Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory.

Cruise Report

R.R.S. CHALLENGER

Cruise 11/1983

10-24 August 1983

RRS CHALLENGER, Cruise 11/1983.

Duration: 1412 h 10 August to 1500 h 24 August 1983.
All times BST.

Locality: Scottish continental shelf and slope, Rockall Channel, 55°-59°N.

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Aims:

1) To service SMBA moorings M (Rockall Channel), Y (Tiree Passage) and J (Sound of Jura), and to retrieve and re-locate moorings A2 to A5 (Scottish slope).

2) To make CTD lowerings and collect radiocaesium samples upon shelf transects between the Mull of Galloway and the Butt of Lewis for SMBA/Glasgow University and for the Fisheries Radiobiological Laboratory, Lowestoft.

3) To sample chlorophyll and nutrients across the shelf and slope to the west of the Hebrides for the Marine Biology Station, Portaferry.

4) To service moorings M2 and HS1, and to retrieve moorings in 55°53'N, 09°13'W for the Marine Science Laboratories, Menai Bridge.

5) To retrieve and re-locate the Dundee University satellite-interrogated buoy (Kraksat) at mooring A2.

6) To recover a Bidston pressure gauge near mooring M.

7) To observe seabirds around the Hebrides for the Marine Science Laboratories, Menai Bridge.

8) To work the Anton Dohrn Seamount CTD section.

Narrative: CHALLENGER sailed from Dunstaffnage at 1412 h, 10 August, calling at Oban North Pier between 1615 and 2005 h to load heavy gear for the cruise. A section of five CTD lowerings and radiocaesium surface samples (1E to 5E) was worked across the Firth of Lorne between 2330 h and 0330 h 11 August. The ship proceeded via the Sound of Islay in excellent weather to a section between Islay and Kintyre and worked four stations (2B to 4B) before setting course at 1015 h for mooring J, west of Danna. The mooring was recovered and re-laid between 1245 and 1441 h and station 1B was completed at 1745 h. A section between the Mull of Kintyre and Antrim (1A to 5A) was worked from 2058 to 0155 h 12 August, CHALLENGER subsequently steaming for the southernmost CTD and radiocaesium section between Copeland and Portpatrick (1Z to 6Z), which was completed between 0730 and 1215 h. Surface caesium and salinity samples were collected between Corsewall Point and the Mull of Kintyre on the northward passage and the first of eight CTD stations from west of Islay (OD to 8D) was begun at 2310 h. Upon completion of the section at 0850 h 13 August we steamed for the three Menai Bridge moorings at the edge of the continental shelf. Despite the initial reluctance of the sub-surface mooring to release, all three were recovered between 1420 and 1801 h, and after a CTD lowering the ship set course for mooring M2 in the vicinity of Blackstones Bank. This was sighted at 0550 h 14 August and recovery was complete by 0809 h. The main mooring was re-laid by 1137 h, but due to the need to arrive at the Tiree Passage mooring before slack water, no separate spar marker buoy was laid, with the hope that this might be possible at the end of the cruise.

Mooring Y, between Coll and Mull was reached at 1515 h, and was found to be lacking its pick-up line. The ship's inflatable was used to attach a line to the buoy, and the mooring was recovered and re-laid by 1901 h. A CTD lowering and surface caesium sample were taken nearby. Part of the severed pick-up line had become entangled in the ship's propellor during the recovery operation and it was agreed that this required examination by divers before proceeding offshore. Accordingly, CTD stations 1G to 6G were worked overnight in from the west of Coll to the Sound of Mull, and CHALLENGER anchored in Scallastle Bay, Mull at 0822 h 15 August. SEOL MARA arrived from Dunstaffnage with divers at 1125 h, and 25 m of 25 mm diameter braidline were removed from the screw by 1135 h. CHALLENGER weighed anchor at 1145 h.

The south-west to westerly wind had freshened to force 5 in the forenoon, but dropped again in the evening during the working of the section westward from station G7 at 1800 h. Barra Head was passed at 0120 h 16 August and the section completed at the former site of the shelf-edge mooring at 1112 h. The ship steamed to mooring M, which was raised and re-deployed between 1718 and 2250 h, and subsequently set course for the westermost station of the Anton Dohrn Seamount section.

