than the lightweight temporary setup currently in use.

Proton Magnetometer

The performance of the RVS supplied type V75 magnetometers on the preceding cruise (JR18) was abysmal. Everything broke down with monotonous regularity. In contrast the same systems back in use a week or so later on JR19 gave very little trouble and recorded good quality data. The weakest link in the system is the connection between the inboard and outboard cables at the cable reel. On the previous cruise, this connector was frequently opened in order to rewind the cable on to the reel and clear the stem deck. For JR1 9 it was always left intact and protected from the weather, except for the three occasions on which the ship berthed.

The magnetometer ran for almost all of the cruise with the exception of the approaches to Rothera (ice) and some very short legs between core sites. On day 090 the electronic unit broke down. Judging by the temperature and smell some component burnt out. The replacement was substituted and continued to work satisfactorily for the remainder of the voyage.

These magnetometer units are getting very old, and trouble-free operation cannot be guaranteed. A replacement system is certainly overdue. Ideally this should be permanently mounted on the ship with its own dedicated (and powered !) cable reel.

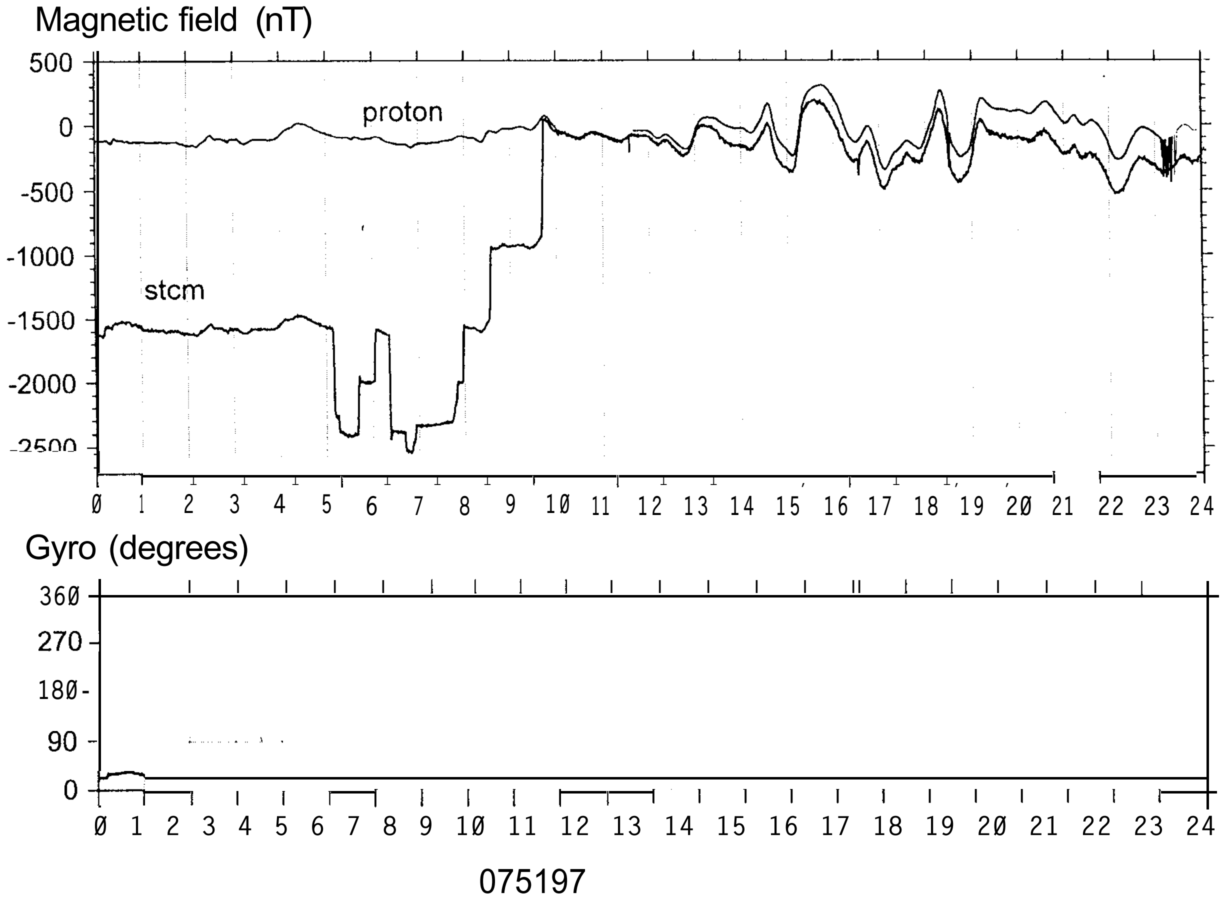


Figure 7. Comparison of data from the proton (towed fish) magnetometer and the STCM for the 24-hour period 0000-2400/075/97. The STCM tracks the proton data for much of the time, but is also affected by large and unpredictable offsets (times 05 10). From 1130-2400 there is a small and gradually increasing offset. Lower plot shows the ship's gyro reading, which varied hardly at all during this period.

