Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory

CRUISE REPORT

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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. DISCOVERY

Cruise 180

20 January - 4 February 1989

R.R.S. DISCOVERY, Cruise 180

Duration of cruise: 1440 h 20 January - 0543 h 4 February 1989
All times GMT.

Locality: Scottish continental shelf, rockall Bank and NE Atlantic.

Staff:
D.J. Ellett(from 22 Jan.)
R. Bowers
A. Edwards
Dr J.M. Graham
C.R. Griffiths
N. MacDougall
Mrs C.M.L. Petre (from 22 Jan.)
R. Wallis (IOSDL, Wormley)
R. Griffiths (RVS, Barry)
J. Getliff (U.W. Coll. of Cardiff)(from 22 Jan.)

Aims:
1) To sample surface and subsurface radiocaesium and obtain CTD profiles at ten standard positions between the Sound of Mull and the shelf-edge, and to sample caesium at the surface in the North Channel.

2) To service the SMBA current meter mooring in the Tiree Passage.

3) To work the Anton Dohrn Seamount CTD section.

4) To obtain Craib corer or Shipek grab samples at a selection of sites upon the shelf and in deep water.

5) To sample midwinter temperature and salinity conditions by CTD in the NE Atlantic between Rockall, 53° 30'N, 28°W and the Porcupine Seabight.

6) To obtain surface chlorophyll and nutrient samples west of Britain as a preliminary to the 1989 BOFS cruises.

7) To obtain surface seawater from the Porcupine Seabight region for the Standard Seawater Service.

Narrative: DISCOVERY sailed from Barry at 1440 h 20 January and made a good passage through the Irish Sea, collecting a surface radiocaesium sample in the North Channel at 1649 h 21 January. The ship hove-to in Loch Nell Bay at 0745 h 22 January to embark three members of the scientific staff from r.v. SEOL MARA at 0939 h. Courses were set for the current meter mooring in the Tiree Passage in freshening southerly winds. In the absence of a pick-up line, the spar buoy of the mooring was grappled at 1337 h. Difficulties arose in taking the buoy aboard with the southerly wind strengthening to forces 6-7, and at 1427 h, when the buoy chain was in sight, the buoy wire parted after the spar had been detached. Grapnels were streamed and two tows were made across the likely location of the ground line without success. As the wind had now reached force 8, it was decided to work the first CTD station off Ardmore Point where conditions were more sheltered, and this was completed at 2042 h.

Overnight the ship steamed on comfortable courses in the entrance to the Sound of Mull awaiting an improvement in the weather. By daylight 23 January the southerly wind had fallen to force 6, and after rigging the water bottle wire upon the forward electric winch, radiocaesium samples were collected off Ardmore Point. Two grapnel hauls were made in the vicinity of the mooring without encountering the ground line, and it was decided to redeploy a replacement while conditions permitted, and this was done between 1515 and 1530 h. CTD and water sampling stations were resumed at 1646 h, and the section from Mull to the shelf-edge was completed at 1443 h 24 January. Winds were close to gale force throughout and at the last large-volume water sampling station the 25 l Niskin bottle was broken against the ship's side whilst being recovered. CTD work was however possible from the amidships winch and the stations of the Anton Dohrn Seamount section were worked in marginal conditions throughout 25 January, with Rockall being reached at 0426 h 26 January. A start was made upon a section running westwards to Ocean Weather Station LIMA, but upon reaching the position of the fourth station high sea and swell conditions and a force 9 wind precluded all work, and the ship hove-to to await an improvement.

Throughout 27 & 28 January very heavy weather continued, with three engines needed to maintain steerage way. Force 10 to 11 southwesterlies abated somewhat on the morning of 29 January and course was set for a station west of LIMA, but adverse forecasts caused a diversion towards more southerly stations, and throughout 30 January DISCOVERY made slow progress southwestwards. By 0600 h 31 January station JW7, to the west of former Ocean Weather Station JULIETT had been reached and XBT profiles and surface samples were collected. Although force 8 winds continued, improved swell conditions made it possible to proceed along the line of the section and similar surface and XBT observations were made at six station positions.

