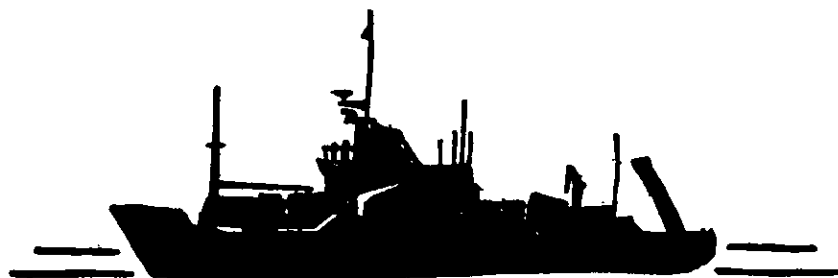
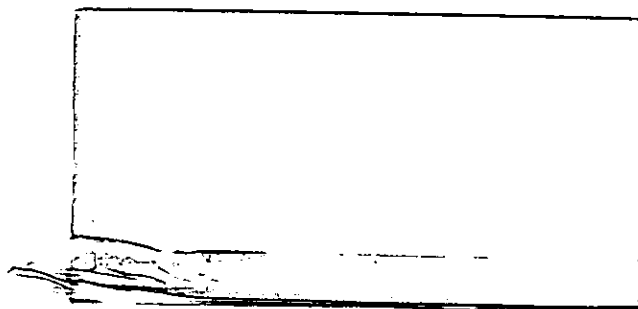


Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory



CRUISE REPORT



S.M.B.A., P.O. Box No. 3, Oban, Argyll, Scotland.

Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory

Cruise Report

R.R.S. Frederick Russell

Cruise 18/1987

27 August - 19 September 1987

R.R.S. Frederick Russell, Cruise 18/1987

- Duration of cruise: 1010h 27 August - 0818h 19 September 1987
All time GMT.
- Locality: Irish Sea, Scottish continental shelf,
Faroe Bank and Wyville-Thomson Ridge.
- Staff:
- | | |
|-------------------------------------|--------------------|
| D.J. Ellett | |
| R. Bowers | (1 Sep. - 19 Sep.) |
| Dr. J.M. Graham | |
| C.R. Griffiths | |
| N. MacDougall | |
| P.E. Bradley (SURRC, East Kilbride) | (27 Aug. - 1 Sep.) |
| J. Robson (MAFF, Lowestoft) | (27 Aug. - 1 Sep.) |
- Aims:
- 1) To recover MAFF current meter moorings U, W and X in the eastern Irish Sea and make a bathymetric survey in the vicinity.
 - 2) To work a 25-hour sampling station in the vicinity of the MAFF mooring sites.
 - 3) To obtain Craib corer samples at six positions between Wigtown Bay and Sellafield.
 - 4) To work CTD sections across the Scottish continental shelf between the North Channel and Cape Wrath, with radiocaesium sampling for MAFF, SURRC and Harwell upon a number of sections.
 - 5) To service the SMBA current meter mooring in the Tiree Passage.
 - 6) To lay current meter moorings to the west of the Wyville-Thomson Ridge (N1 and N2) to monitor Norwegian Sea inflow ('Blue Skies' project).
 - 7) To work CTD sections around the inflow area and across Faroe Bank to examine the water mass exchange and circulation of the region. ('Blue Skies' project).

Narrative: FREDERICK RUSSELL was berthed in the inner part of Troon harbour and was able to sail at 1010h 27 August, three hours after low water. The ship laid stopped off the port from 1045 to 1130h to allow a blocked fuel jet to be cleared and then proceeded to Wigtown Bay for a line of core samples, worked between 1953h and 0026h 28 August. Lowestoft moorings W, U and X were checked overnight and recovery of X began at 0726h. All three were inboard by 1050h and a bottom topography survey in the vicinity was carried out until 1650h.

CTD lowerings on the hour and water-bottle casts on the half-hour were made over 25h from 1800h until 1906h 29 August. The ship proceeded to the North Channel, initially at reduced speed to enable the metering gear for hydrowire winch barrel to be dismantled for repairs. Station 12 off Copeland Island was begun at 0146h 30 August and the six stations of this section completed at 0652h. After collecting surface samples at the Larne-Stranraer midway position the ship stopped briefly for an unsuccessful test of the metering gear and resumed course for the Antrim-Kintyre section, worked between 1020 and 1343h.

In continuing fine, clear and quiet weather, FREDERICK RUSSELL steamed to the west coast of Islay and began section D at 1802h. The westernmost station was completed at 0140h 31 August. Winds freshened from the south to forces 6-7 during the steam to the shelf-edge at station 16G, reached at 0900h, but had fallen calm by 0212h 1 September when station 1 G was completed off Ardmore Point. Mooring Y in the Tíree Passage was recovered between 0702 and 0715h, and relaid at 0823 to 0831h, after which the ship steamed for Oban, berthing at the North Pier at 1200h.