5. WATER SAMPLING FOR PLANKTONIC FORAMINIFERA (RVD, TJP)

5.1 Introduction

Eight sites were sampled for live planktonic foraminifera from surface waters. The specimens were requested by Dr K Darling (Department of Earth Sciences, University of Edinburgh) for her DNA-based studies of the genetic relationships between extant species of planktonic foraminifera.

5.2 Methods

Specimens of planktonic foraminifera were collected from the ship's uncontaminated sea water supply to the wet laboratory. The seawater intake is located under the hull approximately 6m below the surface. The Ocean Logger monitors the temperature of the uncontaminated supply, which is automatically recorded at one minute intervals, and logged on the Level ABC system along with navigational parameters. This water is passed through a coarse filter near the intakes to remove items B1.500 microns.

Water was run continuously, to ensure that samples were fresh and not from residual water in the system. The flow rate is not monitored in the laboratory, but an approximate rate was measured at 8l/min. The supply was filtered through -500μ and 63μ screens, and the latter was used for the for-am collections. The collection procedure was as follows:

i) The time (GMT) and navigational position was noted at the commencement and end of each period of sieving, the durations of which varied from -20 to 150 minutes (depending on the abundances anticipated).

ii) The residue from the 63μ sieve was washed with fresh sea water into a plastic petri dish. (Sieve was back-washed, brushed and ultra-sound cleaned between samplings)

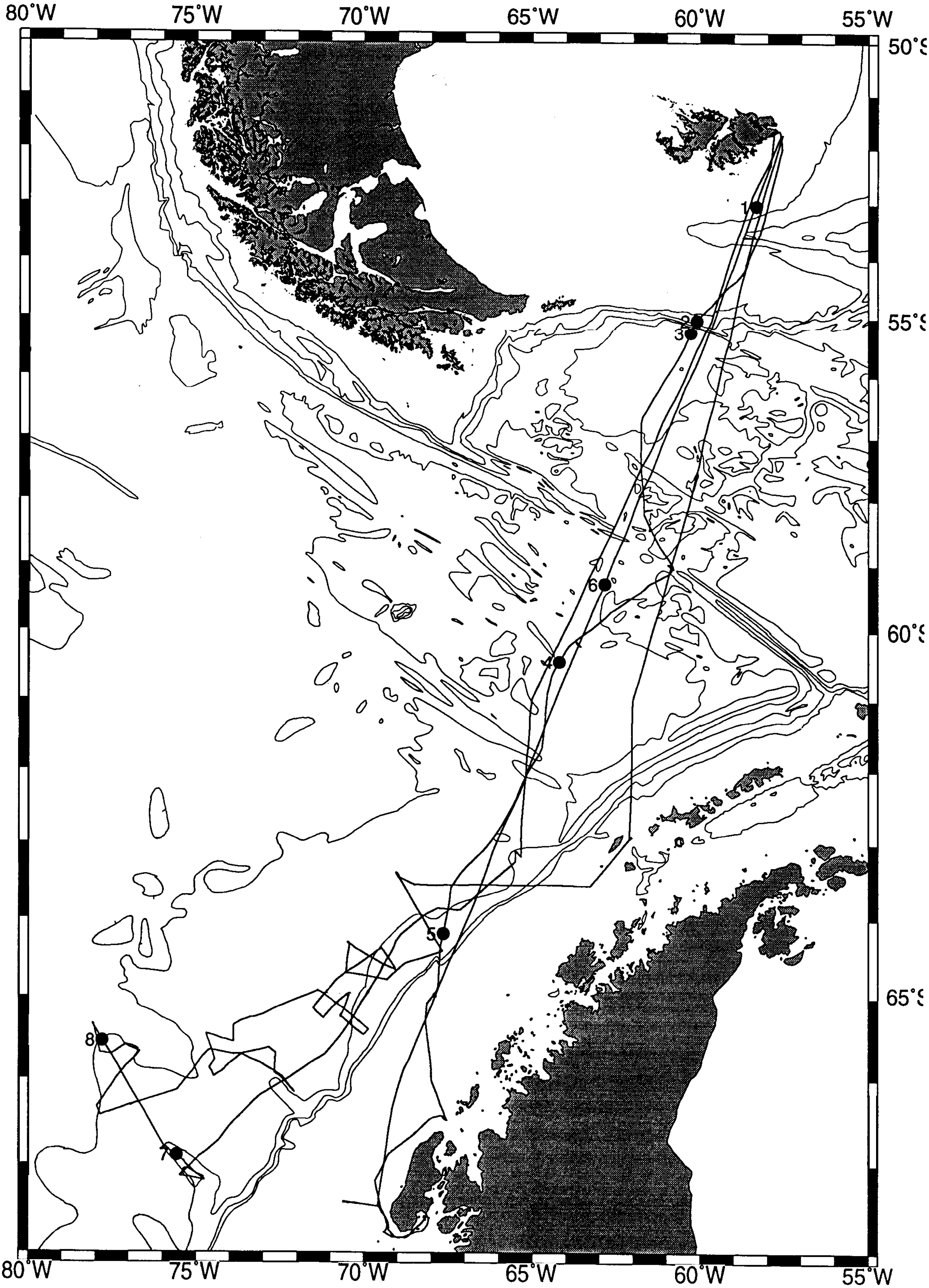
iii) The suspended residue was filtered onto a Millepore disk using a low-powered vacuum pump. Filtration was terminated while the residue was still visibly moist and was used merely to concentrate the suspensate.

