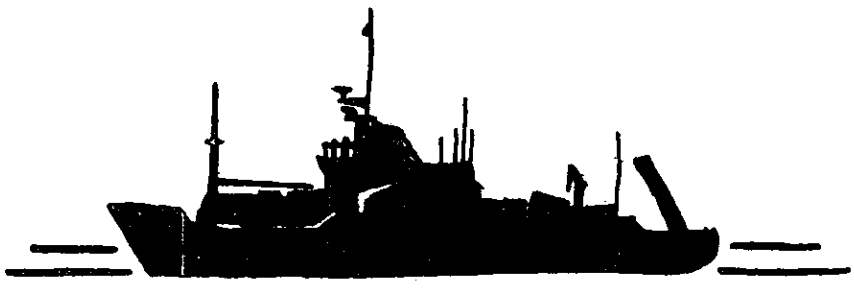
Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory



CRUISE REPORT

RRS SHACKLETON

Cruise 5/1979

19 June - 2 July 1979

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

RRS SHACKLETON : Cruise 5/1979

Duration of cruise: 1202 h 19 June - 0800 h 2 July 1979

Times BST unless otherwise specified.

Locality: Northern Rockall Channel and Scottish continental shelf.

Staff:

D.J. Ellett

A. Edwards

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I. McLean (Student)

P.G. Challenor (IOS)

Aims:

1) To service the SMBA shelf current meter mooring in $57^{o}N$, $9^{o}W$.

2) To lay two current meter moorings in the Little Minch for the duration of the cruise.

3) To make a comprehensive CTD survey of the shelf to the west of Scotland.

4) To make CTD observations to examine the paths of Norwegian Sea Deep water overflow into the northern Rockall Channel.

5) To work the Anton Dohrn Seamount CTD section.

6) To lay two SMBA moorings for fouling studies to the west of S. Uist.

7) To collect 50 litre water samples and CTD profiles at standard positions between the shelf-edge and the Sound of Mull for radiocaesium analysis.

8) To send temperature-depth profile messages to Bracknell.

Narrative: SHACKLETON sailed from Ardrossan at 1202 h 19 June in fine calm weather and set courses for Lough Foyle. The first CTD section, across the North Channel, was begun at 2112 h and apart from initial troubles due to a bad earth on the CTD and the failure of a Precision Echo-sounder amplifier, this and the following section to the west of Islay were completed by 1227 h 20 June. The ship then steamed for the Little Minch with surface salinity samples being taken en route. Poor visibility led to reduced speed in the evening and hindered the working of the section from Loch Maddy to Loch Boisdale which was completed at 0459 h 21 June. Two current meter moorings, V and W, were laid between Skye and Harris from 0625 to 1136 h, and three further CTD sections were worked in the North Minch between Loch Seaforth and Loch Inchard from 1357 h 21 June to 1329 h 22 June. Winds had increased during the afternoon of 21 June to forces 7-8, south-easterly, and continued strong and squally, with a heavy swell during the first half of a section from the Butt of Lewis to the Wyville-Thomson Ridge, begun at 1900 h 22 June. By the afternoon of 23 June it had again become calm and fine, and the Ridge was reached at 0114 h 24 June. Thereafter an echo-sounder survey was carried out between the Ridge, Bill Baileys Bank and the Ymir Ridge, this being completed at 2335 h with a traverse of the sill between the Cirolana Deep and the Rockall Channel. Soundings were continued to the start of the next CTD section at 0657 h 25 June, which ran from deep water to the east of Rosemary Bank in to Gallan Head. Winds

strengthened from the west to force 7 during the afternoon, and speed was reduced on the next outward leg from West Loch Tarbert, but conditions improved after completing this at 1542 h 26 June. A section from the continental slope towards Benbecula was begun in the evening, but broken off after completion of a station south-east of St. Kilda at 0620 h 27 June in order to steam to the shelf-edge current meter mooring. Wind and swell were freshening, but no difficulties were encountered in laying a mooring between 1118 and 1204 h and retrieving its predecessor between 1344 and 1408 h.