After a partial exchange of staff and gear FREDERICK RUSSELL left Oban at 1634h and steamed for the Butt of Lewis via the Minches. The Butt was reached at 0606h 2 September and section M, running northwestwards, was begun at 0700h. A moderate swell slowed progress, and with a weather forecast which precluded the passage to Farøe Bank, the section was broken off at 1330h shortly after completing station 6M. Easterly winds, though strengthening, permitted work in the North Minch and sections from Eddrachillis Bay to Broad Bay and from Loch Seaforth to Gairloch were made between 2050h 2 September and 1040h 3 September, when station 8K was completed. Southeasterly winds of force 8 made it impossible to work the final station of the section in restricted waters, and the ship ran to Broad Bay, where she anchored at 1407h. Southerly winds of forces 8-9 continued throughout 4 September, but began to moderate during 5 September, and at 2000h the ship set course for the Butt of Lewis and deep water in order to test acoustic releases and glass floats for the current meter moorings. Testing to depths of 1000m was satisfactorily carried out between 0630 and 1437h 6 September in a moderating swell and light winds, and after a sounding run across the proposed sites of the two moorings, these were successfully deployed between 1858 and 2006h. CTD sections across the basin between the Wyville-Thomson and Ymir Ridges were begun at 2213h and continued until 2100h 7 September, when strong winds and swell and the need to investigate bad interference in the CTD records stopped work. The weather improved during the forenoon of 8 September and CTD sections recommenced at 1045h, by which time a fault on a CTD board had been rectified and generator repairs had been completed by the ship's engineers. During 9 September CTD work in the eastern basin was completed and a section from the deep water on to the southern flank of Farøe Bank was begun. Wind and swell increased during the day and at 2012h course was set for the Farøes. The ship berthed at Tórshavn at 0749h 10 September to take on fuel, water and supplies. Visits were exchanged between the Fiskiransóknarstovan and the ship.

FREDERICK RUSSELL sailed from Tórshavn at 0838h 11 September in quiet and fine weather and steamed westwards to work the section across the Farøe Bank Channel and NE Farøe Bank.

The wind became southeasterly, force 7 in the evening, and with a forecast of a prolonged period of gales, work stopped after reaching the bank crest. The ship ran for shelter, anchoring in Lopransfjord, Sutheroy, at 0411h 12 September. Winds continued at forces 8-9 throughout 13 September and by 1304h 14 September had veered northerly, necessitating a change of anchorage to Vaagsfjord nearby. Towards the end of this day winds had begun to slacken and at 0604h 15 September the ship weighed anchor. Work began upon the SE Faroe Bank section at 1148h and continued across the crest of the bank to the NW section, which was completed at 0450h 16 September. Course was set for the western bank section, but during the forenoon the southerly winds reached force 9 with an increasing swell. By the end of the day it became apparent that work in this area would not be possible during the remaining available time, and it was decided to dodge towards the Scottish coast on such southerly courses as could be made. With winds up to 50kt little progress was made during the morning of 17 September, but as winds became westerly more speed was possible, and FREDERICK RUSSELL rounded the Butt of Lewis at 2232h. Surface salinity and radiocaesium samples were collected en route from the shelf-edge.

Continuing westerly gales precluded work off the north coast or to the west of Lewis, so the ship proceeded to the Little Minch where the Loch Dunvegan to Loch Maddy section was worked from 0439h 18 September, followed by the Loch Boisdale - Loch Bracadale - Loch Moidart section which was completed at 2245h. FREDERICK RUSSELL berthed at the Railway Pier, Oban at 0818 19 September, and after discharging scientists and gear, sailed for Barry at 1000h.

Results

Aim 1)

MAFF current meter moorings U, W and X were recovered successfully on 28 August. Details are given in Table 1. A bathymetric survey was made of the area around the mooring sites during 1127 to 1650h on the same day, using the PES mk3 and hull transducer. Courses were steered along Decca Navigator lanes at 8kt. using the Decca plotter, providing sounding lines at approximately 45° to the previous Lowestoft surveys.

Aim 2)

A 25-hour station of CTD lowerings alternated with water-bottle casts to obtain suspended load and particle size samples was occupied in the vicinity of the site of mooring U from 1800h 28 August to 1906h 29 August.

Aim 3)

Four good cores were obtained from positions between Wigtown Bay and Sellafield for the Scottish Universities Research and Reactor Centre (SURRC) on 27-28 August. Sand from a fifth site was preserved, but the bottom proved too hard to sample at a sixth position.

Aim 4)

Details of CTD sections worked across the Scottish continental shelf are given in Table 3. Radiocaesium samples for MAFF were taken at standard positions between the shelf-edge and the Sound of Mull (section G) and between Larne and Stranraer (station LS).

Samples for intercalibration between MAFF and SURRC were collected at G1, G2 and LS, and SURRC radiocaesium samples were taken upon sections Z, A, D, K and northwest of the Butt of Lewis. Surface radionuclide and sedimentation samples were collected for Dr. W.A. McKay of the UKAEA Environmental Division at a selection of stations on sections A, G, M, L and between the shelf-edge and the Butt of Lewis.

Warmest surface temperatures (14.4°C) were encountered in the Atlantic water west of Islay (Figure 2a). Nearshore waters were well-mixed and at about $12.5 - 13.0^{\circ}\text{C}$. Salinity in the coastal current rose from close to 34.0×10^{-3} in the North Channel to 34.7×10^{-3} in the North Minch (Figure 2b).

Aim 5)

SMBA current meter mooring Y, in the Tíree Passage, was recovered and redeployed on 1 September. The retrieved current meter had provided good data of 123 days' duration since its deployment on 1 May, and gave a mean residual current over this period of 4.92 km day^{-1} towards 349°T .

Aim 6)

The two moorings laid to monitor Norwegian Sea deep water inflow to the Rockall Trough were deployed on 6 September at positions given in Table 2, after a short survey of depths in this section of the channel leading westwards from the Wyville-Thomson Ridge. Mooring N1 was placed in the axis of the channel at a depth of 1115m, with two current meters at 20 and 171m above the bottom. N2 was positioned on the southern flank in a depth of 710m with three current meters at 20, 171 and 440m above bottom. A north-south CTD section made across the moorings (Figure 3) shows the lower four meters to be positioned in overflow - derived waters at this time.