iv) The filter paper was returned to the petri dish and the mush was examined under a low powered binocular microscope. Planktonic foraminifera were extracted using a fine camel hair picking brush into a watch glass, which contained a small quantity of fresh sea water.

v) The contents of the petri dish were then examined and identifications of various species made. At this stage a fine needle was used to move specimens around. This technique allowed the spinosity, colour and coiling directions to be determined more readily (it was extremely difficult to do this in the filter mush against the white background of the Millepore disk). It was also found to be the most practical way to deal with heavy rolling of the ship and vibrations of the field of vision (e.g. it was found impracticalto work with the brush in the watch glass preparation).

vi) Individual specimens were extracted into prepared 0.5ml screw top micro-vials containing 30μl of lysis buffer solution using the fine needle tip (from a syringe: a bent tip was found to be the most efficient shape to scoop specimens from the swaying meniscus). The average time elapsed from end of sieving to immersion in the fixer was -10-l 5 minutes, and the specimens were never allowed to dry during this time.

Figure 8. Foram sample locations. Bathymetry at 1000m intervals. →


80°W
75°W
70°W
65°W
60°W
55°W
50°S
55°S
60°S
65°S
1
2
3
4
5
6
7
8

vii) Each specimen was then crushed using a fine glass rod with an expanded tip. The glass rods were thoroughly cleaned using 1M HCl and fresh tap water after each operation.

viii) The vials and contents were cured in an oven at 60°C for one hour and then placed in a freezer at -20°C for long-term storage.

Because of practical difficulties in coping with heavy seas, and with tight time constraints, two people were needed to complete the whole operation in a coordinated fashion. RVD undertook the microscope work and TJP the vial handling, note taking and specimen crushing.

The composition of the lysis buffer agent supplied by Dr Darling was made up of dilute quantities of : Tris, EDTA, Triton X-100 and Na Deoxycholate.

5.3 Results

Eight sites were occupied at positions selected to sample various water masses and geographical localities. A total of 72 vials were frozen, containing 73 forams (vial 72 contained two specimens considered identical, but otherwise, rather than risk mixing different species and varieties, each vial contained a single specimen). Figure 8 shows the geographical localities of sites, Figure 9 the sites plotted against surface water temperature and latitude, and Table 2 the identities, specimen colours and coiling direction of *Neogloboquadrina pachyderma.* Coiling directions are quoted in relation to the apical view.

Three species of planktonic foram were recognised: *Globigerina bulloides, Globigerina quinqueloba* and *Neogloboquadrina pachyderma,* but only *N. pachyderma* was found south of the Polar Front. The number of specimens of forams at each site was not noted, except for the southern-most two sites (7 & 8), where they were particularly sparse (1 specimen/l 20 1, and /24 1, respectively). In addition, the species diversity at sites to the north of the Polar Front is only crudely represented by the ratio of specimens preserved and should not be taken as having any statistical significance.

The overriding consideration in the microscope work was care to prevent contamination, and the need to work quickly to prevent specimens drying. In additional, ship's motion often inhibited orientation of specimens under the microscope and safe transfer to the vials (the operators were frequently in rapid motion themselves!), while the small size of many of the specimens, relatively low magnification power of the microscope, and specimen motion militated against identification.

A summary of results:

Site I. Closest deep water to the Falkland Islands: the Falkland Trough (~1000m). Here *we* found left and right *coilingpachyderma,* abundant *bulloides,* and one *?quinqueloba.* We did not record colour at this site.

Site 2. Along the southern edge of the South American continental shelf: Burdwood Bank. Here we found abundant *pachyderma* (probably only left coiling) and *bulloides.* Test colour was a mixture of red and brownish green.