SHACKLETON then steamed to station P of the Anton Dohrn Seamount section and worked CTD stations back to the shelf. The acoustic release of the mooring laid on the slope near P on 20 May was successfully interrogated in passing. Radiocaesium samples and CTD profiles were taken at positions inward to Barra Head and to the east, although reduced visibility slowed the ship at times. After working station C6 at 0452 h 28 June, SHACKLETON returned west of Barra and worked two stations en route to the site of the moorings for fouling studies. The toroidal buoy with near-surface fouling panels was laid between 1030 and 1157 h and the bottom array between 1300 and 1401 h. In increasing wind and swell three stations were worked between Benbecula and St. Kilda to complete the line abandoned on the previous day and at 1912 h course was set for Barra Head. The south-westerly wind reached force 9 in squalls, but moderated to force 5 in the Little Minch by 0938 h on the morning of 29 June, when recovery of mooring W

began. This and mooring V were retrieved by 1245 h, when course was set for Loch Bracadale for the section running southward to Oigh Sgeir and thence to Loch Boisdale. Winds decreased to force 3 during the working of the section, which was completed at 2202 h. SHACKLETON then steamed to stn C5 to complete the remaining radiocaesium stations, but upon hoisting out the CTD a loose turn crossed the winch flange and was nipped. Surface samples were taken and ship proceeded as the CTD joint was re-made. Signals from the CTD failed at the surface at the following station and after inspection the entry plug was found to be broken. The last four stations were therefore sampled at the surface only, C1 off Ardmore Point being reached at 0621 h, 30 June. The ship anchored in Ardmucknish Bay at 0928 h and CALANUS came alongside at 1055 h. After disembarking scientific staff and the lighter gear to CALANUS, SHACKLETON sailed at 1245 h, reaching Barry at 0800 h 2 July.

Results: Aim 1) The shelf-edge current meter mooring laid from CHALLENGER on 11 May was retrieved on 27 June and a replacement mooring was laid. Details are given in Table 1. The two current meters had functioned correctly and 47 days of data were recorded.

Aim 2) Details of the two moorings laid for eight days in the Little Minch are given in Table 1. Three of the four meters gave good results, but the lowest meter at station V was fouled by jellyfish at an early stage. The period of deployment, 21-29 June, centered upon spring tides.

Aim 3) To the east of the Outer Hebrides, CTD sections were worked northwards from the North Channel to Cape Wrath, and five sections were worked inwards from the slope zone to the west coasts of the islands. Surface and bottom temperature distributions for these stations are given in Figures 2 and 3. Lowest surface temperatures ($< 8.5^{\circ}C$) were found in well-mixed waters across the shallowest part of the Little Minch, and temperatures below $9^{\circ}C$ were found in the North Channel off Islay. Offshore temperatures ranged from $13^{\circ}C$ west of Islay to 10.5° - $11^{\circ}C$ over the northern parts of the shelf. Bottom temperatures were lowest in the North Minch ($< 7.5^{\circ}C$) and highest off Northern Ireland and along the western coasts of the Outer Hebrides. Cold bottom water existed below the upper 30 - 40 m of the water column over most of the outer shelf. Towards the shelf-edge a complex sequence of inversions was found at a number of stations.

Aim 4) CTD observations in deep water were limited to 1150 m depth by the unexpectedly short length of cable carried by the winch. Water-bottle observations could not be made below 1150 m to supplement the CTD lowerings as this would have required the re-reeving of the wires and re-making of the CTD termination on each station. A section was therefore worked between the Hebridean shelf-edge and the Ymir Ridge in depths of up to 1150 m, and observations were made in the basin between the Ymir Ridge and the Wyville-Thomson Ridge. There appeared to be no indication of Norwegian Sea overflow water in the vicinity of the BNOC deep drilling site to the south-east of the Ymir Ridge. Temperatures

below 4°C in the upper basin indicated that overflow had recently occurred across the Wyville-Thomson Ridge.

As near-bottom CTD observations could not be made in the vicinity of Cirolana Deep, opportunity was taken to run sounding lines to the north, east and south of the deep. A number of features were examined and depths of several crests and troughs measured in locations not covered by previous sounding lines. The survey showed that there was no continuous channel running south-eastwards at the foot of the Ymir Ridge, suggesting that this is not a normal route taken by overflow water from the deep, and a sounding line across the sill to the south of the deep gave the greatest depths (ca. 1400 m) in the south-west, in a trough at the foot of the rising topography bounding the deep in this quarter.

Aim 5) The Anton Dohrn Seamount CTD section was not worked because of lack of time and the restriction to 1150 m depth. Stations eastwards from P, on the continental slope, were worked on 27 June.

Aim 6) The two SMBA moorings for studies of fouling in the region for possible deployment of wave energy generators to the west of South Uist were laid on 28 June. Fouling panels for near-surface and 10 m depths were hung from a toroidal buoy moored with paraffil cable and chain, and a triangular bottom array of panels was provided for recovery with a sub-surface steel sphere attached to a dhan buoy by a buoyant paraffil cable. The two

moorings were estimated to be 0.07 n.ml apart, in depths of 48 and 45 m for the toroid and bottom array respectively.

