

Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory



CRUISE REPORT

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Cruise Report

R.R.S. CHALLENGER

Cruise 22/1987

23 November - 5 December 1987

R.R.S. CHALLENGER, Cruise 22/1987

Duration of cruise: 1046 h 23 November - 0900 h 5 December 1987.
All times GMT.

Locality: Scottish continental shelf, N. Channel - Cape Wrath.

Staff: D.J. Ellett
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D. Green (Dept. of Zoology, Cambridge) (2 - 4 Dec.
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Aims:

- 1) To work CTD sections across the Scottish continental shelf between the North Channel and Cape Wrath, with radiocaesium sampling for MAFF and the Scottish Universities Research and Reactor Centre upon a number of sections.
- 2) To service the SMBA current meter mooring in the Tiree Passage (mooring Y) and to lay moorings in the Little Minch (V and W) and to the west of Lewis (X).
- 3) To deploy a satellite-tracked drogue over a number of 25-hr periods at locations in the coastal current, and to obtain acoustic doppler current profiles over similar periods of time.
- 4) To convey a Cambridge Dept. of Zoology party from St Kilda to Oban at the end of the cruise.

Narrative: Staff joined the ship at Campbeltown at 1120 h 21 November. With westerly winds of forces 8-9 existing, and forecast for the following 24 hours, it was agreed to postpone sailing until the following morning. Strong westerly winds continued however during 22 November, delaying sailing by a further day. CHALLENGER sailed at 1046 h 23 November, by which time winds had decreased somewhat to force 7 and become northerly. Station LS was sampled at 1429 h, but it became apparent when the North Channel section between Copeland Is and Portpatrick was reached that CTD work would not be possible due to the difficulty in holding the ship to the wire. With no early improvement in the weather likely, it was decided to sample radiocaesium and salinity at the surface for these stations, and these were completed by 1904 h. Surface salinity was sampled across the Firth of Clyde entrance (section Y) and surface salinity and radiocaesium again across section A between Kintyre and Antrim at 0051 to 0204 h 24 November.

Continuing strong northerlies made work west of Islay inadvisable, so we proceeded northwards via the Sound of Islay and Sound of Mull. CTD lowerings and caesium sampling at depth began in the latter at 1538 h after

a 2-hour delay whilst the lack of meter wheel readout from the hydrographic winch was investigated. The equipment proved to be entirely inoperable, and all CTD work during the cruise was directed by the use of a bottom pinger, or by feeling for the bottom in shallow depths. Stations were continued westwards towards Barra Head until 0037 h 25 November at station 9G, where work was broken off in order to reach the Little Minch mooring sites in mid-morning. Winds had dropped to forces 4-5 with decreasing swell.

Current meter mooring V was laid between 0900 and 0908 h and mooring W at 1050 to 1102 h and course was set for the outer shelf via the Butt of Lewis. Menai Bridge mooring L2 was seen unlighted 2.2 n.m.l. off position at 1705 h. The section northwest from the Butt was worked overnight, between 0032 and 0853 h 26 November after 1½ hours delay due to A-frame problems. The site for current meter mooring X was reached at 1306 h and the mooring deployed by 1325 h. Section J, from Loch Resort, was worked in fine quiet weather between 1510 h 26 November and 0200 h 27 November, though swell had increased somewhat during the evening. The outer five stations of section BN were worked between 0614 and 1205 h, and the opportunity was taken to contact the Cambridge University party upon St Kilda whilst working in the vicinity. In view of forecasts of worsening weather it was decided to give priority to the sub-surface radiocaesium and CTD sampling between the shelf-edge and Barra Head rather than the completion of the BN section, and stations Q, 16G to 10G were worked from 1627 27 November until 0315 h 28 November. Two CTD lowerings were made in the Sea of the Hebrides en route to section D, west of Islay.