A rapid improvement occurred in the early hours of 1 February and at 0221 h CTD profiles were obtained at station JF5. A trial lowering of the stand-alone pump was made successfully at this station. The quieter weather offered the chance to obtain Craib core samples, so after CTD work at JF6 at 1330 h the ship steamed for the southern part of Porcupine Bank. A core was obtained in 437 m at 1904 h, and we returned to deeper water off the bank, a second core being obtained in 2315 m at 2157 h from a small shelf which interrupted the steep gradient of the slope zone. CTD profiles were resumed at 0031 h 2 February at station JF7, and the section was continued on to the bank and across the Porcupine Sea Bight. The southwesterly wind freshened again to force 7 and an attempt to obtain a core at the shelf-edge was defeated by swell conditions and lack of winch read-out at 0018 h 3 February. A second attempt was made in quieter waters east of Fastnet at 0940 h, but due to echo-sounding problems the corer touched bottom unexpectedly, causing lose turns to damage the winding-on gear. The corer was recovered by means of the whipping drum of the anchor windlass, and at 1056 h the ship resumed course for Barry.

DISCOVERY moored at RVS, Barry at 0543 h 4 February. Customs clearance was given at 1330 h.

Results:

Aim 1) CTD profiles and radiocaesium samples were obtained at the ten standard positions between Mull and the shelf-edge during 22-24 January. No sub-surface sample was obtained at the shelf-edge station due to the breaking of the Niskin sampling bottle in rough weather at the station. A surface sample was collected at the Larne-Stranraer mid-point on 21 January.

Aim 2) The Tiree Passage current meter mooring deployed on 8 June 1988 should have been recovered in October-November, but was not because of poor weather and handling difficulties from m.v. GORSETHORN. Attempts to retrieve the mooring in December by r.v. CALANUS were also defeated by bad weather. DISCOVERY's visit was in far from ideal conditions, and the loss of the pick-up line during the previous seven months led to delays which must have put heavy strains upon the buoy wire. Only the spar buoy was recovered before the wire broke. The replacement mooring was laid to the south of the previous position, which may allow CALANUS to drag for the lost current meters.

Aim 3) All stations of the Anton Dohrn Seamount CTD section were worked. Preliminary results (Figure 2) show warmer high salinity water (>10°C, >35.4°/$_{oo}$) over the slope zone west of the Hebrides, presumably delineating the slope current. A general fall in temperature and salinity values towards the west of the Rockall Channel gives a pattern of isotherms and isohalines which slope upwards towards the west at all depths above 1400-1500 m. The upper mixed layer is shallower in the west (200-300 m) and reaches to 500 m over the slope in the east.

Aim 4) The weather during the cruise provided only the briefest of opportunities for core sampling, but material was obtained from 437 and 2315 m on 1 February. A shelf-edge core was attempted on 2-3 February, and another on 3 February, but the mishap with the winch at the latter station precluded any further coring en route to Barry. Samples from 5-6 depths within the cores were fixed with formalin, and three replicate samples for each of 8 periods between 0 & 180 minutes, taken from the uppermost 1-2 cm of each core, were incubated with 2H-thymidine and subsequently fixed with sodium hydroxide and refrigerated for processing at Cardiff.

Aim 5) A continuous sequence of depressions passing northeastwards from Newfoundland to the Norwegian Sea prevented the ship from getting to the westward of 21°W. Only surface observations were obtainable in the area to the west and southwest of Rockall Bank. From 21°W to 18°W XBT observations were made on the section through JULIETT to Porcupine Bank, but CTD lowerings were resumed from 17°W to the shelf.

XBT temperatures in the vicinity of JULIETT showed the clear influence of Subarctic Intermediate water at depths below 250 m (Figure 3a), but warmer water was found over the deepest part of the Rockall Channel entrance. A complex distribution of temperature and salinity was found at the Porcupine Bank slope (Figures 3a & b), suggesting a cold-core eddy of Subarctic Intermediate water adjoining the warm, high salinity slope current. A core of Gibraltar water existed at 900-1200 m depth in the Porcupine Seabight.

Aim 6) Twenty-two sets of surface chlorophyll, nutrient and salinity samples were collected over the western part of the ship's track and frozen for analysis at IOSDL, to provide data upon conditions in the region of 20°W in the winter preceding the first BOFS surveys.