Site 3. A deep oceanic location adjacent to the continent, but well to the north of the Polar

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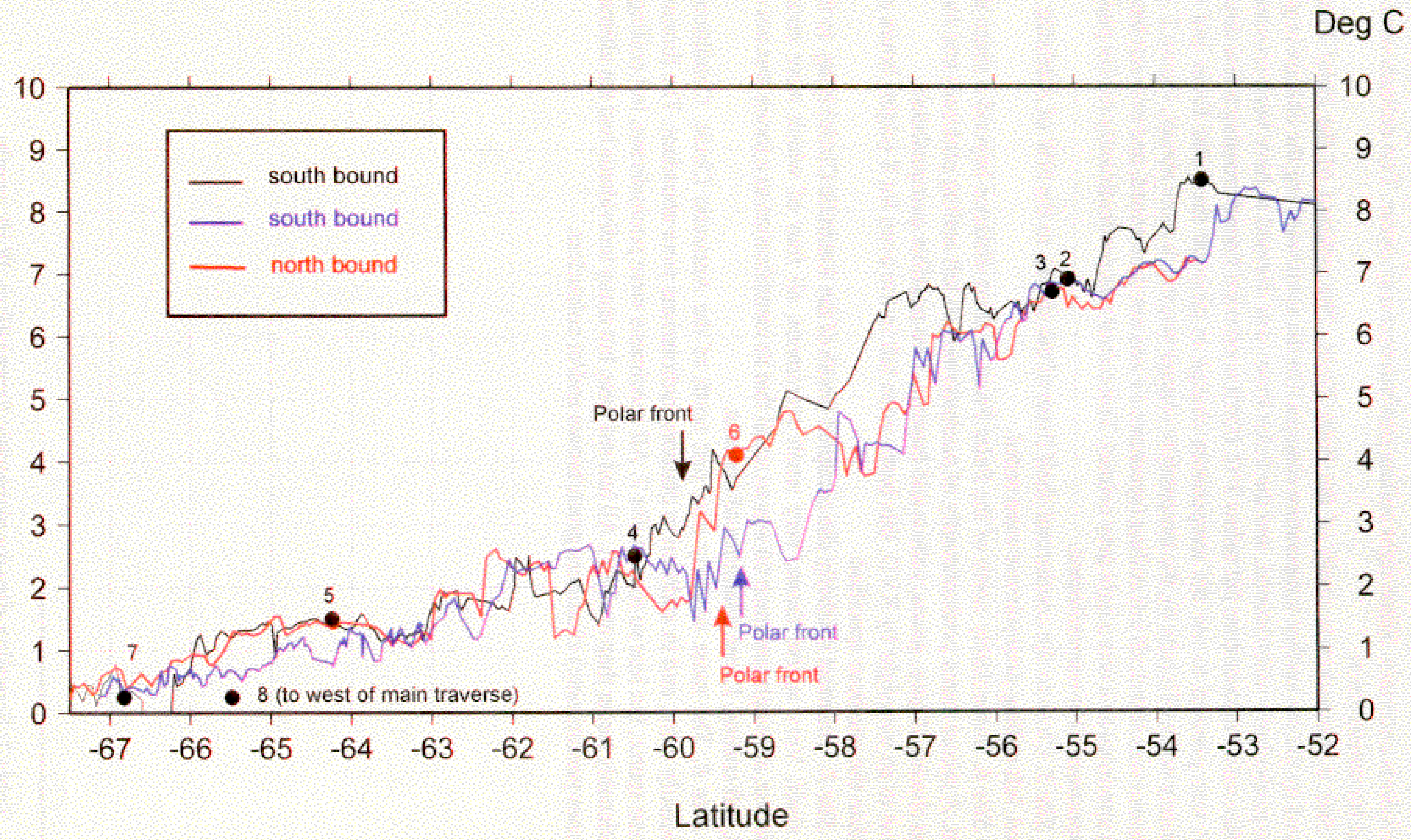
Figure 9. Temperature profiles from JR19 crossings of Drake Passage, with foram sample locations.



Deg C
south bound
south bound
north bound
Polar front
Polar front
Polar front
8 (to west of main traverse)
Latitude

Front: south of Burdwood Bank. A mixture of all three species, though identification of *quinqueloba* is uncertain. Some right coiling *pachyderma* may occur. Test colours were mixed reds and brownish/green.

Site 4. Immediately south of the Polar Front. The position of the Polar Front was monitored by the sea surface temperature changes. On the southward leg the change in gradient was not particularly well-defined, and the Polar Front was deemed to have been crossed when the surface water temperature fell below 3°C. (On a northward bound crossing a few days later, when it was planned to use the temperature change to pinpoint the Polar Front and sample immediately north of it (site 6), the temperature change was much more abrupt, Figure 2: .). Only *pachyderma* was found, all left coiling (specimen 33 was not determined, and may not have been a living specimen as it was a light grey colour). Test colour was predominantly red (or pink). One green specimen (37) was collected.