Force 5-6 westerly winds and a moderate swell permitted the D section to be completed between 1054 and 2209 h, and section P to Skerryvore thereafter at 2302 h 28 November to 0427 h 29 November. Despite clear weather, nothing was seen in passing of Menai moorings I1 and I2. CHALLENGER arrived at mooring Y in the Tìree Passage at 0730 h and recovered the spar buoy, ground line and anchors by 0933. The lower of the two current meters had previously been recovered ashore in Mull. Redeployment was effected at 1336 to 1400 h. Acoustic Doppler current profiles were obtained across the Tìree Passage between 1435 and 1555 h and subsequently at the mooring site during the working of a CTD station. The northerly force 6 wind became light in the evening, and the Loch Moidart to Loch Boisdale section was completed between 1900 h 29 November and 0223 h 30 November, with the section into Loch Bracadale at 0400 to 0713 h.

The positions of Menai moorings S1-3 were investigated in the passage northwards. Despite excellent (40 miles) visibility, calm and sunny conditions, no traces of S1 or S2 were seen, but mooring S3 appeared intact, though west of its nominal position. The CTD section between Loch Maddy and Loch Dunvegan was completed by 1415 h and course was set for mooring V. There was concern that the spar buoy at this mooring had too little scope, having been laid in deeper soundings than anticipated at the beginning of deployment. The excellent calm weather offered a chance to raise and relay the mooring in better depths and closer to its advertised position, and this was done between 1550 and 1634 h. The CTD and radiocaesium section between Loch Seaforth and Loch Gareloch was begun at 1752 h and completed at 0035 h 1 December. A half-hour delay arose after station 4K because of difficulties in changing between the hydrowire and CTD cable winch barrels. Because of this it was decided to forego sub-surface caesium sampling at station 8K. The Eddrachillis Bay to Broad Bay CTD section was worked between 0437 and 0958 h, and Menai mooring L2 was inspected en route to a section northward from the Butt of Lewis. The mooring appeared to be intact, though off position.

Upon completion of the Butt of Lewis stations at 1505 h, CHALLENGER returned west of Lewis to obtain a CTD and ADCP section of seven stations immediately to the south of current meter mooring X, beginning at 2041 h and finishing at 0058 h 2 December. Three stations needed to complete the section from the Monach Is past St Kilda were worked between 0523 and 0916 h and the ship then steamed to Village Bay, St Kilda, to uplift the three Cambridge scientists for transit to the mainland. After their arrival aboard at 1120 h course was set for the Sound of Mingulay and thereafter CTD lowerings were made on two short sections 10 n.mls south and north of a position chosen for the release of a drogue on the following day. These were completed at 0436 h 3 December and the ship lay at the drogue position from 0730 h until daylight.

The drogue was deployed at 0829 h and CHALLENGER stood by it throughout the day, making hourly approaches to record its position. At sunset the drogue line was grappled and at 1610 h course was set for the Sound of Mull. The ship arrived off Oban overnight and berthed at the Railway Pier at 0933 h 4 December. After landing scientists and gear CHALLENGER sailed for Troon at 1145 h, docking there the following day.

Results

Aim 1) Details of CTD sections and radiocaesium sampling are given in Table 1. Strong winds restricted work in the North Channel to surface sampling, but an extensive set of sections was worked northwards from Islay to the Butt of Lewis. Surface temperatures ranged mostly from 10.0 to 10.8°C, falling to 9.5°C at a very few inshore stations. The surface salinity pattern north from Islay is shown in Figure 2.

Aim 2) Details of current meter moorings serviced and laid are given in Table 2. Mooring Y, in the Tìree Passage, had been damaged and one of the two current meters had been retrieved earlier ashore in Mull. The second meter was missing when the spar and ground line were recovered on 29 November.

Moorings V and W were laid in the Little Minch on 25 November, V being moved to better soundings on 30 November. Mooring X was laid on 26 November and checked in passing on 1 December.

Acoustic Doppler current profiles were obtained at all mooring sites as described under Aim 3, below.

Aim 3) The loss of two days at the beginning of the cruise due to gales precluded any long-term drifts of the satellite-tracked drogue in coastal waters. A drift during the daylight hours of 3 December in the Sea of the Hebrides between Canna and S. Uist, clearly showed the need for a ship to stand by the 60 m² drogue even in areas of light traffic in view of the hazards to and from fishing and cargo vessels. The task of long-term drifts may be more appropriate for CALANUS in a future summer.