Aim 7) Water samples for radiocaesium analysis by the Fisheries Radiobiological Laboratory were collected at ten standard positions between the shelf-edge and the Sound of Mull on 27 - 28 and 30 June. CTD profiles were not taken at the five easternmost stations due to misadventures with the CTD cable and connection. Additionally, five samples were taken across the shallowest part of the Minch at CTD stations D1 - 5 on 21 June and five to the west of Harris at stations J1 - 5 on 25 - 26 June.

Aim 8) Fourteen temperature profiles from CTD lowerings were coded and sent to Bracknell during the cruise.

Acknowledgements. We are most grateful to Captain Selby-Smith, his officers and crew for their assistance and encouragement during the cruise.

D.J. Ellett

28 September 1979

Table 1. Details of current meter moorings laid during RRS SHACKLETON cruise 5/1979.

Station	R	V	W
Position N	56°59.8'	57°41.6'	57°41.4'
W	09°00.2'	06°38.1'	06°52.3'
SMBA Mooring No.	56	54	55
Sounding (m.)	139	86	120
Nominal depth of sub-surface float (m.)	34	36	30
Nominal meter depths (m.) (All have temperature sensors)	44	43 [1]	40
	114	68 [2]	100
Sampling frequency	10 mins	[1] 10, [2] 5 mins	10 mins
Laid at (GMT)	1103 h. 27 June '79	0622 h. 21 June '79	1036 h. 21 June '79
Recovered at (GMT)	-	1106 h. 29 June '79	0837 h. 29 June '79

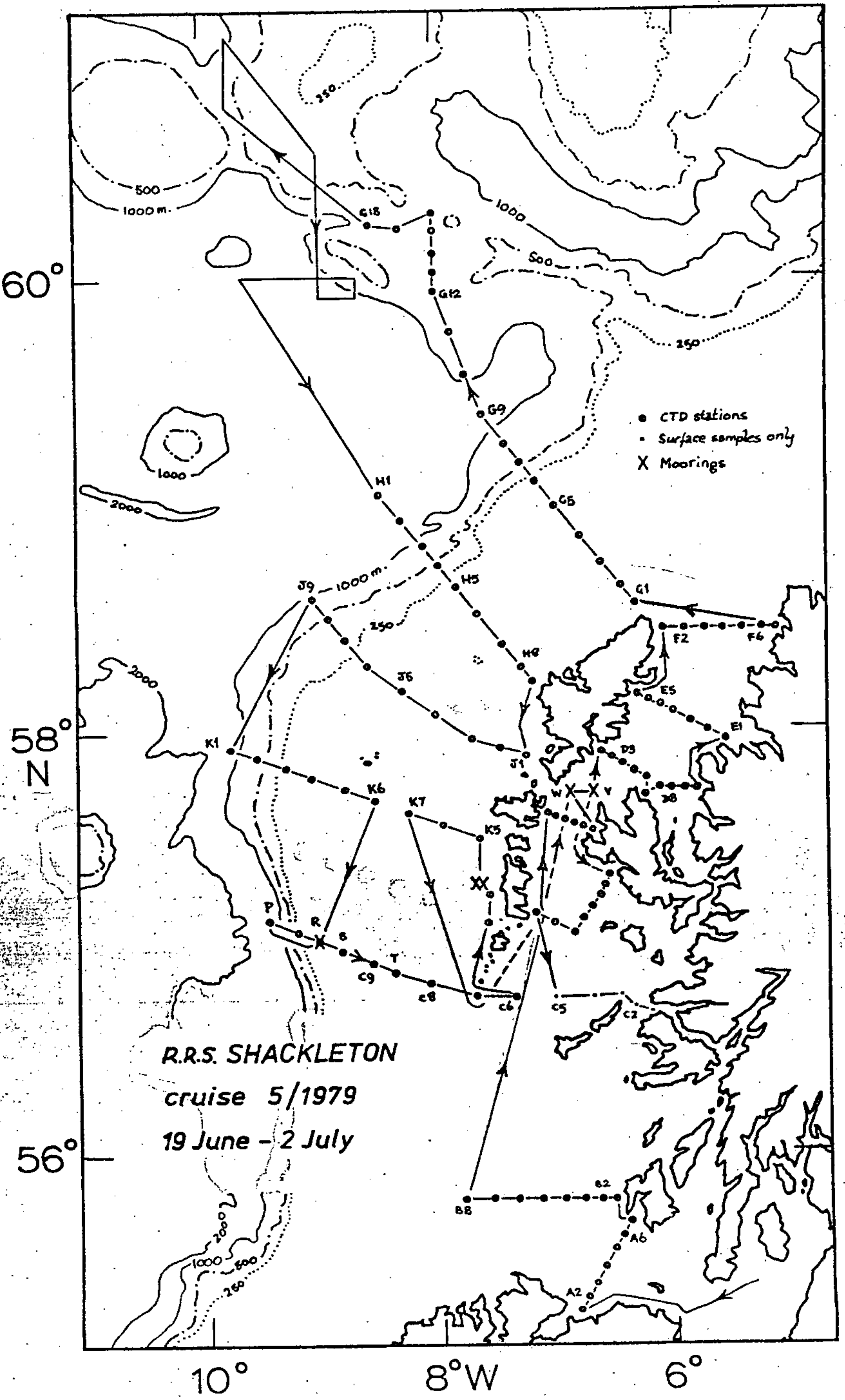
R.R.S. SHACKLETON
cruise 5/1979
19 June - 2 July
CTD stations
Surface samples only
X Moorings
60°
58°
N
56°
10°
8°W
6°