Station A, close to Rockall, was begun at 1222 h 17 August in quiet conditions with a low swell, and continued to station N, completed at 1417 h 18 August. A bottom mounted Bidston pressure gauge laid in the vicinity during Cruise 11/1983 was contacted and raised between 1518 and 1651 h, having proved somewhat difficult to locate on the surface despite the idyllic conditions. Mooring A5 was subsequently sought, but despite a search between 1710 and 1900 h over the supposed position and along the 1550 - 1600 m isobaths the mooring was not found and attention was turned to A4, which was switched on at 2026 h. It was at first believed that the mooring had not been released after firing, but whilst preparations were being made for dragging, the sub-surface buoy was sighted from the engine room by the third engineer, an especially notable feat in view of the misty, but fine, conditions now prevailing. Recovery was completed by 2201 h.

During the night the section was completed by stations O to R, the latter being finished at 0650 h 19 August. In patchy mist and fog the ship steamed for the surface moorings at A2. The current meter mooring was located and recovered between 0953 and 1021 h, but the upper meter and sub-surface float had gone, presumably by trawling. The spar buoy upon which the Dundee University satellite-transmitting thermistor and salinity sensors were deployed was absent from the site, but in steaming from the locality the Master observed a stationary weak radar echo some 3 miles to the north of the position, and this emerged from the fog at 200 m range as the missing Kraksat. The buoy, when recovered at 1140 h, had been unshackled at the join between the buoy wire and the long-link chain connecting it to the anchor, and was thus only remaining in position because of the weight of the buoy wire. This suggests that the interference had been recent, throwing suspicion upon a group of foreign distant-water trawlers seen fishing in company at the shelf-edge to the south a few days earlier.

Mooring A3, in 500 m depth, was next sought. The release was contacted at 1224 h and fired at 1400 h. The mooring failed to rise, although there was apparently a bottom echo, suggesting that the rig was upright. A Gifford grapnel with chain and 12 mm diameter wire were attached to the main warp and the position encircled with the aid of the Decca plotter. Despite numerous circuits of the site between 1620 and 1920 h nothing was entangled, and it was assumed that the 'bottom' echo must have been an echo from the surface or the ship's hull. Course was set for a CTD section eastwards from the shelf-edge, which was begun at 2333 h. Five stations (BN8 to BN4) of this line were worked and at 0630 h 20 August the ship steamed for a CTD and radiocaesium section north-westwards from Loch Resort, Lewis. The eight stations of the section (1J to 8J) were occupied between 1215 h 20 August and 0135 h 21 August. CHALLENGER steamed towards the new sites in 59°N selected for the replacement slope moorings, stopping at 0545-0652 h for acoustic release tests. The deepest mooring, U in 1400 m depth, was laid between 0833 and 1017 h, V in 1000 m at 1323 - 1455 h and W in 500 m at 1616-1723 h. The Dundee University equipment was re-deployed upon a spar buoy in 190 m at the eastern end of this

line of moorings between 1819 and 1902 h. CTD observations were made at each site and the CTD section continued towards Lewis with stations 1M to 6M at 2013 h 21 August to 0300 h 22 August. Quiet weather continued with improved visibility.

CTD sections were worked in the North Minch from Broad Bay to Eddrachillis Bay (1L to 6L) and Loch Gairloch to Loch Seaforth (K1 to K9) during 0630 h 22 August to 0005 h 23 August, and course was set for mooring HS1 between Skye and Benbecula. The mooring was raised in patchy mist and fog between 0635 and 0747 h, and the ship adjourned at the behest of RVS to Loch Bay, Skye to retrieve a recovered sub-surface buoy, returning to lay the replacement mooring at 1446-1523 h. Upon completion of a CTD lowering at 1541 h course was set for the Sound of Mull via the Sound of Rhum to provide maximal cover of sea-birds. CHALLENGER berthed at Oban North Pier at 0636 h 24 August, and after unloading heavy gear and reloading equipment for the following cruise,proceeded to Dunstaffnage,berthing at 1500 h.

Results Aim 1) Details of moorings recovered and laid are given in Tables 1 & 2. The Sound of Jura mooring (J) provided two records of 73 days duration: The single Tiree Passage current meter (Y) was fouled by the anchor, probably during laying, but this will become clear when the record is examined: Mooring M provided three 89 day records, but a fourth current meter had lost its rotor, though at what stage of the deployment is not yet known. These three moorings were re-laid.