Site 5. Close to the continental shelf (base of the slope), to the NW of Adelaide Island. Only red, left coiling *pachyderma* were noted.

Site 6. Immediately north of the Polar Front, a short distance beyond a sharp thermal gradient. A mixed fauna predominantly of *pachyderma* (all left coiling pink/red) and *bulloides* (various shades of grey, green, yellow and brown). Two possible *quinqueloba's*.
NB. Due to an oversight by RVD, this batch were left in the oven for 8 (eight) hours at 60°C rather than the one hour specified.

Site 7. The most southerly site occupied (south of the Antarctic Circle) lying to the west of the shelf. Very sparse fauna, very small specimens, all four of which were considered *pachyderma,* although specimen 66 was so small that its identification as a foram was not certain. All red, left coiling. Large quantities of diatoms.

Site 8. The most westerly site, just north of the Antarctic Circle. Conditions were exceptionally calm, and in addition to diatoms, radiolarians were abundant. The foraminiferal fauna was sparse, but less so than at site 7. All specimens were *pachyderma,* left coiling, small (but noticeably larger than at site 7). All had red tests, but many individuals had the ultimate (and sometimes penultimate) chambers green/brown and/or colourless.

Table 2: Sampling sites for planktonic foraminifera, JR19 -->
All times are GMT; n/n = not noted.

Site No.	Time/date	Location			Temp.	~Vol (l)
1-	2032-2052/067/97	Centre of Falkland Trough			8.5 C	160
		53°21.5'S, 58 20.1'W to 53° 25'S, 5822.1'W'				
Sample No.	**Specimen**	**Spinose**	**Coiling**	**Colour**	**Comments**	
1	*pachyderma*	no	right	n/n		
2	*bulloides*	yes		n/n		
3	*pachyderma*	no	n/n	n/n		
4	*bulloides*	yes		n/n		
5	*bulloides*	yes		n/n	possibly empty test	
6	*?quinqueloba*	yes		n/n		
7	*pachyderma*	no	right	n/n		
8	*bulloides*	yes		n/n		
9	*bulloides*	yes		n/n		
10	*bulloides*	yes		n/n		

Site No.	Time/date	Location			Temp.	-Vol (l)
2	09 17-0940/068/97	Southern edge of Burdwood Bank			6.9 C	184
		55°01.4'S, 60°05.6'W to 55°03.6'S, 60°08.3'W				
Sample No.	**Specimen**	**Spinose**	**Coiling**	**Colour**	**Comments**	
11	*pachyderma*	no	left	green		
12	*pachyderma*	no	left	green		
13	*bulloides*	Yes		n/n		
14	*pachyderma*	no	n/n	red		
15	*pachyderma*	no	left	red		
16	*pachyderma*	no	left	brownish/green		
17	*pachyderma*	no	left	brownish/green		
18	*pachyderma*	no	left	n/n		
19	*bulloides*	yes		n/n		
20	*pachyderma*	no	left	n/n		

Site No.	Time/date	Location			Temp.	-Vol (1)
3	1109- 113 l/068/97	South of Burdwood Bank			6.7 C	176
		55°14.1'S, 60°16.7'W to 55°16.9'S, 60°18.9'W				
Sample No.	**Specimen**	**Spinose**	**Coiling**	**Colour**	**Comments**	
21	*I uachvderma*	no	left	red		
22	*bulloides*	yes		brownish/green		
23	*pachyderma*	no	n/n	pink		
24	*pachyderma*	no	left	red		
25	*pachyderma*	no	left	red		
26	*pachyderma*	no	?left	reddish/green		
27	*bulloides*	yes		n/n		
28	*?quinqueloba*	yes		n/n		
29	*bulloides*	yes		reddish		
30	*pachyderma*	no	?right	n/n		
31	*bulloides*	yes		brownish/green		
32	*pachvderma*	no	left	n/n		