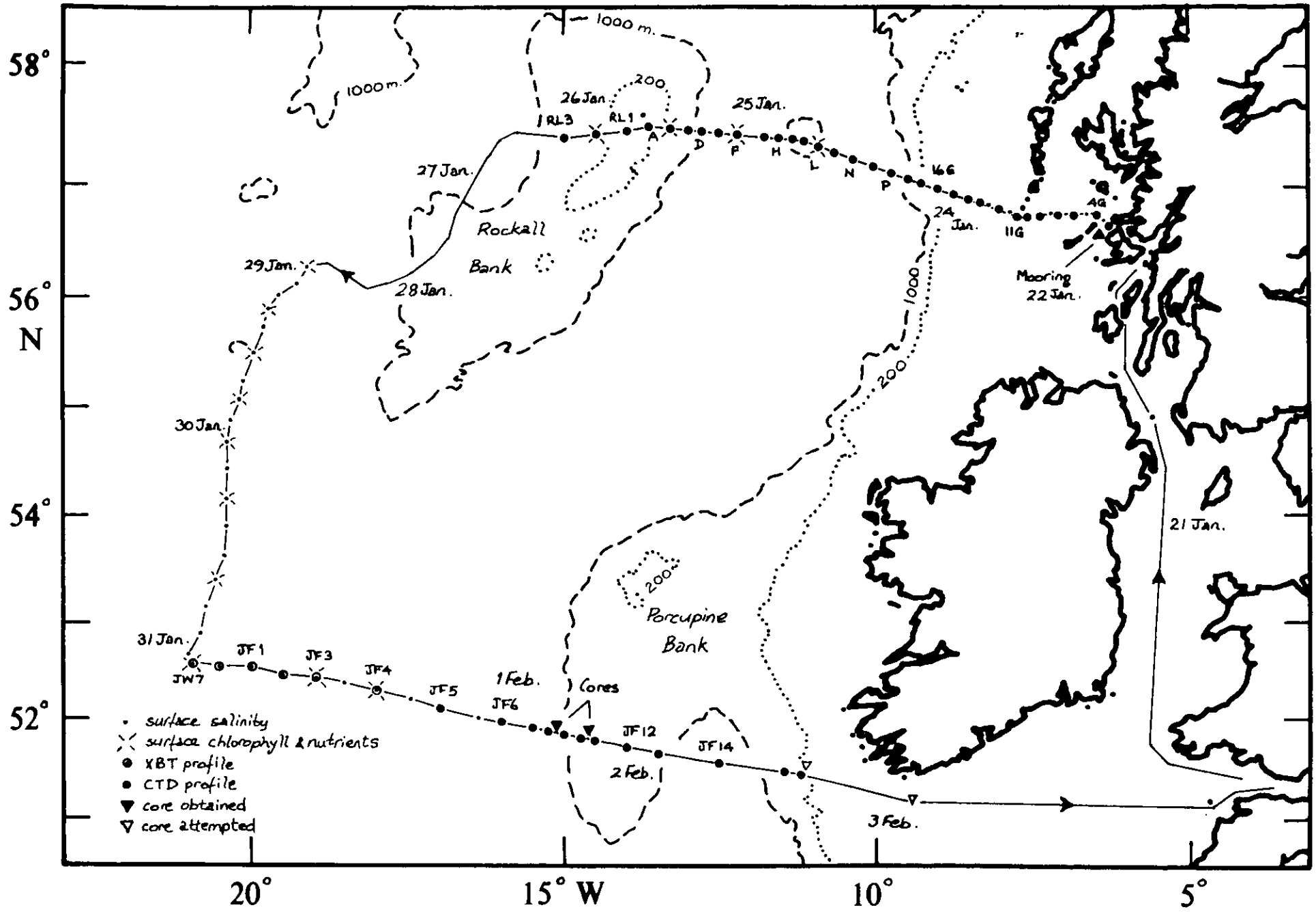
Aim 7) About 600 gallons of surface seawater were collected in the vicinity of 52°N, 16°25'W for the Standard Seawater Service, Wormley.

Miscellaneous 1) 9 XBT messages were transmitted to Northwood and the GTS from 11 launchings and 3 CTD traces. The rather poor success rate arose from initial attempts to launch from aft of the main hydrographic winch during bad weather, when it was unsafe to launch from the after deck, but improving conditions permitted the latter position to be used with much greater success.

