

**I.O.S.**

TO: I.O.S. (13)  
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RRS DISCOVERY  
CRUISE 133

22 - 27 FEBRUARY 1983

INSTRUMENT AND EQUIPMENT TRIALS

CRUISE REPORT NO. 142  
1983

NATURAL ENVIRONMENT  
INSTITUTE OF OCEANOGRAPHIC SCIENCES  
RESEARCH COUNCIL

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INSTITUTE OF OCEANOGRAPHIC SCIENCES

WORMLEY

R.R.S. DISCOVERY

CRUISE 133

22 - 27 February 1983

Instrument and equipment trials

Principal Scientist

J.S.M. Rusby

Cruise Report No.142

1983

CONTENTS

	<u>Page</u>
Itinerary .. .. .	1
Scientific Personnel .. .. .	1
Ship's Officers .. .. .	1
Objectives .. .. .	2
Summary of Ship's Log .. .. .	3
Project Reports:	
1. Trial deployment of the new 3-strand tapered warp .. .. .	5
2. Deployment and operation of the multiple RMT 1+8 net system .. .. .	5
3. Deployment and operation of the OTSB 14 otter trawl at 5000 metres .. .. .	6
4. Testing of monitors plus near-bottom echo sounders for the RMT 1+8 net and towed survey camera .. .. .	6
5. Trial of the 3.5 kHz high resolution reflection seismic sonar .. .. .	7
6. Trial of the precision echo sounder tracker (PEST) .. .. .	7
7. Trial of the sonar platform and sidescan sonar .. .. .	8
8. Development and testing of geophysics programmes for the PDP 11/34 computer system .. .. .	8
Acknowledgements .. .. .	9
Track chart .. .. .	10

## ITINERARY

Departed Lisbon 22nd February 1983

Arrived Lisbon 27th February 1983

## SCIENTIFIC PERSONNEL

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M.P. Burnham	I.O.S.
E.P. Collins	I.O.S.
E. Darlington	I.O.S.
R.H. Edge	I.O.S.
C.G. Flewellen	I.O.S.
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C. Jackson	R.V.S.
Miss D. Jones	R.V.S.
G.V. Lodge	I.O.S.
P. Mason	R.V.S.
N.R. Merrett	I.O.S.
H.S.J. Roe	I.O.S.
J.S.M. Rusby - PSO	I.O.S.
R.M. Sharpington	I.O.S.
R.A. Wild	I.O.S.
Professor L. Saldanha	University of Lisbon

## SHIP'S OFFICERS

S.D. Mayl	Master	P.J. Byrne	2nd Engineer
A.L. Moore	Chief Officer	C.J. Phillips	3rd Engineer
J.K. Seymour	2nd Officer	G.L.R. Parker	4th Engineer
A.R. Louch	3rd Officer	N. Davenport	5th Engineer
F. Dunning	Fishing Skipper	T.J. Comley	5th Engineer
M. Taperell	Radio Officer	P. Higginbottom	Purser
D.C. Rowlands	Chief Engineer	P. Sharpe	Electrical Officer

## OBJECTIVES

The purpose of the cruise was to test deck equipment and new warps near the start of the annual cruise period, to develop handling techniques and to fish 'midwater' and trawl nets at oceanic depths, and to test certain new instruments and their associated telemetry including applications of the near bottom echo sounder or altimeter systems at sea. The tasks undertaken included:

1. Trial deployment of the new 3-strand tapered warp to 5000 metres using a 2-ton weight as end load,
2. Deployment and operation of the RMT 1+8 multiple net system at 5000 metres,
3. Deployment and operation of the OTSB 14 otter trawl at 5000 metres,
4. Testing of monitors plus near-bottom echo sounders for the RMT 1+8M net and towed survey camera,
5. Trial of the 3.5 kHz high resolution seismic reflection sonar,
6. Trial of the precision echo-sounder tracker (PEST),
7. Trial of the sonar platform and sidescan sonar,
8. Development and testing of geophysics programmes for the PDP 11/34 computer system.

This was the first time that a trials cruise had been programmed to depart from Lisbon and for the work to be carried out in the nearby Tagus Abyssal Plain. The region proved ideal for this type of exercise; an extensive area of deep water in excess of 5000 metres was available within 100 miles of the port of Lisbon, and the lower latitudes of 37-38°N gave good weather over the five-day period. During the period strong winds were blowing in the south west approaches to the British Isles as a succession of depressions moved north-east, and it would not have been possible to complete the required work in that area.