The RD Instruments Acoustic Doppler Current Profiler (ADCP) continuously recorded profiles throughout the cruise. Most current measurements were absolute due to the instrument's ability to 'bottom track'; only off the shelf-edge did measurements become relative. Ten-minute ensembles were taken of all three velocity components, AGC (a measure of scattering through the water column) and percentage of good data.

At all four mooring sites measurements were taken over at least one sampling period of the Aanderaa current meters. In addition at moorings Y and X current profiles were obtained on transects across the Tiree Passage and between Lewis and the Flannan Is, respectively to obtain an indication of the degree to which the current meter moorings could represent the general transport of water through these channels.

ADCP measurements were made throughout the period of the Drogue deployment on 3 December to provide an intercomparison with its drift.

(C.R. Griffiths)

Aim 4) The three Cambridge zoologists were collected with their samples from St Kilda on 2 December and landed on arrival at Oban on 4 December.

D.J. Ellett

22 December 1987

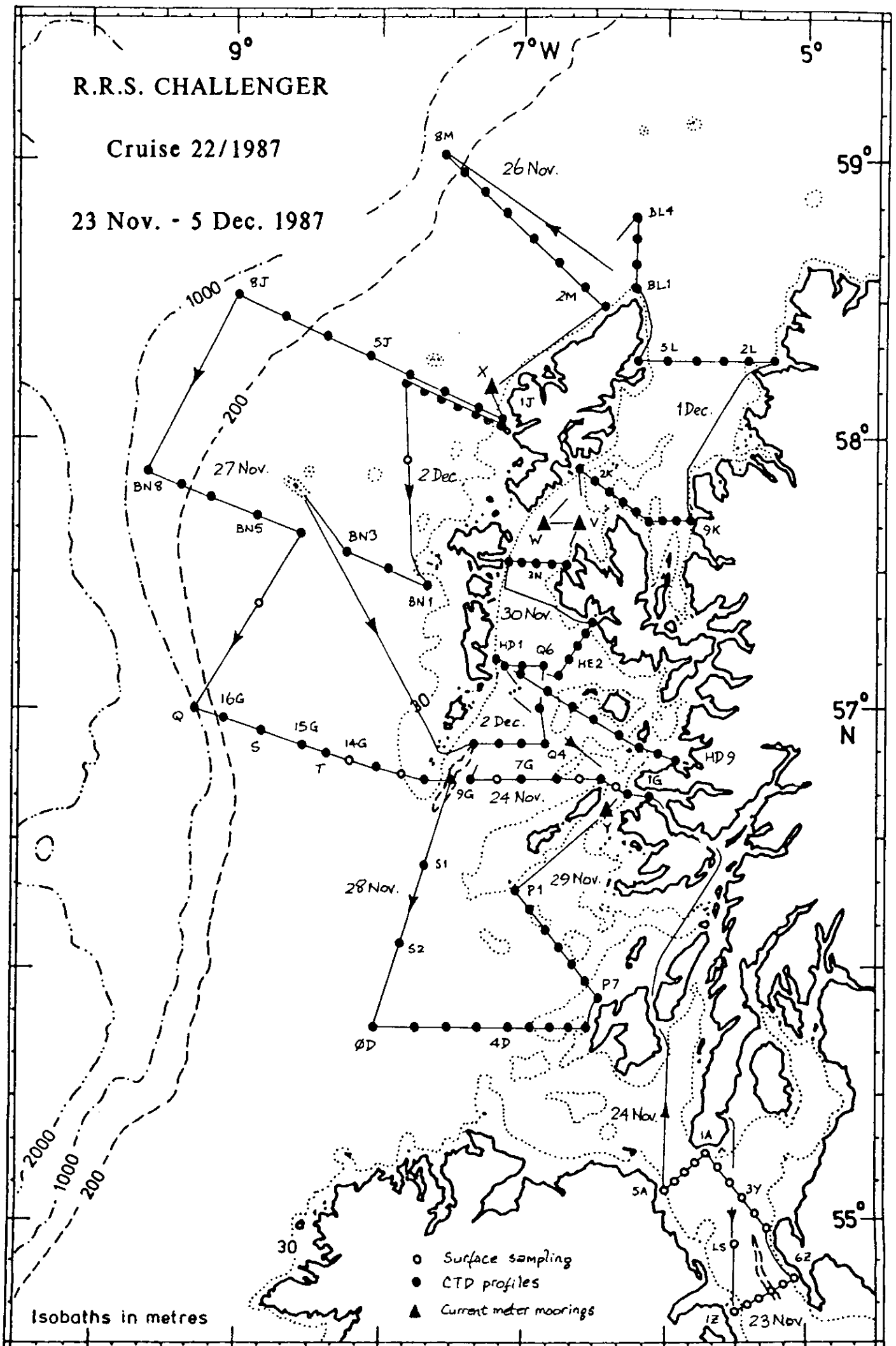
Table 1. Stations and sections worked during Cruise 22/1987