Of the 'A' moorings over the continental slope in 57°20'N, only A4, in 1000 m depth was completely successful, giving four records of 90 days' duration. A5 could not be located despite a search, and A3 was found to be without sub-surface buoyancy. Dragging around the latter position produced no results. A2, a U-shaped shelf mooring, had been damaged by trawling and the sub-surface float and one of the two current meters had gone. Three of these moorings and the Kraksat buoy (Aim 5) were re-located across the slope in 59°N, the sites chosen being across a steep section of slope which may be less attractive for trawling.

Aim 2) Eleven shelf CTD sections were worked and surface samples taken upon an additional line. Details of the sections are given in Table 3. Radiocaesium samples were taken for Glasgow University Chemistry Department upon the transects worked in May and also in the Firth of Lorne and across the Firth of Clyde entrance. Samples for the Fisheries Radiobiological Laboratory, Lowestoft, were taken at the ten standard positions between the shelf-edge and the Sound of Mull and will allow intercalibration of the two methods. Sub-surface samples for radiocaesium were taken at stations 7G, 2 & 3J and 3K.

Aim 3) Chlorophyll and nutrients were sampled and fluorometer lowerings made upon sections, G, BN and J for the Portaferry Laboratory. Additionally, samples for ammonia analysis were taken on sections Z, A and K. Surface chlorophyll was recorded continuously throughout the cruise.

Aim 4) Menai Bridge moorings M2 and HS1 were again serviced. Three moorings laid by the Unit for Coastal and Estuarine Studies, Menai Bridge during July were successfully recovered.

Aim 5) The spar buoy carrying the University of Dundee satellite transmitter, thermistor chain and salinity sensor had apparently been trawled at the A2 position but was recovered nearby. Apart from some flooding of the salinity sensor and a barnacle which had taken up residence within the electrodes thereof, the equipment appeared to be in order. After exchanging connectors between the old and new battery boxes the new battery was fitted. The salinity sensor was dried out, cleaned and re-assembled, the seals being well taped. The buoy was deployed at 59°00.6'N, 07°24.0'W on 21 August, in the neighbourhood of the slope current meter moorings. Interrogation of the Toulouse ARGOS computer indicates that the thermistors are functioning but the salinity cell is not.

Aim 6) The Bidston pressure gauge (N), deployed on the May cruise, was successfully recovered. The experimental glass-fibre flagpole had unfortunately not survived its descent and ascent and the difficulty of finding the low-floating pressure gauges on the sea surface remains a problem.

Aim 7) Systematic observations were made on the distribution and abundance of moulting auks (razorbill and guillemot). These species undergo an abrupt post-nupital moult during which they become flightless and at the same time continue to tend their young at sea. Previous observations in the Irish Sea had shown that they tend to concentrate in areas where shallow thermoclines make O-group clupeid fish particularly accessible.

During the cruise bird data was gathered using standard NCC/Seabird Group methods. After trying a vantage position on the wheelhouse top it was found that 90° forward scans from a bridge wing were more effective. This position is less exposed, has a gyro compass repeater and the ship's speed indicator is visible without moving from the starboard wing.

In total, 575 standard 10 minute transect blocks were recorded, with a further 55 usable part blocks. The transects thus covered a steaming distance of about 1350 km. In addition, counts of associates were made near the end of the time the ship was stopped at virtually all daylight stations.

Concentrations of moulting auks were found in the following localities:

1. Sound of Jura, south of Skerryvuile
2. Firth of Lorne
3. Tiree Passage
4. Sea of the Hebrides, offshore from Loch Bracadale, Skye, to the Sound of Rhum
5. Outer Sound of Raasay
6. Minch, off the Summer Isles
7. Off Scarp Island, Harris

Except for a few scattered puffins no auks were seen out on the Malin or Hebrides Shelf nor out across the Rockall Trough.

Although, in general, the distribution of the concentrations conformed to the hydrographic pattern, the complex topography means that there are many boundaries between mixed and stratified water amongst the Hebridean islands. To fully understand the patterns the several patches would each have to be surveyed in detail. (E.I. Rees).

Aim 8) All stations of the Anton Dohrn Seamount section were worked, the only problem being the failure of the new wire metering gear in deep water. This mysteriously corrected itself at the final deep stations of the section.

Acknowledgements. The fine weather allowed a great deal of work to be carried out and our thanks are due to Captain Moran, his officers and crew for their assistance and encouragement.

D.J. Ellett

30 August 1983.

Table 1. Moorings recovered during RRS CHALLENGER Cruise 11/1983.