Figure 1

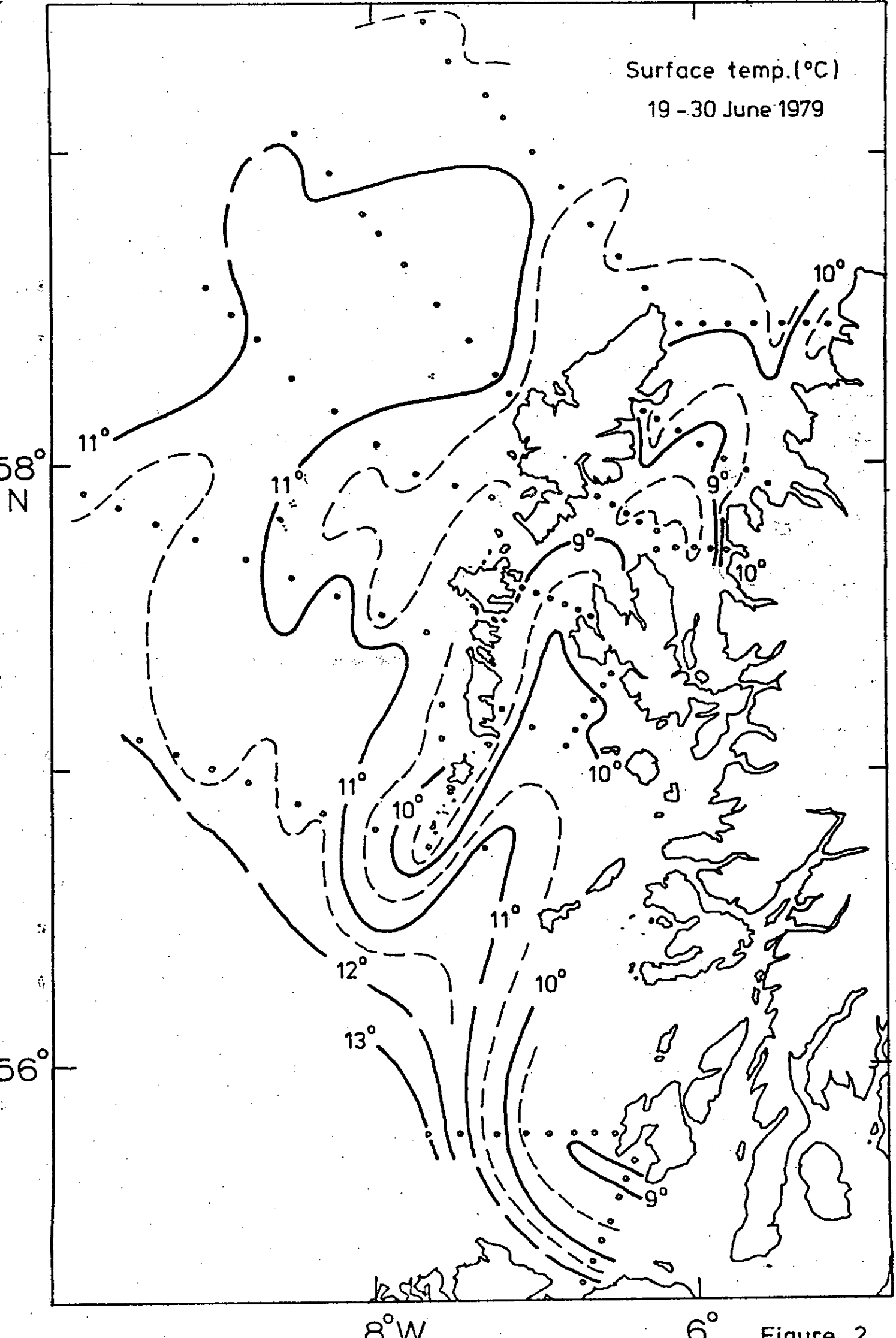
Surface temp.(°C)
19 - 30 June 1979
11°
11°
10°
9°
9°
10°
10°
11°
10°
11°
12°
10°
13°
9°
58°
N
56°
8°W
6°