ite No.	Time/date	Location			Temp.	~Vol (1)
4	0739-0809/070/97	Just south of Polar Front			2.5 c	240
		60 25.3'S, 64 10.1'W to 60 28.7'S, 64 14.3'W				
ample No.	Specimen	Spinose	Coiling	Colour	Comments	
3 3	*pachyderma*	no	n/n		?living	
34	*pachyderma*	no	left	red		
35	*pachyderma*	no	left	red		
36	*pachyderma*	no	left	red		
37	*pachyderma*	no	left	green		
38	*pachyderma*	no	left	red		
39	*pachyderma*	no	left	pink		
ite No.	Time/date	Location			Temp.	~Vol (1)
5	1535-1608/071/97	Base of slope, N. of Adelaide Island			-1 5c	264
		64 08.4'S, 67 37.2'W to 64 13.5'S, 67 39.7'W				
ample No.	Specimen	Spinose	Coiling	Colour	Comments	
40	*pachyderma*	no	left	red		
41	*pachyderma*	no	left	red		
42	*pachyderma*	no	left	red		
43	*pachyderma*	no	left	red		
44	*pachyderma*	no	left	red		
45	*pachyderma*	no	left	red		
46	*pachyderma*	no	left	red		
47	*pachyderma*	no	left	red		
48	*pachyderma*	no	left	red		
49	*pachyderma*	no	left	red		
50	*pachyderma*	no	left	red		
ite No.	Time/date	Location			Temp.	~Vol (1)
6	0518-0554/076/97	Just north of Polar Front			4.1 c	288
		59 21.5'S, 62 54.1'W to 59 13.2'S, 62 47.6'W				
ample No.	Specimen	Spinose	Coiling	Colour	Comments	
51	*bulloides or*	yes		grey/brown		
	quinqueloba					
52	*pachyderma*	no	left	pink		
53	*pachyderma*	no	left	pink		
54	*bulloides*	yes		grey		
55	*bulloides*	yes		grey/brown		
56	*?quinqueloba*	yes		yellow/green		
57	*bulloides*	yes		u/n		
58	*ipachyderma*	no	left	red		
59	*pachyderma*	no	left	red		
60	*bulloides*	yes		yellow/grey		
61	*bulloides*	yes		yellow/grey		
62	*bulloides*	yes		greylgreen		
		*Sample 6 **left** in oven at 60 Cfor 8 hours instead of I hour*				

5.1 Other surface water samples (CJP)

Near most of the core sites, samples were drawn from the ship's uncontaminated seawater supply and filtered, in order to compare the living plankton assemblage with that found in core tops. One 5 litre sample was taken for the total plankton assemblage, then a sieve was set under the seawater tap for half an hour to collect the larger phytoplankton (diatoms) and zooplankton (radiolarians, foraminifera, dinoflagellates, pteropods etc.). Both total and > 63μ samples were filtered through polycarbonate membrane filters of 0.4μ pore size. The filters will be examined by scanning electron microscopy at BAS.

Table 3. Surface water samples

No	Type/ vol	Time	Start	position	End	position	Comments
1	5 l	0050/071	62°30.4'S	65°36.5'W			Drift 1
2	>63μ	0050-0120/071	62°30.4'S	65°36.5'W	62°33.0'S	65°39.7'W	
3	3.5 l	1445/071	64°00.4'S	67°33.5'W			Drift 3
4	>63μ	1445-1515/071	64°00.4'S	67°33.5'W	64°05.2'S	67°35.6'W	
5	3 l	1835/081	63°11.1'S	65°29.9'W			Drift 1
6	>63μ	1835-1905/081	63°11.1'S	65°29.9'W	63°15.4'S	65°32.9'W	
7	3 l	1725/082	64°42.4'S	69°32.6'W			Drift 4
8	>63μ	1725-1756/082	64°42.4'S	69°32.6'W	64°46.8'S	69°39.0'W	
9	5 l	2240/083	66°29.9'S	76°23.2'W			Drift 6
10	>63μ	2240-2310/083	66°29.9'S	76°23.2'W	66°24.8'S	76°30.0'W	
11	4 l	1748/084	65°41.3'S	77°27.2'W			Drift 6
12	>63μ	1748-1818/084	65°41.3'S	77°27.2'W	65°37.9°S	77°14.8'W	
13	4 l	1808/085	65°55.1'S	72°37.8'W			Drift 5
14	>63μ	1808-1838/085	65°55.1'S	72°37.8'W	65°58.3'S	72°26.1'W	
15	3 l	0015/087	65°32.4'S	73°58.4'W			Drift 5
16	>63μ	00 15-00451087	65°32.4'S	73°58.4'W	65°29.9'S	73°52.9'W	
17	4 l	2036/089	63°29.9'S	68°44.5'W			Drift 3
18	>63μ	2036-2106/089	63°29.9'S	68°44.5'W	63°32.6'S	68°31.6'W	
19	5 l	1410/090	62°55.8'S	62°07.2'W			Smith I.
20	>63/.1	141 o- 1440/090	62°55.8'S	62'07.2'W	62'49.6%	62'06.6'W'	

6. DATA LOGGING (PM)

The *James Clark Ross* is equipped with an RVS type ABC data logging system.

'Level A' are the special interface units which link individual instruments to the system.
'Level B' is the central tape and disk storage system on which the data is recorded.
'Level C' is a suite of software for extracting and manipulating data from the level B store.

6.1 Level A performance

During the cruise most level A instruments performed well. The only real problems encountered were with the Ashtech and Glonas GPS systems. These tended to 'drop out' from time to time and fail to return. In the case of the Ashtech the level A unit simply needed to be reset. The Glonas situation was more complex in that a PC needed to be connected to the Glonas receiver each time to command it to start transmitting to level A again. One 'master clock jump' took place which required a general reset of all level A units.