Aim 7)

Between 6 and 9 September CTD sections were made across the basin lying between the Wyville-Thomson Ridge and the Cirolana Deep. Preliminary examination of the bottom temperature (Figure 4) shows water of $3^{\circ} - 3.5^{\circ}\text{C}$ in the upper basin and water of $5^{\circ} - 6^{\circ}\text{C}$ in the channel leading westward. However, strong currents in the bottom water made near-bottom sampling difficult at some stations and true bottom temperatures may be lower in the channel. Overflow water covered the northern, but not the southern, flank of the channel, extending upwards to at least 500m (Figure 3).

Sections were made on to Faroe Bank from four directions; south, southeast, northeast and northwest during 9-16 September. A further section was prevented by bad weather towards the end of the cruise. Shallow (ca. 100m) stations on the crest of the bank were well-mixed when sampled on 15 September after three days of gales, but weak stratification persisted in depths of 150m and more.

Acknowledgements

It is a pleasure to thank Captain Jonas, his officers and crew for their wholehearted help during the cruise. Working arrangements aboard FREDERICK RUSSELL for CTD and mooring work are the best integrated of the NERC fleet and it should be an aim to bring the larger vessels up to the same standard. Her superior steaming speed, which gave a voyage average of 11.1kt, enabled the best use to be made of good weather. The ship exemplifies the philosophy that small organisations are more efficient and very much more motivated than large ones, and it is greatly to be hoped that a continuing role in the NERC fleet will be allotted to her.

D.J. Ellett
1 October 1987

Table 1. Mooring recoveries during Cruise 18/1987

Mooring	Institute	Depth m.	Lat. N ° 1	Long. W ° 1	Deployment dates 1987	No. of current meters	Remarks
X	MAFF	75	53 39.9	4 38.2	20 July - 28 Aug.	3	Surface toroid
U	MAFF	52	53 43.3	4 38.8	20 July - 28 Aug.	3	Surface toroid
W	MAFF	57	53 46.9	4 39.2	20 July - 28 Aug.	3	Surface toroid
Y	SMBA	48	56 37.2	6 24.9	1 May - 1 Sep.	1	Surface spar

Table 2. Moorings deployed during Cruise 18/1987

Mooring	Institute	Depth m.	Lat. N ° 1	Long. W ° 1	Date deployed 1987	No. of current meters	Remarks
Y	SMBA	50	65 37.5	6 24.3	1 September	2	Surface spar
N1	SMBA	1115	60 15.6	8 45.1	6 September	2	Acoustic release, glass floats
N2	SMBA	710	60 17.4	8 46.8	6 September	3	Acoustic release, glass floats

Table 3. Stations and sections worked during FREDERICK RUSSELL Cruise 18/1987

Section	Dates 1987	Stations	CTD Dip. Nos.	Observations
-	27 Aug	CSA	-	Surf. Cs and S%
Wigtown Bay - Sellafeld	27 - 28 Aug	Cores 1-6	-	Craib corer
25-hr station	28 - 29 Aug	U	001-027	CTD, suspended load, part. size
Copeland-Portpatrick	30 Aug	1Z-6Z	028-033	CTD, surf. Cs; mid and bott. Cs (2-5)
Midway, Larne-Stranraer	30 Aug	LS	-	Surf. Cs and S%.
Kintyre - Antrim	30 Aug	1A-5A	034-038	CTD, surf. Cs; bottom Cs (2 and 4)
West of Islay	30 - 31 Aug	OD-8D	039-047	CTD, surf. Cs
Shelf-edge - S. of Mull	31 Aug - 1 Sep	1G-16G	048-060	Surf. S% ; CTD, Cs surf, mid and bottom (1, 2, 4, 6, 7, 9, 11, 13, 15, and 16); CTD (10, T and S)
Butt of Lewis NW'ward	2 Sep	1M-6M	061-066	CTD; surf. Cs and sedim. (1, 3 and 6)
Eddrachillis Bay - Broad Bay	2 - 3 Sep	1L-6L	067-072	CTD, surf. Cs and sedim (2-5)
L. Seaforth - L. Gairloch	3 Sep	1K-8K	073-080	CTD; surf. Cs; Cs bott. (2, 4 and 8)
Wyville-Thomson Ridge	6 - 7 Sep	A1-A9	081-089	CTD
- Ymir Ridge Region	7 Sep	B1-B6	090-095	CTD
	7 Sep	D1-D3	096-099	CTD
	8 Sep	B7-B9	100-102	CTD
	8 - 9 Sep	C1-C3	103-110	CTD
	9 Sep	E1-E8	111-118	CTD
Cirolana Deep - S. Faroe Bank	9 Sep	S2-S7	119-124	CTD
NE Faroe Bank	11 Sep	NE1-NE8	125-132	CTD
SE Faroe Bank	15 Sep	SE1-SE6 and NE10	133-139	CTD
NW Faroe Bank	15 - 16 Sep	NW1-NW6 and NE9	140-146	CTD
NNW from Butt of Lewis	17 Sep	WM1-WM5	-	Surf. Cs, sedim. and S%
Loch Dunvegan - Loch Maddy	18 Sep	N1-N6	147-152	CTD
Loch Boisdale - Loch Bracadale	18 Sep	HD1-HD9	153	
- Loch Moidart		HE1-HE5	-166	CTD

