SMBA Dunstaffnage Marine Research Laboratory

Cruise Report RRS CHALLENGER, Cruise 8/1976.

Duration 1400h 19 May - 0800 h 1 June 1976. All times BST.

Locality Rockall Channel and Sea of the Hebrides.

Staff

D.J. Ellett (20May - 1 June)

R. Bowers (20 - 30 May)

G.G. Coghill (" ")

D.J. Edelsten (" ")

N.D. Pascoe (" ")

A.M. Souter (" ")

D.I. Williamson (20 - 31 May), University of Liverpool, Port Erin.

A. Nelson (19 - 26 May), Grant Institute of Geology, Edinburgh.

C. Chaplin (" "), Grant Institute of Geology, Edinburgh.

Miss M. Assem (20 May - 1 June), Univ. Coll. of Wales, Aberystwyth.

Aims

1) To service the current meter mooring in 57°N, 9°W.
2) To work the Anton Dohrn Seamount hydrographic section.
3) To obtain live spiny crab larvae for Dr Williamson.
4) To work two deep stations in the Rockall Channel for particulate analysis by the Grant Institute of Geology and trace metal analysis by the Fisheries Laboratory, Lowestoft.
5) To lay three current meter moorings in the Sea of the Hebrides for the duration of the cruise.
6) To work a grid of STD stations in the Sea of the Hebrides, sampling for caesium, lead and radium isotope determination by the Nuclear Geochemistry Unit, Chemistry Dept., Glasgow University.
7) To obtain 50 litre surface water samples at standard positions over the Scottish shelf for caesium isotope determination by the Fisheries Radiobiological Laboratory, Lowestoft.
8) To obtain bottom grab samples for the Dept. of Geology, Univ. Coll. of Wales, Aberystwyth.

Narrative. CHALLENGER sailed from Ardrossan at 1400h 19 May with Messrs Nelson and Chaplin and berthed at Dunstaffnage at 0630h on the following morning. All gear was loaded and the remainder of the scientific staff joined the ship, which sailed at 0917h.

After passage through the Sound of Mull, current meter moorings A and B were laid in excellent weather between 1335 and 1810h. The ship diverted briefly to a point west of Tiree where a drifting buoy had been reported, but this was not seen and course was set for station T of the Anton Dohrn Seamount section. This was commenced at 0018h 21 May and stations T, S, P and Q were worked before returning to station R to service the current meter mooring deployed on 1 April. The spar buoy had gone, but the pellets attached to the sub-surface float were in the position in which they were laid, and hauling from this end began at 0826h. The sub-surface float was recovered, but as the meter wire was being hauled a Talurit splice pulled out at the termination of the ship's messenger wire. The splice was later found to have been crimped in too large a size of press. Dragging commenced at 0856h using the Gifford and Mersey grapnels in series. After four tows the wind increased to 35 kt, making it difficult to handle the ship with the necessary precision, and dragging was abandoned at 1254h. An STD lowering was made and the ship worked STD and plankton stations at O and M before the winds and increasing swell stopped work at 0030h 22 May.

Work re-commenced in improved conditions at 0930h at station L and continued throughout the day. 300m of STD cable were cropped at K due to kinks which were 'birdcaging', and in the afternoon lighter winds and lessening swell permitted tests of the Edinburgh 30 litre Niskin bottles at I. Stratified plankton tows were made at most stations.

On 23 May winds became southerly and again increased to force 7. The section was completed at 1212h. Subsequently the ship steamed south-eastwards to work a chemical station in a depth of 1800m, stopping en route for a plankton tow. The chemical station commenced at 1928h and continued until 0940h on the following morning when plankton hauls and an STD lowering were made, the ship setting course at 1227h. The poor weather conditions and the failure of all but one of the five

General Oceanics Niskin bottles led to the abandonment of the plan to work a second chemical station on the passage back to the shelf. Moderate to heavy swell and a head sea reduced speed to $6\frac{1}{2}$ knots, and the southerly winds attained force 9 during the night of 24 - 25 May. Five further plankton stations were however worked over the deep water, and winds dropped to force 5 during the forenoon of 25 May.

The STD and caesium isotope sampling grid was begun between the Foyle and Islay at 2035h, 25 May. 14 stations had been completed by 1340h, 26 May when it became necessary to return to Dunstaffnage to land a crew member for domestic reasons. Messrs Nelson and Chaplin were also disembarked when CHALLENGER anchored in Ardmucknish Bay at 2300h. A replacement engineer arrived and the ship set sail at 0100h, 27 May.

The sampling grid was modified to omit one of the four planned westerly legs, and work re-commenced in the Firth of Lorn at 0335h, 27 May in a glassy calm which continued until evening. m.f.v. ALERT reported by VHF that the drifting buoy unsuccessfully investigated on 20 May was now some 10 n.ml. further north-eastward, and it appeared from the description to be a steel wreck buoy. HMS HECLA, engaged in an STD and bottom camera survey, was also spoken to in the vicinity of station 11D. The intention to take near-bottom caesium samples at alternate stations on this leg was defeated by the malfunction, and finally, disintegration, of the remaining Niskin bottle after only one sample had been obtained. Shipek grab samples were taken at the majority of grid stations.