6.2 Level B

The following instruments were logged to level B:

Instrument	Mnemonic	Parameter	Logging Freauencv
Trimble	gps_nmea	position	30 sec
Glonas	gps-glos	position	1 sec
Ashtech	gps-ash	position, pitch and roll	1sec
TSSHRP	tssrp	pitch and roll	2 sec
Simrad 500	sim500	water depth	2 sec
Gyro	gyro	direction	1 sec
EM log	em-log	speed	2 sec
Doppler log	dop-log	speed	1 sec
Proton magnetometer	magnet	magnetic field	1 min
STCM	stcm	magnetic field components	1 sec
Anemometer	anemom	wind speed/direction	1 sec
Ocean logger	oceanlog	water parameters	30 sec
Winch	winch	winch data	15 sec

Level B Performance

At the start of the cruise the level B disk and tape storage system was completely rebuilt (by DJR). Although the system seemed to run rather warm this did not appear to affect its performance. No obvious problems were found with either level B hardware or software during JR19.

6.3 Level C

Level C format data files were created for all of the Level B data streams. In addition some extra data files were produced:

bestnav, bestdrf position and drift velocities calculated using program 'bestnav'. The preferred positions are those from Glonas, with Trimble and Ashtech used as secondary and tertiary sources.

relmov the relative motion of the ship (velocities N and E) from gyro and em log.

promag90 subtracts IGRF from proton magnetometer data. The 1990, rather than the latest, 1995, set of coefficients are used.

rawdep, prodep Water depths from the PES were manually input into the level C data file 'rawdep'. These were then Carter corrected using the program 'prodep' to produce the file 'prodep'.

6.4 Data Archiving

The Level B data are stored on fifteen 150 Mbyte data cartridge tapes (type DC6 150).The data on these (after a 2048 byte tape header) is in ASCII. The level C data, which is in binary, has been downloaded to Exabyte using the Unix 'dump' command.

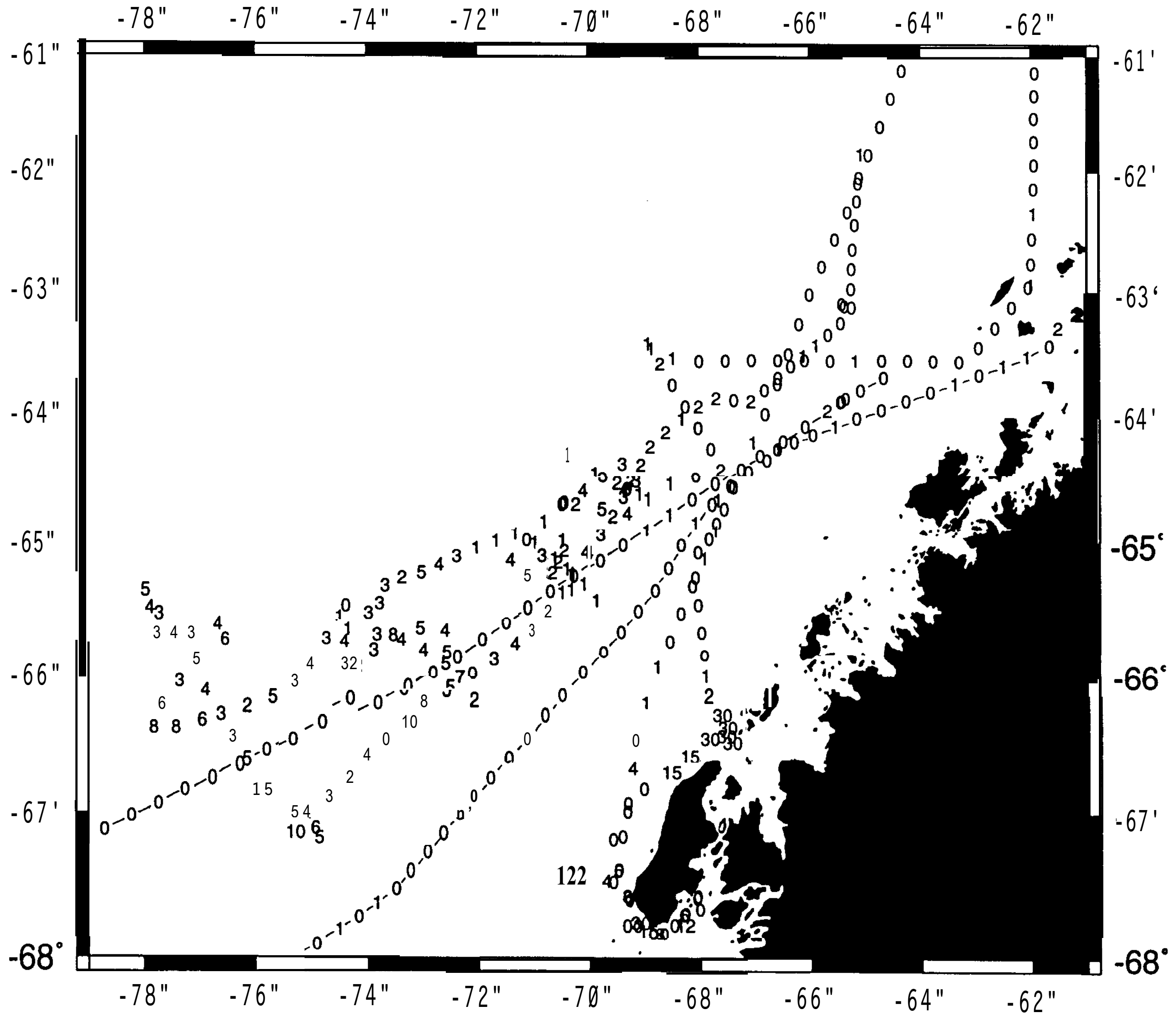
The essential track line data for the cruise has been collected together into an MGD77 format data file (JR19_97.mgd77). This is a standard and widely used (ASCII) format for geophysical data archival and exchange. A preliminary version of the file was generated using the level C 'mgd77' command. This was, however, nonstandard in several respects (e.g. no end of line characters and variable column widths) and needed further editing. The magnetic and bathymetric data on the file were examined using the Geosoft Oasis editor and corrected/ despiked as appropriate. New magnetic residual anomalies were recalculated using the latest (1995) version of the IGRF before the magnetics and bathymetry were written back into the final version of the MGD77 file.