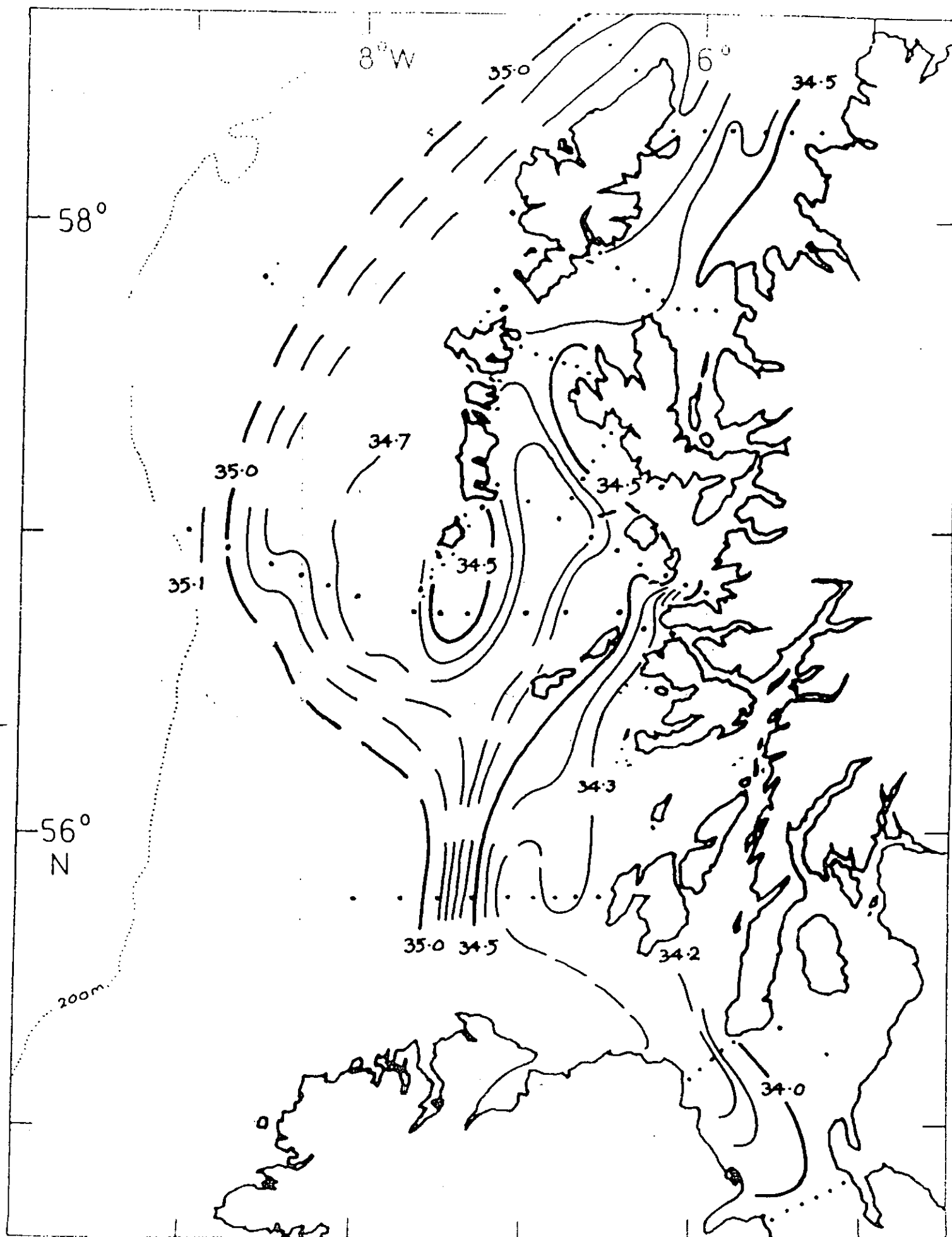


Figure 2b : Surface salinity ($\times 10^{-3}$), 30 Aug. - 18 Sep. 1987.