SUMMARY OF SHIP'S LOG

Tuesday 22nd February 1983

- 08.00 Preparing vessel for sea.
- 10.48 Let go (slack water high).
- 11.48 Passing North Channel. 12.07 Pilot left off Cascais.
- 12.24 Commenced passage, passing south of shipping lanes.
- 14.30 - 15.25 Streamed PES and 3½ kHz fish. Position 38°32'N, 9°52'W, proceeding NW.
- 16.15 B.O.T. drill.
- 17.22 Position 38°43'N, 10°07'W. A/C 210°T at 8 knots.
- 20.04 Reduced to 6 knots, course 210°. Testing 3½ kHz fish. 38°22'N, 10°28'W. Wind 190° / 15 knots. Low swell. Fine and clear.

Wednesday 23rd February 1983

- 07.13 Hove to for winch trials. Position 37°26'N, 11°07'W.
- 09.40 Side-scan sonar deployment tested.
- 10.15 Two ton weight over on 3-strand wire - lowered to 5100 m.
- 15.18 Weight inboard. Preparing fishing gear. Wind 160° / 15 knots. Overcast with drizzle. Swell 290°/8 secs/4 ft.
- 20.08 - 21.05 Tested net overside.
- 22.45 Position 37°36'N, 10°55'W (Station 10651) Experimental shoot of Multiple RMT net. Heading SSW at 2 knots.

Thursday 24th February 1983

- Net at 5000 m, experimental winch control from Plot. Net 100 m off sea bed.
- 08.10 Fog. Vessel detected on collision course. Net closed, commenced hauling.
- 11.17 Net inboard. Position 37°15'N, 11°16'W. A/C 040° at 8 knots. Wind 180° / 12 knots. Mist/fog. Swell 130°/4 secs/2 ft.
- 13.47 Position 37°27'N, 11°01'W. A/C 220°. Speed 1½ knots. Shooting bottom trawl.
- 21.07 Trawl on bottom at 5100 m. 37°09'N, 11°17'W. 13,881 m wire out.
- 22.22 Trawl off bottom. 37°06'N, 11°20'W (Station 10652).
- 23.15 Hauling.

Friday 25th February 1983

- 03.45 Net on surface, recovering. Mist turned to rain, visibility improved.  
05.17 All inboard. Position  $36^{\circ}57'N$ ,  $11^{\circ}34'W$ . Set course  $037^{\circ}$  at 8 knots.  
08.13 Hove to.  $3\frac{1}{2}$  kHz fish recovered.  $37^{\circ}15'N$ ,  $11^{\circ}17'W$ . Wire tests on midships winch of survey camera. Wind  $220^{\circ}$  / 15 knots. Swell  $240^{\circ}$  / 8 secs/5 ft.  
16.16 B.O.T. drill.  
19.17 Finished test.  $3\frac{1}{2}$  kHz fish streamed. Course set  $031^{\circ}$ , full speed. Various personnel reported sick during the day.

Saturday 26th February 1983

- 03.39 Position  $38^{\circ}22'N$ ,  $10^{\circ}22'W$ . Reduced speed to 8 knots. A/C  $029^{\circ}$ ,  $3\frac{1}{2}$  kHz test.  
06.46 Reduced to 2 knots. Side-scan sonar platform lowered. Increased to 8 knots.  
08.31  $38^{\circ}57'N$ ,  $10^{\circ}05'W$ . A/C  $270^{\circ}$ .  
09.00  $38^{\circ}57'N$ ,  $10^{\circ}10'W$ . A/C  $010^{\circ}$ .  
10.00  $39.03'N$ ,  $10.08'W$ . A/C  $193^{\circ}$ . Wind  $270^{\circ}$  / 15 knots. Swell increasing.  
13.02  $38^{\circ}40'N$ ,  $10^{\circ}17'W$ . Side-scan platform retracted. Resumed course.  
14.56  $38^{\circ}22'N$ ,  $10^{\circ}21'W$ . Hove to for wire tests.  $3\frac{1}{2}$  kHz fish recovered. Swell  $290^{\circ}$  / 10 secs/20 ft.  
19.26 - 22.00 Tested camera to 4954 m.  
22.24 PES fish in, proceeding towards Lisbon.