7. ICEBERG OBSERVATIONS (Bridge/CJP)

The sediment drifts will be drilled by the ODP ship SEDCOBP 47 1 in the 1997-8 season. Because the drillship will spend several days at each site attached to the seabed by a drillstring, drifting ice presents a potential hazard. During JR19 we took the opportunity to collect the iceberg observations made by the watchkeeping officers on the bridge, and plot them along track. Once per hour, the number of of icebergs visible as targets on the 12-mile range on the radar, from abeam to ahead of the ship, was recorded in the ship's log. Subsequently we also collected the equivalent observations made during two tracks of JR04 in the area.

The results are shown in fig. 9. In 1997 there were very few bergs north of 65°s. South of 65°S, there were normally 3 to 8 bergs visible on half the 12-mile radar range; this is equivalent to 1 berg in every 75 to 28 square miles. In 1993 there were very rarely more than 1 or 2 bergs visible.

Figure 9. Iceberg numbers along track. The JR04 tracks are shown by the dotted lines.



8. CRUISE STATISTICS (CJP)

Total cruise time, Stanley to Stanley	25.7 days
Station time	
Coring + dismantling/rebuilding	2.1 days
Equipment downtime (wire)	0.3 days
Survey and passage time	
Part I, Stanley - Rothera - Stanley (Including Rothera and Stanley port calls)	11.5 days
Part II, passage (north of 62°S)	4.7 days
Part II, survey (south of 62°s)	7.1 days
Underway data collection	
10 kHz PES	19.2 days
3.5 kHz profiler	19.2 days
Ocean logger	21 days
Towed magnetometer	18.4 days
STCM	19.5 days

9. CREW LIST (SM)

Officers

Christopher Elliott	Master
John Harper	Chief Officer
Brian McJury	2nd Officer
Andrew Wallis	3rd Officer
John Summers	Deck Officer
Stephen Mee	Radio Officer
David Cutting	Chief Engineer
William Kerswell	2nd Engineer
Robert Caldwell	3rd Engineer
Robert McAskill	3rd Engineer
Douglas Trevett	Deck Engineer
Norman Thomas	Electrical Officer
Kenneth Olley	Catering Officer
Christopher Lowe	Cadet

Crew

Robert Watson	Bosun
Colin Lang	Bosun's Mate
Jonothan Dodd	Seaman
Albert Bowen	Seaman
George Dale	Seaman
David Watson	Seaman
David Taylor	Seaman
Sydney Smith	Motorman
Bruce Smith	Motorman
Daniel McManamy	Chef
Alistair McAdam	2nd Chef
Robert Heeney	2nd Steward
David McLean	Steward
Lee Jones	Steward
Tracey MacAskill	Steward

Scientific Party

Carol Pudsey	BAS Geoscience (PSO)
Richard Dingle	” ”
John Howe	” ”
Mark Lavelle	” ”
Peter Morris	” ”
Andy Tait	” Mechanical Engineer
Mark Preston	” Electronics Engineer
Dave Richmond (Part I only)	” Computer Engineer
Christopher Rymer	RVS Mechanical Engineer
Anne Polkey	BASMU (Doctor)
Steve Moreton	CASE Student
Tracey Paramor	CASE Student

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