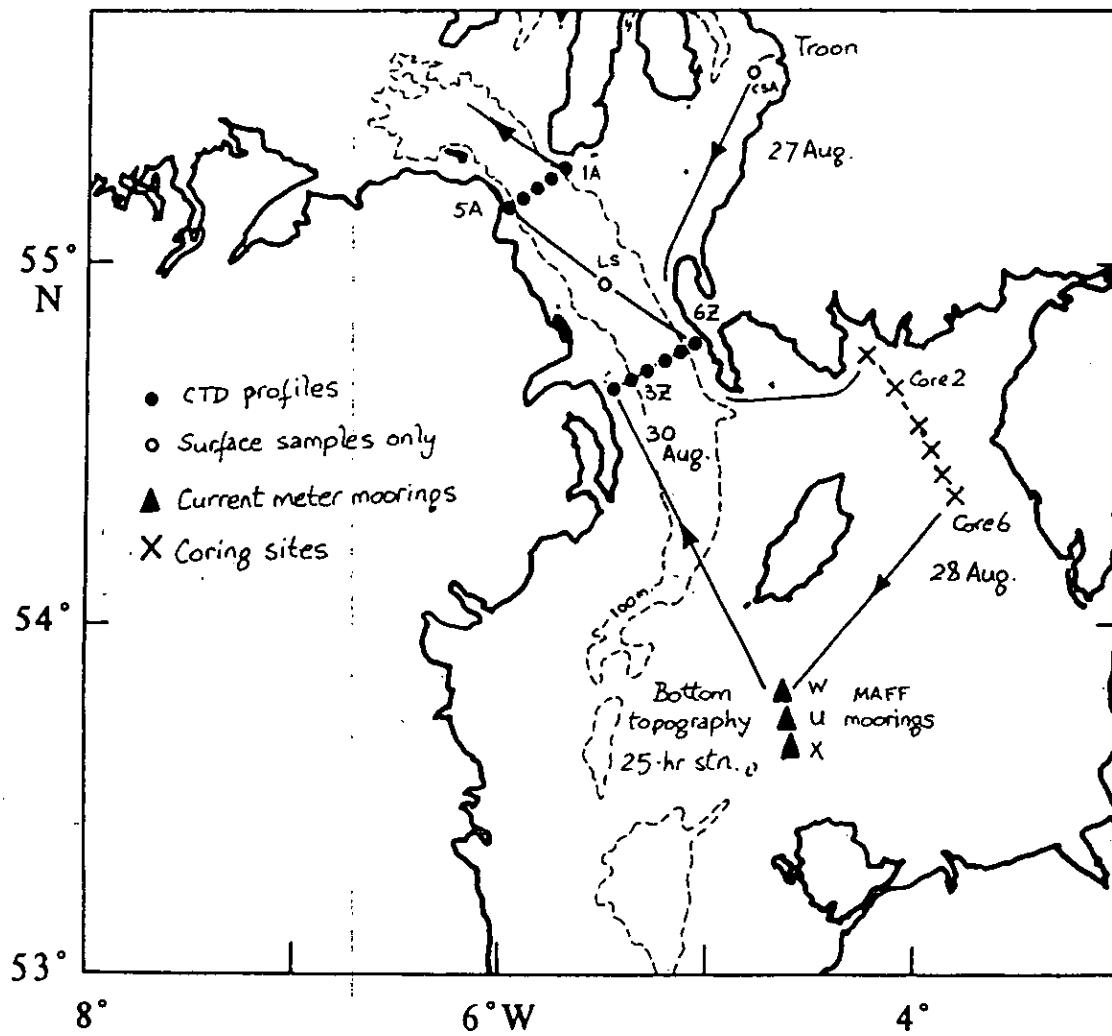


Figure 1a : Ship's track 27-30 August 1987.