2) A new stand-alone pump constructed for BOFS use was tested satisfactorily between 0412 and 0740 h 1 February. Samples were retained for Wormley.

3) Samples for butylaldehyde analysis for an American GOFS participant were taken at the surface at station JF1 and at the surface and 100 m depth at JF6. The samples were frozen and sent to Wormley.

D.J. Ellett
10 February 1989



R.R.S. DISCOVERY Cruise 180 20 Jan. - 4 Feb. 1989 Figure 1. Ship's track

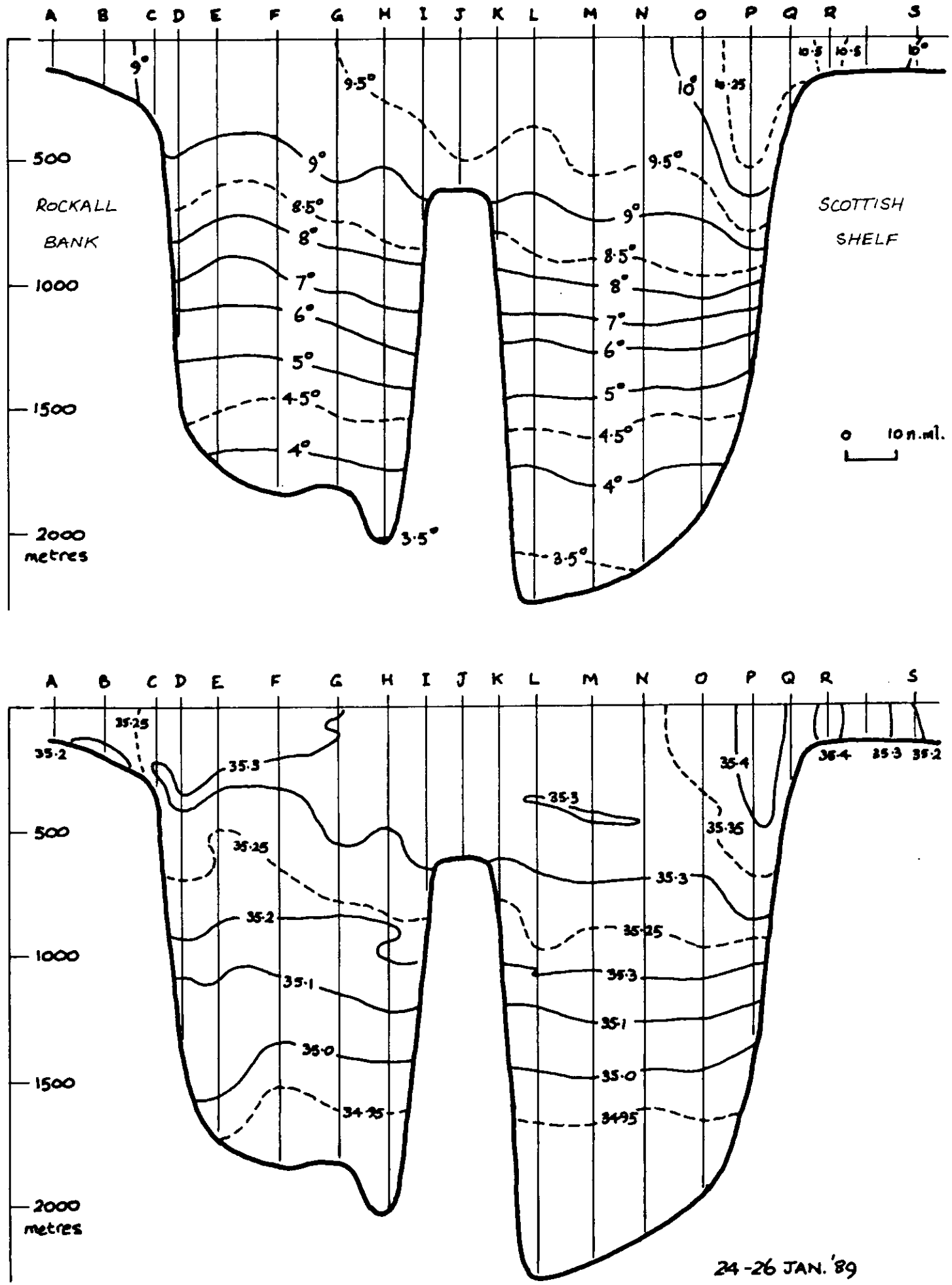


Figure 2. Temperature and salinity sections (uncorrected) between Scotland and Rockall.