At 0702h 28 May CHALLENGER arrived back at the position of the lost current meters. After STD and grab observations were completed the grapnels were streamed in conditions of low swell and force 4 easterly winds. At 1120h during the third tow the ground wire was caught and retained by the Mersey grapnel, and both current meters were recovered by 1157h. The sampling grid was continued eastward and a final line of stations from Ardnamurchan through the Small Isles was completed at 0751h, 29 May. Course was set from Rhum for current meter mooring A, which was raised by 1031h in an easterly force 5 wind which

freshened to force 6 during the subsequent retrieval of mooring B between 1325 and 1349h. STD and surface caesium samples were taken at both positions.

The ship steamed southward to pass en route for Dunstaffnage across the southern end of the Tiree Passage in order to test a method of collecting radium isotopes by towing a manganese impregnated fibre carrier within a Hardy Plankton Indicator. Two 15-minute tows were obtained at stations 10n.ml. apart, but during preparations for a third tow the rear hinge of the instrument broke and further observations were not possible.

CHALLENGER berthed at Dunstaffnage at 0630h, 30 May, and all gear was disembarked, together with the majority of the scientific staff. Sailing at 0930h, the ship steamed southward by way of the Sound of Islay to reach Port Erin at 0145h on the following morning when Dr Williamson left the ship at a rendezvous with r.v. SILVER SPRAY. The passage to Barry continued through 31 May and the ship docked at 0800h, 1 June.

Results Aim 1) The current meter rig in 57°N, 9°W was retrieved on 28 May after an unsuccessful attempt on 21 May. The surface spar buoy had gone adrift and after examination of the remaining buoy wire it was concluded that this had been cut near its mid-point after fouling fishing gear. Fishing was still heavy in the area; one grapnel tow on 28 May had to be terminated when a Russian-built stern trawler of indeterminate nationality towed into CHALLENGER's path, and a fleet of over 30 Russian vessels with factory ships was working on the shelf-edge about 12n.ml. further south on the previous day.

The current meters appeared to have functioned correctly and should provide 51 days of records at 30 and 100 m depth. Gear shortages and the heavy fishing concentration made it inadvisable to re-lay the mooring at this time, and this was therefore postponed to the August cruise.

Aim 2) The 20 stations of the Anton Dohrn Seamount section were worked between 0018h, 21 May and 1212h, 23 May, mostly in winds of forces 6 - 7. Work was interrupted by stronger winds and swell on 22 May for 9 hours.

Aim 3) Half-metre plankton net hauls, normally stratified, were made on the hydrographic wire at 19 stations to the west of the continental shelf-edge, but few crab larvae were caught and none were of the spiny type of unknown species sought by Dr Williamson for culturing. Though rare, their absence for the second consecutive year, following a number of records from this area, may reflect another aspect of the changes which have returned recent winter salinity values in the Rockall Channel to the low levels of 1950.

Aim 4) A station was worked in 1800m depth to the south-eastward of Rockall on 23 - 24 May to obtain samples of particulate organic matter, particulate inorganic matter and dissolved organic carbon. Samples were taken at 100m depth intervals and supplemented at 50m intervals in certain portions of the water-column. Oxygen content was also measured. Samples were filtered for later analysis at the Grant Institute of Geology, and 10 litre samples were deep-frozen for trace metal analysis at Lowestoft.

Aim 5) Due to non-delivery of lights and shortages of other components only two current meter rigs were available for the short-term measurements in the Sea of the Hebrides and it was decided to lay these at positions to the east (A) and west (B) of Coll. Both were in operation from 20 - 29 May, having single current meters at depths of 22 and 20m respectively. The meter at B appeared to have functioned correctly, but the final third of the tape record at A was mangled in the tape recorder. The two stations should however allow estimates to be made of the order of magnitude of the northward coastal flow during the period of the cruise.

Aim 6) A grid of 48 stations was sampled at the surface for caesium and salinity in a cooperative study with the Nuclear Geochemistry Unit of Glasgow University. At six stations on the central leg of the grid samples were additionally taken for lead and radium isotopes. At all but one station STD lowerings were made, but only one 30 litre near-bottom sample was obtained due to the failure of the last functioning Niskin bottle.

It was not possible until the grid had been completed to test a method of radium isotope determination by towing a manganese impregnated fibre within a Hardy Plankton Indicator, and the tests were brought to a halt when the rear hinge of the Indicator snapped. The two samples obtained may be able to show whether the fibre is sufficiently exposed by this method.

Preliminary analysis of the STD observations confirms the need for additional water-mass tracers at the surface, where only the extreme values of Atlantic water, St. George's Channel water and Clyde/Irish Sea coastal water are well defined. At the bottom, Clyde/Irish Sea coastal water, St. George's Channel water, Atlantic water and Hebridean Shelf water are tentative identifications of four main groupings of points on the temperature-salinity plot. At this level, Irish Sea influence (i.e., both St. George's Channel and coastal waters) extended to about 30 miles west of Islay, but to the west of Tiree its boundary lay close to current meter rig B. In the Tiree Passage a mixed water appears to have been produced from the two Irish Sea components, and their separate identities are not apparent to the north of this.

Aim 7) 50 litre surface samples for caesium isotope determinations were obtained for Lowestoft at stations C2 to C10 of the line regularly sampled. As samples were also taken for Glasgow at the same stations the results will provide an intercomparison of the differing methods of determination.

Aim 8) 30 Shipek grab samples were obtained at stations on the continental shelf, and one sample on Rockall Bank. The poor wind and swell conditions during the working of the Anton Dohrn Seamount section precluded the use of the grab in deep water.

D.J. Ellett

1 June '76.