Figure 2

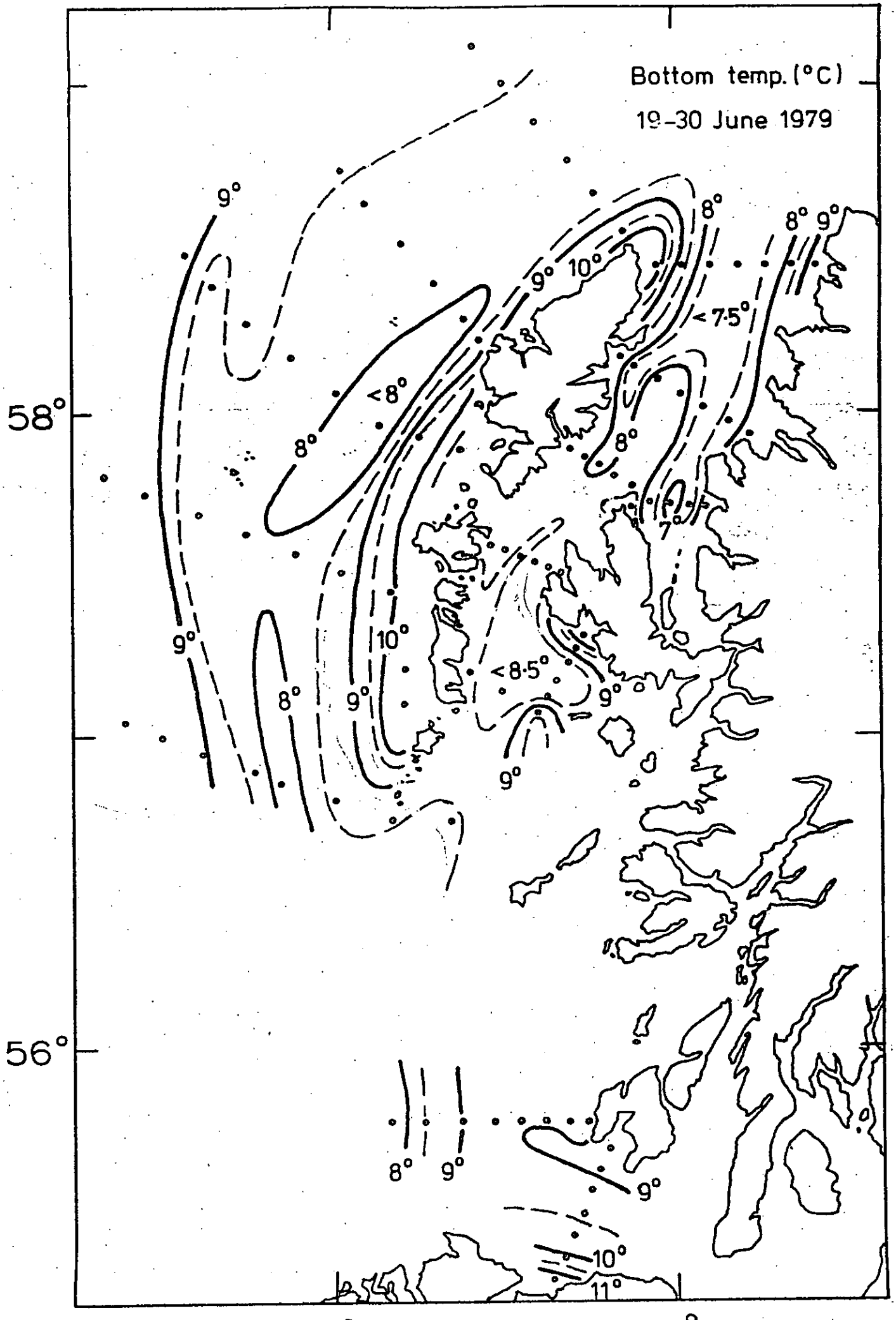

Figure 3