Mooring	Owner	Depth m.	Lat o ' N.	Long. o ' W.	Date moored 1983	Date recovered 1983	No. of current meters	Remarks
J	SMBA	68	55 55	05 49	30 May	11 August	2	Surface spar.
IW3A	UCES	190	55 53	09 13	9 July	13 August	thermistors	Surface toroid (met. buoy).
IW3B	UCES	190	55 53	09 14	9 July	13 August	5	Sub-surface
IW3C	UCES	185	55 53	09 14	9 July	13 August	1 VACM	Surface toroid
M2	MSL	67	56 09	06 55	30 May	14 August	3	Surface toroid & spar.
Y	SMBA	46	56 38	06 24	30 May	14 August	1	Spar. No pick -up line, meter fouled.
M	SMBA	2230	57 16	10 19	19 May	16 August	4	Sub-surface. 1 rotor lost.
N	Bidston	2030	57 19	09 54	22 May	18 August	Pr. gauge	Deployed on sea bed.
A5	SMBA	1575	57 19	09 40	20 May	-	4	Sub-surface, not located.
A4	SMBA	995	57 20	09 33	20 May	18 August	4	Sub-surface.
A2	SMBA	185	57 19	09 17	25 May	19 August	2	Spar. 1 Meter & sub-surf. los
KRAKSAT	U. Dundee	205	57 23	09 19	25 May	19 August	thermistors	Spar. No anchor 3 miles off position
A3	SMBA	517	57 20	09 27	25 May	-	3	Sub-surface. Release lying on bottom.
HS1	MSL	148	57 27	07 01	29 May	23 August	3	Surface toroid & spar.

UCES = Unit for Coastal & Estuarine Studies, Menai Bridge

MSL = Marine Scinece Laboratories, Menai Bridge

U. Dundee = University of Dundee, Dept. of Physics

Bidston = Institute of Oceanographic Sciences, Bidston.

Table 2: Moorings deployed during RRS CHALLENGER Cruise 11/1983.

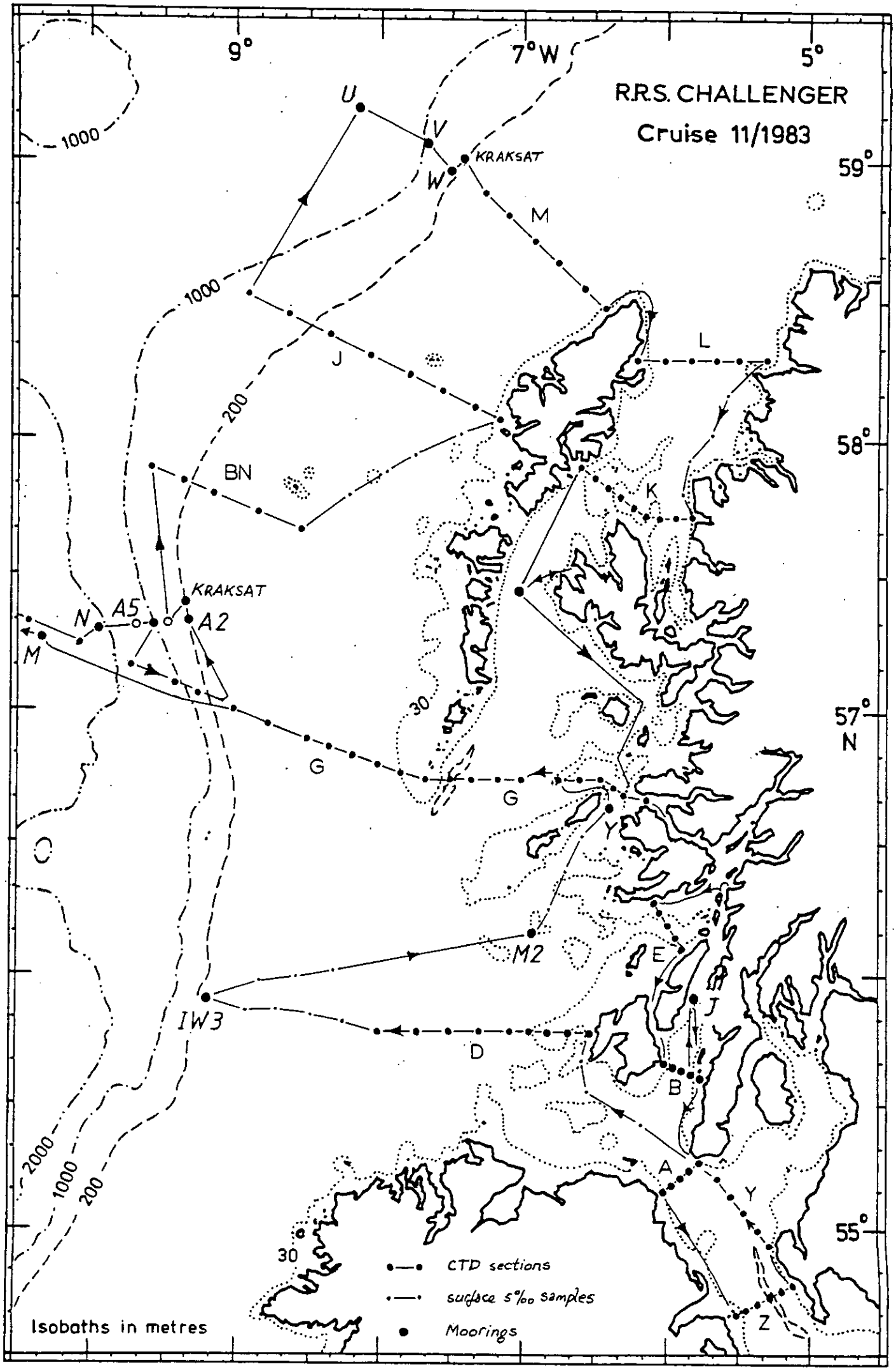
Mooring	Owner	Depth m.	Lat. N. ° '	Long. W. ° '	Date deployed 1983	No. of current meters	Remarks
J	SMBA	60	55 55	05 49	11 August	2	Surface Spar
M2	MSL	68	56 09	06 56	14 August	3	Surface toroid, no spar
Y	SMBA	48	56 38	06 24	14 August	1	Surface spar
M	SMBA	2235	57 16	10 21	16 August	4	Sub-surface
U	SMBA	1394	59 11	08 09	21 August	4	Sub-surface
V	SMBA	1015	59 03	07 40	21 August	4	Sub-surface
W	SMBA	515	58 58	07 31	21 August	3	Sub-surface
KRAKSAT	U. Dundee	194	59 01	07 24	21 August	thermistors	Spar, satellite transmitter
HS1	MSL	153	57 26	07 00	23 August	3	Surface toroid & spar