Stations	CTD Disc/ Dip Nos.	Location	Dates 1987	Observations
LS	-	Larne - Stranraer midway	23 Nov.	Surface Cs & S ₀
1Z-6Z	-	Copeland - Portpatrick	23 Nov.	Surface Cs & S ₀
1Y-5Y	-	Corsewall - Sanda	23-24 Nov.	Surface Cs & S ₀
1A-5A	-	Kintyre - Antrim	24 Nov.	Surface Cs & S ₀
9 1G-9G	078/001-006	Sd. of Mull - Barra Hd.	24-25 Nov.	Surface S ₀ ; CTD, Cs surface, mid-water & bottom (1,2,4,6,7 & 9).
8 8M-1M	078/007-014	NW Butt of Lewis	26 Nov.	CTD.
8 1J-8J	078/015-022	NW from L. Resort	26-27 Nov.	CTD; Cs surface (2,4,6 & 8) & bottom (2).
5 BN8-BN4	079/023-027	St Kilda shelf-edge	27 Nov.	CTD
8 Q,S,T, } 16G-10G }	079/028-035	Shelf-edge - Barra Head	27-28 Nov.	Surface S ₀ ; CTD (Q,S,T,16,15,13,11 & 10); Cs surface, mid-water & bottom (16,15,13 & 11).
2 S1, S2	079/036-037	Sea of the Hebrides	28 Nov.	CTD
7 ØD-8D	079/038-046	W. of Islay	28 Nov.	CTD, Cs surface; Cs bottom (2,4 & 7).
7 P7-P1	079/047-053	Islay - Skerryvore	28-29 Nov.	CTD.
1 Y	079/054	Tiree Passage mooring	29 Nov.	CTD.
2 HD9-HD1	080/055-063	L. Moidart - L. Boisdale	29-30 Nov.	CTD.
2 HE1-HE5	080/064-068	Oigh Sgeir - L. Bracadale	30 Nov.	CTD.
6 6N-1N	080/069-075	L. Maddy - L. Dunvegan	30 Nov.	CTD.
9 1K-9K	080/076-084	L. Seaforth - L. Gairloch	30 Nov. - 1 Dec.	CTD, Cs surface; Cs bottom (2 & 4).
9 1L-9L	080/085-086}	Eddrachillis Bay - Broad Bay	1 Dec.	CTD.
3 4L-6L	081/087-090}			
4 BL1-BL4	081/091-094	N. from Butt of Lewis	1 Dec.	CTD.
4 1J-4J	081/095-101	L. Resort - Flannan Is.	1-2 Dec.	CTD, ADCP
3 BN1-BN3	081/102-104	Monach Is. - St Kilda	2 Dec.	CTD.
9 Q1-Q9	081/105-113	Sea of the Hebrides	2 Dec.	CTD.

Table 2. Current meter moorings deployed or serviced during Cruise 22/1987

Mooring	Depth m	Lat. °	N. '	Long. °	W. '	Deployment/servicing date, 1987	No. of current meters	Remarks
V	94	57	40.3	6	38.2	25 Nov.	2	Recovered and redeployed in shallower depth 30 Nov.
W	123	57	42.0	6	50.0	25 Nov.	2	
X	123	58	12.0	7	13.9	26 Nov.	2	
Y	57	56	37.8	6	24.6	29 Nov.	2	Previously deployed 1 Sep. 1987. Spar & anchors only recovered.
V	78	57	41.8	6	36.8	30 Nov.	2	

Figure 1. Track chart.