Sunday 27th February 1983

- 05.00 Arrived off Tagus Bar.  
05.35 Proceeding inwards.  
07.00 Pilot boarded off Belem Tower.  
08.00 Berthed Sta. Maritima da Rochas.

S.D. Mayl, Master.



## PROJECT REPORTS

### 1. Trial deployment of the new 3-strand tapered warp

This 8000 metre-long warp was deployed to 5000 metres using a 2-ton steel weight as the end load, in preparation for the following geophysics cruise (No. 134) where it will be used with the Driscoll corer and other instruments. No problems were experienced in veering and hauling the warp through the traction winch system. The 50-metre long tapered sections had been carefully laid-up by the manufacturer, British Ropes Ltd., and gave no indication of strain as the marked sections passed over the twin drums. Much lower deck loads were recorded compared with the parallel 18-strand warp. It was noticeable that, when hauling, the vertical part of the warp outboard of the ship was rotating, suggesting that the warp was not fully torque-balanced. However no rotation was observed as it crossed the poop deck and traversed the traction winch, and no residual torque was experienced on the storage drum. During this test the modified accumulator system, designed to maintain a constant tension between the traction unit and the storage drums, was tested under sudden stop/start conditions involving winch speeds in excess of 1 m/s. At no time during the tests did the inboard warp tension fall below 150 kgf or show any tendency to jump off the sheaves. Some traction drum bolts worked loose during the test and it was arranged for these to be welded in place in Lisbon and for two pairs of shear plates to be welded on each drum side.

(R.H. Edge, M.P. Burnham and J.S.M. Rusby)

### 2. Deployment and operation of the multiple RMT 1+8 net system

The multiple midwater trawl (RMT 1+8M) was fished on this cruise to:

1. Ascertain whether the recent modifications to the davit and winch would facilitate net handling,
2. To test a new near-bottom echo sounder (altimeter) fitted to the net monitor to enable trawling to be carried out near the sea bed, and
3. To attempt to fish at greater depths than hitherto possible off 'Discovery'.

All three objectives were successfully accomplished.

The increased torque on the crane davit allows it to slew, even when the nets are open, a marked improvement on our experiences last summer. The new jockey wheel on the hauler gives better control of slack wire but it seems probable that some manual assistance here will always be necessary.

The near-bottom echo sounder worked perfectly whilst the nets were open and hauls were made at a height of about 80-100 m off the bottom in a depth of 5110 m. Net height was controlled in the Plot by the watchkeeper using a remotely operated winch control circuit.

The nets were successfully operated at a depth of 5000 m with a maximum 6-strand warp length of 10482 m. This greatly exceeds the previous operational depth of this net system and allows us to plan future deep water sampling with some confidence.

(H.S.J. Roe)

### 3. Deployment and operation of the OTSB 14 otter trawl at 5000 metres

The semi-balloon otter trawl (OTSB 14) was operated successfully on the bottom in 5112 m soundings. This resulted in the deepest sample so far collected with this gear. The method of deployment devised by the Fishing Skipper, for this first operation using the Schat crane davit and a single A-frame, was to pay out the doors on their 50 m bridles initially from the auxiliary winch. Two lengths of wire, of sufficient length to reach the davit from the A-frame, were connected to the inboard end of the bridle passing through the A-frame on the port side. A single wire of similar length was attached to the starboard bridle. This rig facilitated the transfer of both bridles to the main warp at the davit. The operation went smoothly and 13,800 m of the tapered 6-strand warp was paid out for the net to take the bottom. Grounding was observed clearly, despite the range, from signals telemetered by the monitor mounted on the trawl door. Recovery of the gear, some 14 hours after shooting, was also accomplished satisfactorily. The catch from 78 minutes of towing on the bottom produced 39 fish representing 7 species. This gave a relative catch per unit area of 0.1 kg/1000 m<sup>2</sup>, which is consistent with results from similar depths in other areas with this net.

(N.R. Merrett)

### 4. Testing of monitors plus near-bottom echo sounders for the RMT 1+8 net and towed survey camera

The RMT 1+8M acoustic telemetry and control system was tested during the deployment of the net to 5000 m and operated correctly. However, it was necessary to increase the transmission blanking time on the near-bottom echo sounder (altimeter) to overcome the increased reverberation of the acoustic transducer in the new reflector. This resulted in the minimum echo sounding range being increased from 10 to 25 metres.