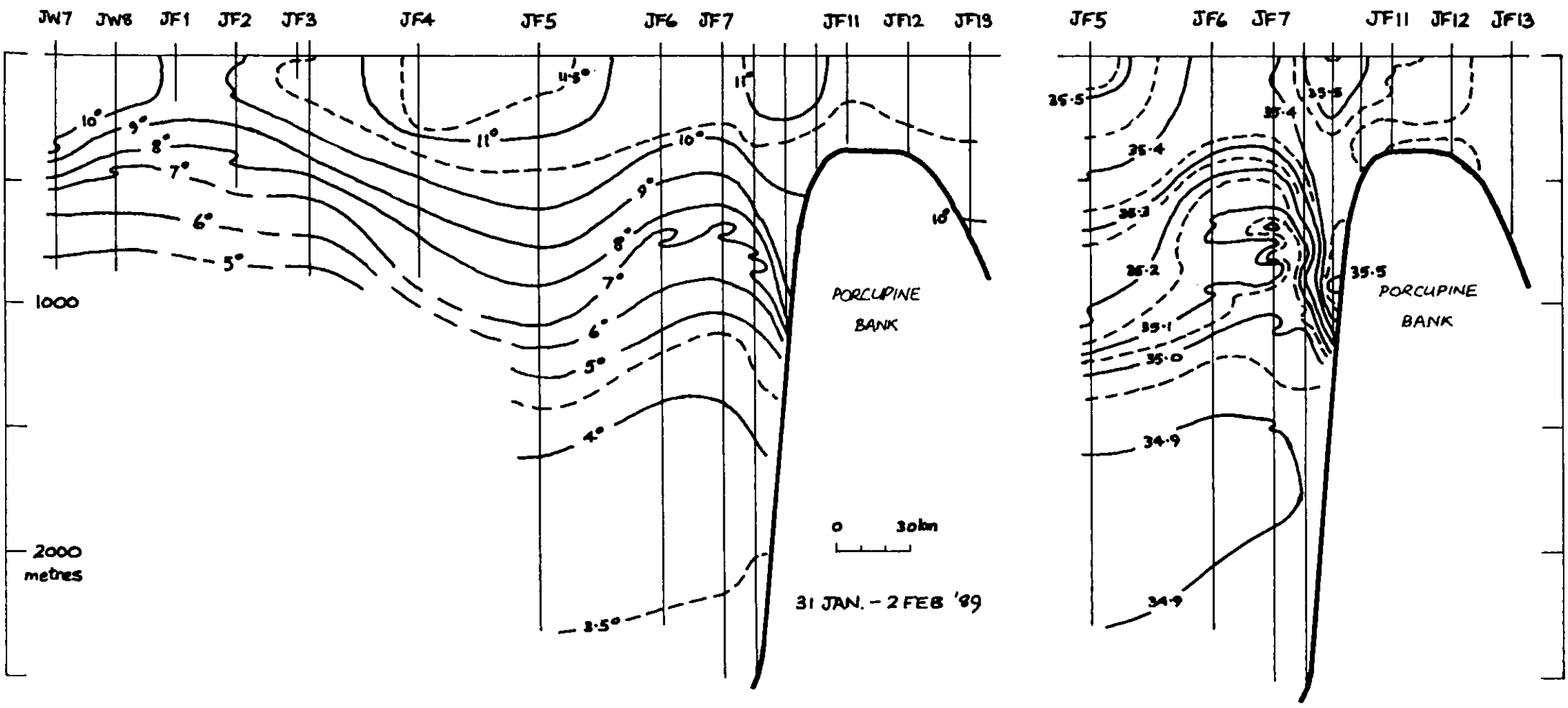


Figure 3. Temperature and salinity sections (uncorrected) in 52° N.