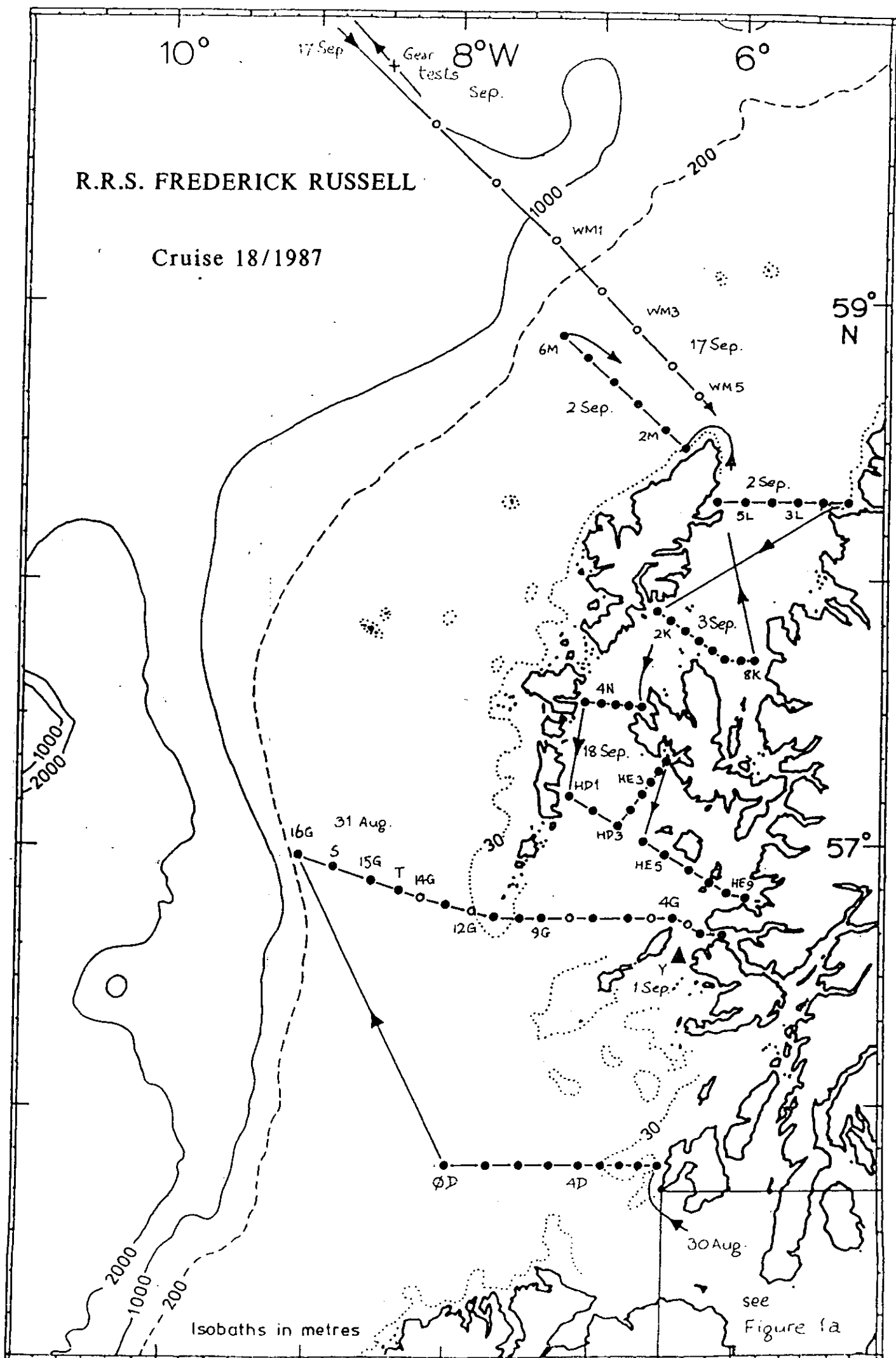


Figure 1b: Ship's track 30 Aug. - 6 Sep. and 17 - 18 Sep. 1987

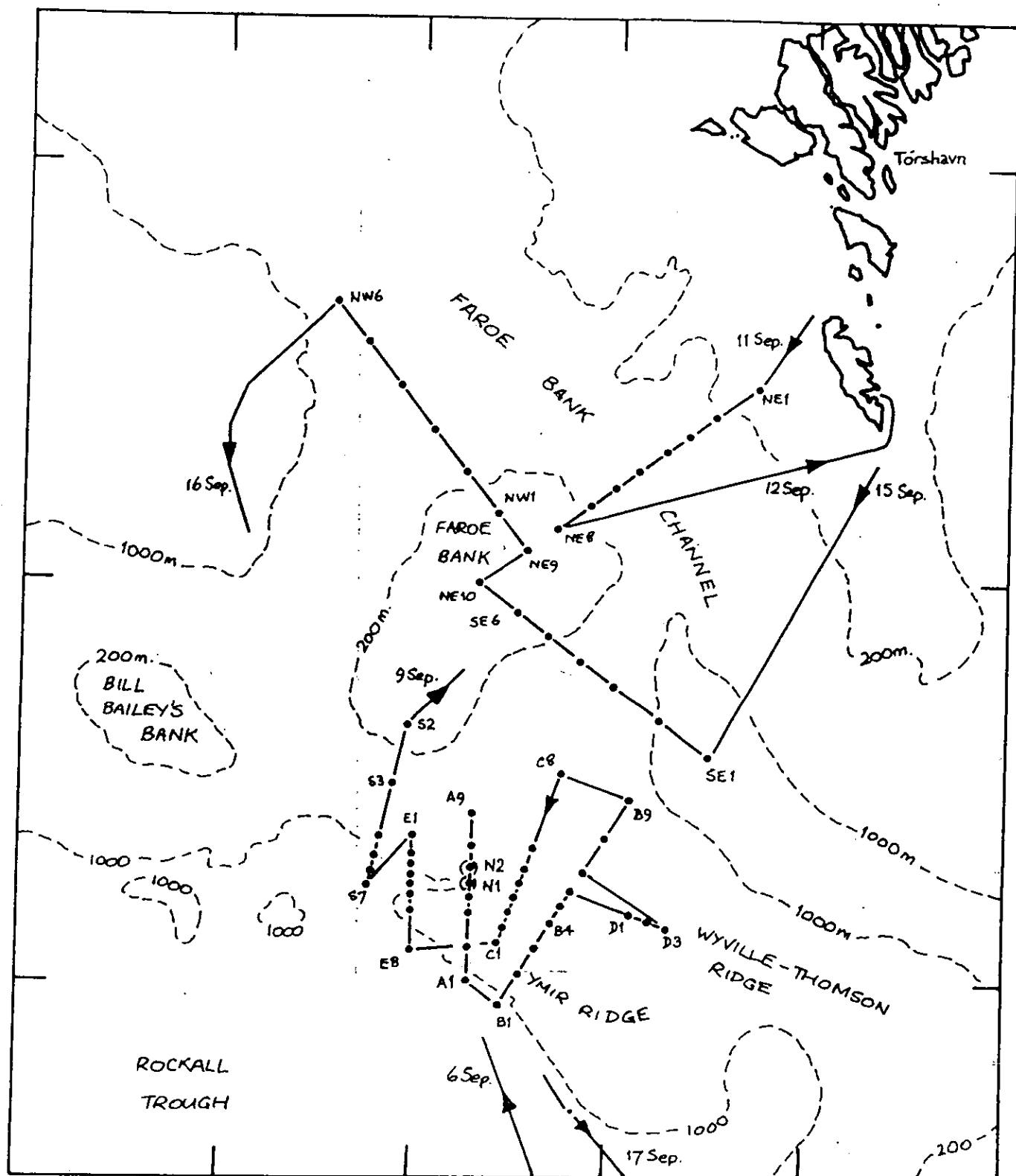


Figure 1c : Ship's track 6-17 September 1987.