A new towed survey camera monitor was completed and tested in the water on six occasions. The first four tests were devoted to checking the performance of the monitor and near-bottom echo sounder, and the last two were made with a complete system including the modified Benthos camera, a single flash unit and a new flash detector. The difficulties in overcoming minor teething problems were aggravated by faulty new Brantner connectors.

(M.J. Harris and E. Darlington)

5. Trial of the 3.5 kHz high resolution reflection seismic sonar

During the last cruise on which this system was used, there was a problem with the Raytheon transceiver. It was found that the maximum power setting of 2 kW could not be used without the load mismatch indicator coming on and shutting down the output. It was thought that the problem lay in the square wave drive to the transducers. A low pass filter capable of handling 2 kW was designed and tried during the cruise with complete success. The system was run, with the correlator in circuit, on a number of occasions during the cruise over a variety of sea floor types.

(D.G. Bishop)

6. Trial of the precision echo sounder tracker (PEST)

The tracker worked immediately after being switched on but was found to be displaying a 6-metre offset. Eventually the cause of this error was discovered and corrected. An addition was made to the program so that up to two consecutive missing echoes would be ignored and so would not produce a step in the tracking window position. Although the system performed well, there remain two areas of difficulty:

1. During a gating sequence the transmission is correctly ignored, but the tracker drifts during muted sweeps,
2. Lag in the tracking filter means that depths are displayed several metres too deep on upward sloping bottoms and too shallow when the bottom is falling.

(C.G. Flewelling)

## 7. Trial of the sonar platform and sidescan sonar

Following the last minute installation of the sonar platform prior to Cruise 132, it was found that there were problems in the azimuth control and indicator circuits. These faults were investigated on Cruise 133 and were found to be due to earthing faults and sea water contamination of a connector on the unit junction box. The system was operated during the latter part of the cruise in the side-scan mode using the one 30 kHz transducer array fitted on the starboard plate. Overall performance was satisfactory although there is evidence of under-correction of the plate stabilisation system during heavy roll conditions, due in all probability to hysteresis in the gyro unit. The array was also used with the correlator, and the pod retracted, in the horizontal position to act as a narrow beam echo sounder. Depths of 5000 m were recorded without any difficulty at speeds up to 10½ knots in good sea conditions.

(E.P. Collins and D.G. Bishop)

## 8. Development and testing of geophysics programmes for the PDP 11/34 computer system

Two programmers and one engineer were on board to prepare the new computer configuration on 'Discovery' for geophysics. The previous cruise had not really used the second computer except as a convenient development machine for scientists' programmes.

The software work covered:

1. Establishment on computer discs of geophysics programmes prepared on shore and transported by tape.
2. Merging of work done during the previous cruise where this was relevant, e.g. depth entry.
3. Configuration of the logging computer to collect magnetics, gravity, depth (manual entry), navigation and meteorology.
4. Initialising whole cruise files on the processing computer, previously untested at full size because lab. discs are not big enough. Tested at seven day length but up to 30 days should be possible.
5. Transfer of logged data from the logging computer into cruise files on the processing computer. Many difficulties were experienced here, not with the transfer but with access to the data on the files.
6. Testing previously written processing routines with data collected at sea. This was delayed and not completed because of the difficulties mentioned above.

7. No work was done on plotting final navigation or geophysics profiles because of lack of time.
8. A utility was written for examining the data on the cruise files.

The hardware work covered:

1. Overhaul of disc drive 1 on the logging computer. This had been giving trouble on the previous cruise.
2. Connection of magnetometer and gravimeter to the logging computer, and running test programmes to ensure that the data was not corrupt. A software modification was made to accept increased accuracy from the magnetometer.
3. Reconnection of the meteorological instruments and testing the values received at the computer.

Operational points:

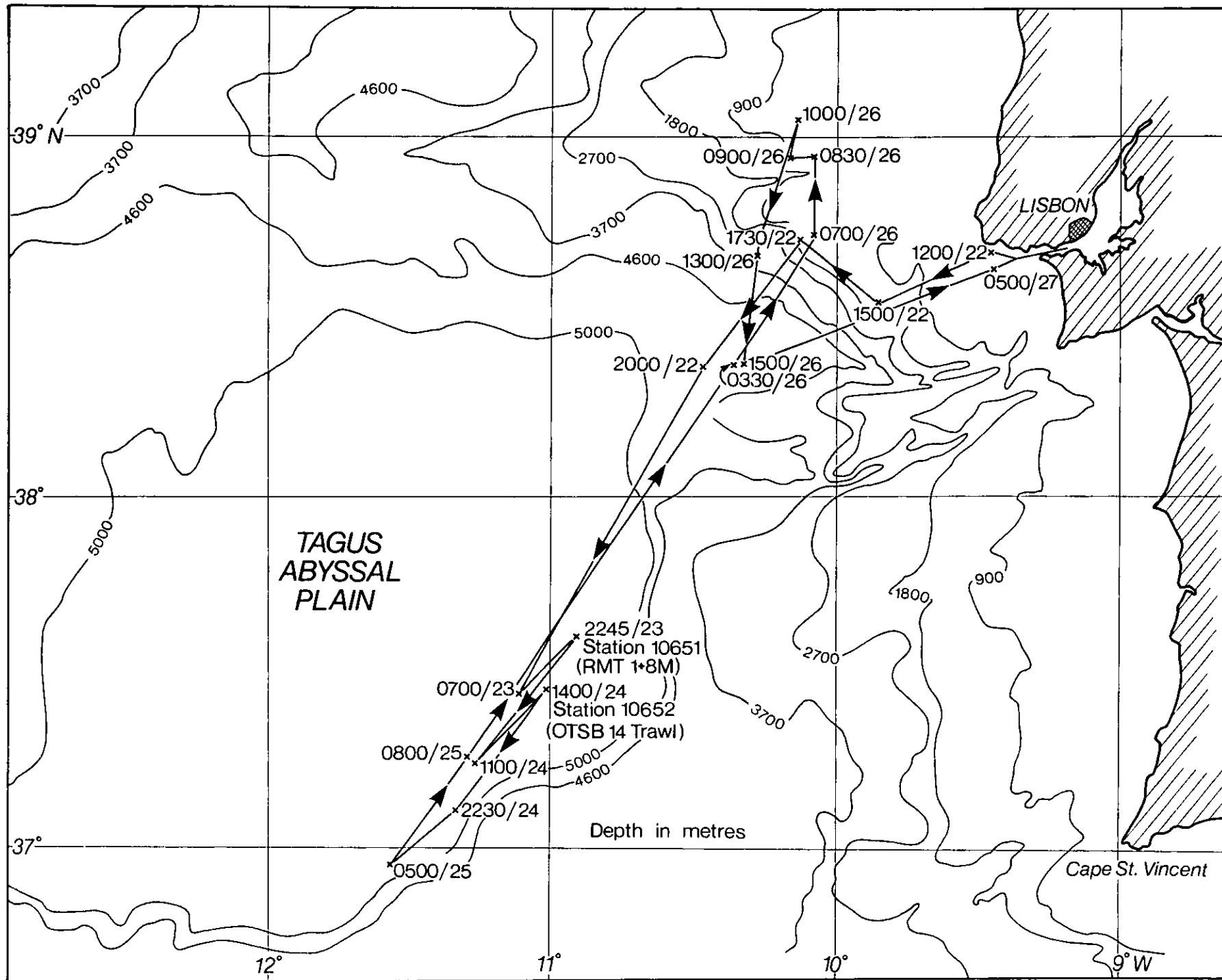
1. Both computers were run continuously for the duration of the cruise.
2. Navigation and meteorology were logged except during hardware testing periods. The data was archived to 'SeaSoar' style tapes but was not processed except to test processing programmes on the processing computer. Automatic course update was the only navigation updating done.
3. We did not use the magnetometer since we were not really ready for it. Instead we used a software programme to generate typical magnetic field values at logging rate. These were logged and transferred to the processing computer to test magnetics processing.
4. A similar technique was used for gravity because the engineer felt that the gravimeter needed the attention of a specialist from RVS before it was switched on.
5. The error log of the processing computer was analysed on the last evening and showed no hardware or software errors had occurred during the cruise. The logging computer did not have the analysis programme available but its log showed no errors.

(C. Jackson, Miss D. Jones and P. Mason)

#### ACKNOWLEDGEMENTS

Thanks are due to the Master, officers and ship's company for their co-operation in making this short cruise so productive. We are also grateful to Frank Dunning for his practical help in establishing a safe and expeditious way of deploying the deep otter trawl from a strange fishing vessel.

It was a great pleasure to have Professor Luis Saldanha from the University of Lisbon on board, and we are grateful for his help during the deep net trials.



**TRACK CHART OF CRUISE 133**