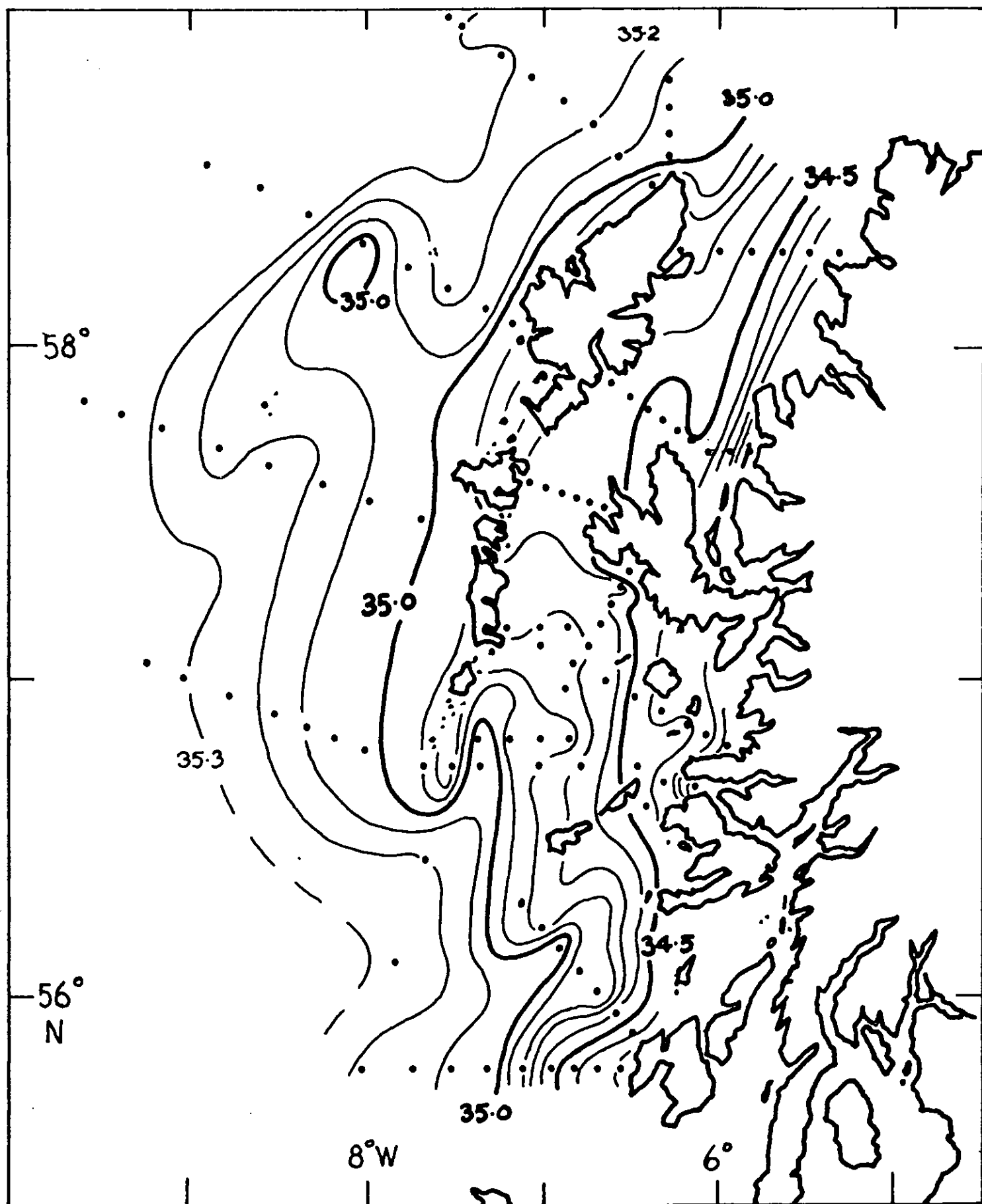


Figure 2. Surface salinity ($\times 10^3$), 24 Nov. - 3 Dec. 1987.