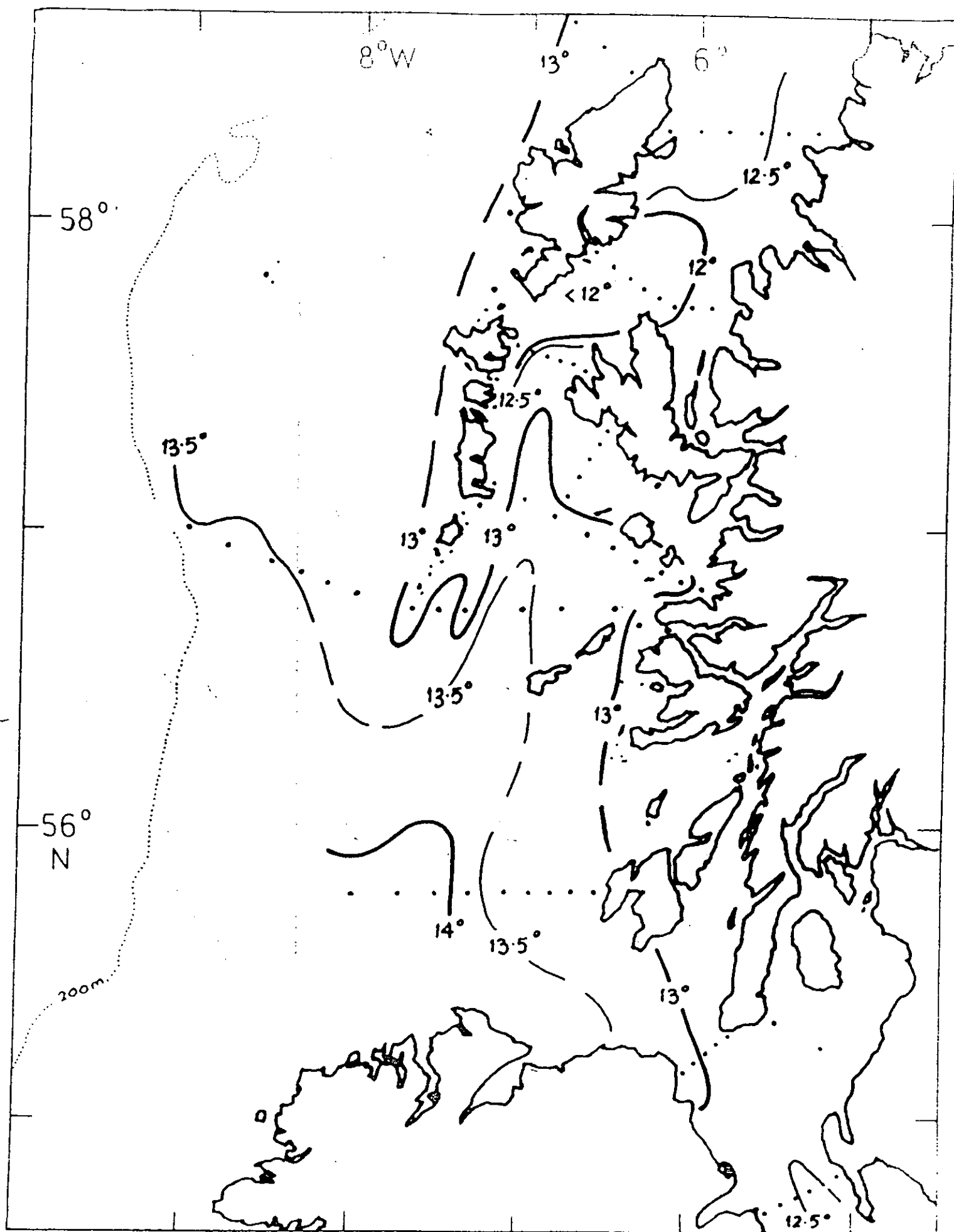


Figure 2a : Surface temperature (°C), 30 Aug. - 18 Sep. 1987.