MSL = Marine Science Laboratories, Menai Bridge

U. Dundee = University of Dundee, Dept. of Physics

Table 3. Sections worked during RRS CHALLENGER Cruise 11/1983.

Stations	Location	Dates	Observations
1Z - 6Z	Copeland - Portpatrick	12 Aug.	CTD; surface Cs; ammonia (2&3)
1Y - 5Y	Corsewall - Kintyre	12 Aug.	Surface s‰ & Cs only
1A - 5A	Antrim - Kintyre	11-12 Aug.	CTD; surface Cs; ammonia (1,3&5)
1B - 5B	Gigha - Islay	11 Aug.	CTD; surface Cs
0D - 8D	West from Islay	12-13 Aug.	CTD; surface Cs
1E - 5E	Firth of Lorne	10-11 Aug.	CTD; surface Cs
1G - 16G	Sound of Mull - Shelf edge	14-16 Aug.	CTD; surface Cs; sub-surface Cs (7); nutrients & fluorometer lowerings (4,6,7,9,11,13,15,16)
BN4-BN8	St. Kilda shelf	19-20 Aug.	CTD; nutrients & fluorometer lowerings
1J - 8J	Loch Resort - shelf edge	20 Aug.	CTD; surface Cs; sub-surface Cs (2&3); fluorometer lowerings.
1K - 9K	Loch Seaforth-Loch Gairloch	22 Aug.	CTD; surface Cs; sub-surface Cs (3); fluorometer lowerings.
1M - 7M	NW from Butt of Lewis	21-22 Aug.	CTD.
1L - 6L	Broad Bay-Eddrachillis Bay	22 Aug.	CTD.
A - T	Anton Dohrn Seamount section	17-19 Aug.	CTD; nutrients & fluorometer lowerings (M,O,P,Q,R,S,T)


R.R.S. CHALLENGER
Cruise 11/1983
9°
7°W
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59°
58°
57°
N
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2000
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CTD sections
surface S‰ samples
Moorings
Isobaths in metres