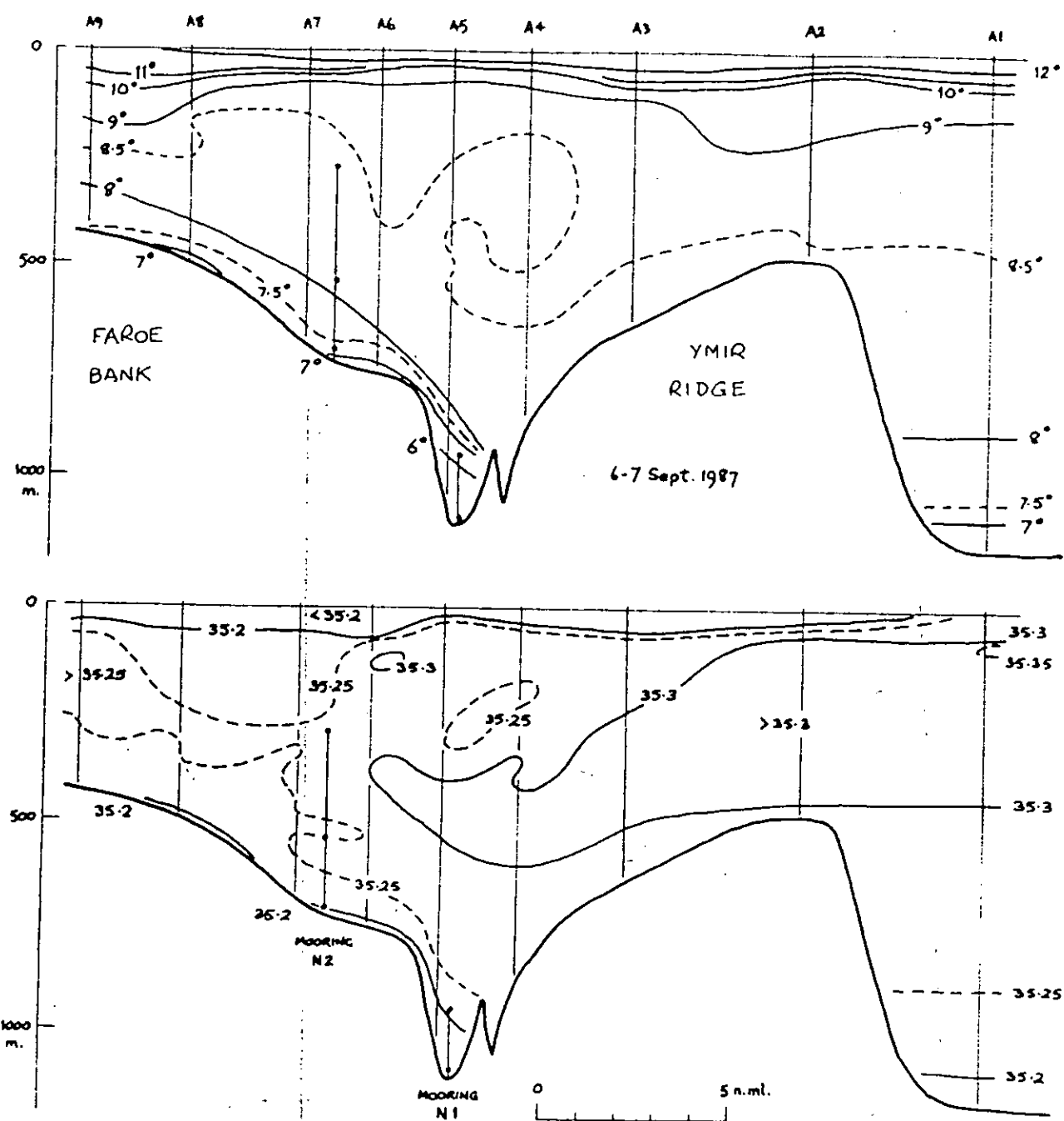


Figure 3.

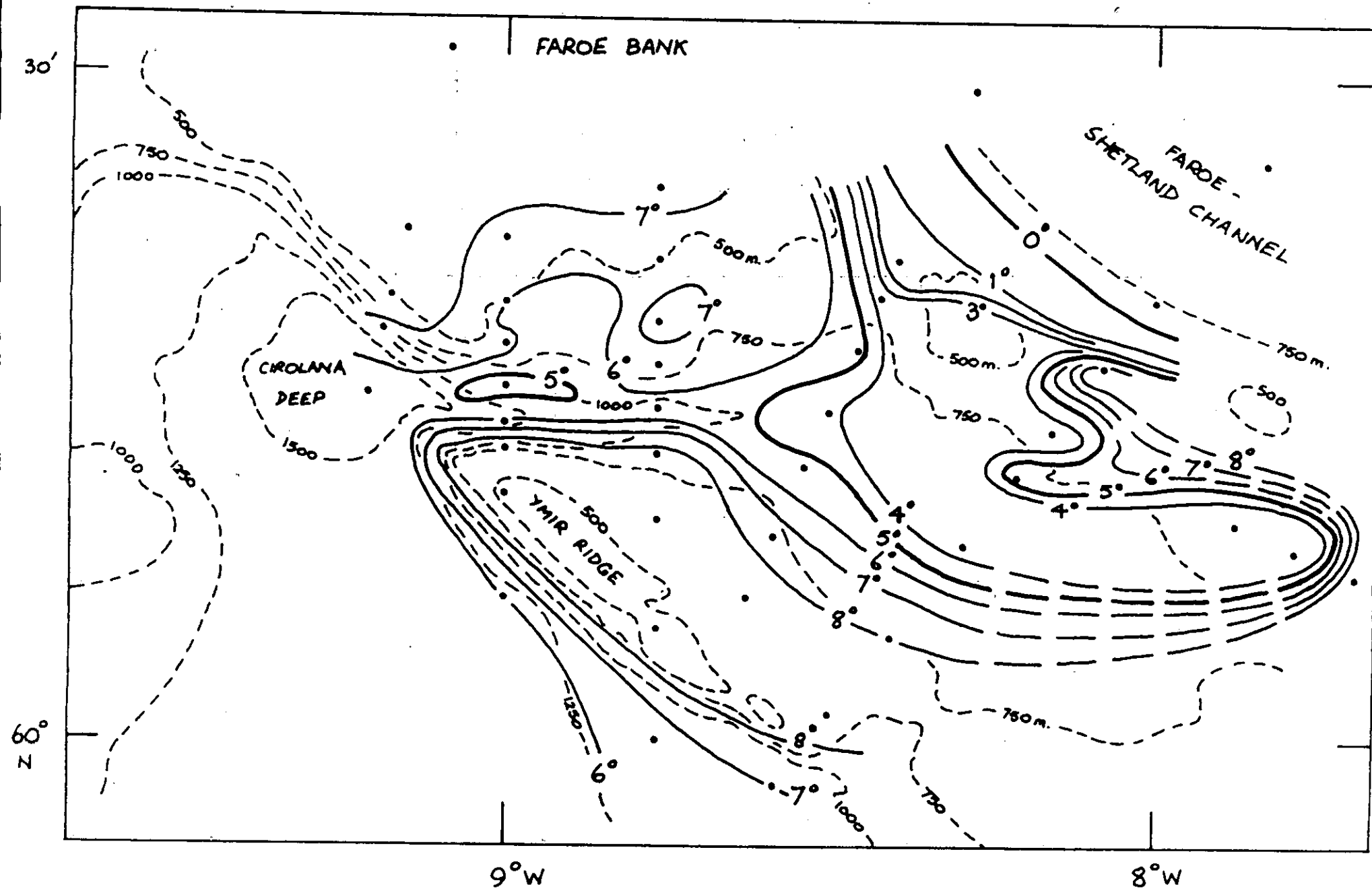


Figure 4 : Bottom temperature, 6-9 September 1987.