SCOTTISH MARINE BIOLOGICAL ASSOCIATION

Dunstaffnage Marine Research Laboratory

Cruise Report

R.R.S. CHALLENGER

Cruise 6/1978

11-21 April 1978.

RRS CHALLENGER : Cruise 6/1978

Duration of cruise : 1117 h 11 April - 2010 h 21 April 1978.

Times BST unless specified otherwise

Locality : Rockall Channel and Scottish continental shelf.

Staff : D.J. Ellett

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P. Tyler (Univ. Coll. of Wales, Swansea).

Aims : a) Hydrographic

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

2) To lay an SMBA deep mooring at a position between Anton Dohrn Seamount and the continental shelf.

3) To work the Anton Dohrn Seamount CTD section.

4) To moor a set of test panels off S. Uist for fouling studies.

5) To make CTD sections on the shelf to the west of the Hebrides.

6) To collect 50 litre water samples at standard positions for radiocaesium analysis.

b) Benthic

7) To obtain an epibenthic sled sample of the abyssal macrobenthos of the SMBA permanent station in 54°40'N, 12°16'W at 2900 m depth in order to continue a long-term time series.

8) To test the mk II box corer at abyssal depths, and to obtain a series of quantitative cores at the permanent station in order to continue studies of macrobenthic community structure.

9) To obtain hauls of the benthic megafauna using an Agassiz trawl in order to continue seasonal studies.

10) To obtain samples of deep plankton at the permanent station using the small rectangular mid-water trawl (RMT 1).

11) To obtain further samples on a partially completed box coring transect across the Hebridean slope in order to study bathyal zonation.

Narrative : Due to the delayed arrival of the lorry, sailing was postponed on 10 April, and loading of gear commenced at 0815 h, 11 April. CHALLENGER cast off from Barry at 1117 h and steamed westward for Fastnet in south-westerly force 6 winds. The Skelligs were rounded at 1800 h 12 April, when three-hourly surface salinity sampling was begun. The SMBA deep benthos site to the north-east of Porcupine Bank was reached at 2000 h 13 April, and sampling began in depths of 2900 m with an epibenthic sled haul between 2012 h and 0030 h 14 April, followed by an Agassiz trawl between 0227 and 0655 h. Two lowerings of the mk 2 box corer were made from 0818 to 1112 h, but although the corer operated, no material was obtained. Subsequently a rectangular mid-water trawl (RMT) haul was made for samples of deep plankton, and this was completed at 1933 h. A second epibenthic sled haul began at 2108 h and was completed at 0124 h, 15 April. Although the sled had apparently struck into the sea-bed,

causing turns in the main warp extending through 200 m with resultant difficulties in hauling, a useful portion of the sample was recovered. The damaged portion of the main warp was subsequently removed.

Upon conclusion of the benthic programme at the permanent station, CHALLENGER steamed northwards in light southerly winds to Rockall to commence the Anton Dohrn Seamount CTD section at the westernmost station, station A, at 2015 h 15 April. Faults which developed in the Precision Echo Sounder (PES) prevented acoustic interrogation of the current meter mooring laid near station F on cruise 2/1978, but in other respects work proceeded uneventfully to station L, completed at 2105 h 16 April. Preparations were made for laying a second deep mooring in the vicinity of station M, and this was deployed between 2153 h and 0034 h 17 April in 2280 m depth. A CTD lowering was subsequently made at station M, but at station N faults developed in the CTD system, and in view of increasing swell and wind it was decided to proceed to the shelf current meter mooring at station R whilst the causes were sought.

The existing mooring, laid on 3 February, was sighted at 1040 h. 17 April. Its replacement was laid between 1147 and 1237 h, and the former recovered between 1250 and 1328 h in force 7 south-easterly winds. As further deterioration in the weather seemed likely, it was decided to work the shelf CTD section to Barra Head and another northwards to the site for the mooring for fouling studies off the west coast of S. Uist. Fortunately the wind became variable force 3 during the morning of 18 April, and the mooring was laid without difficulty between 1008 and 1024 h. CTD stations were continued northwards to the Monach Is., and from thence north-westwards past St. Kilda to reach depths of 1850 m at longitude 10°W. Station J, on the crest of Anton Dohrn Seamount was reached at 0636 h, 19 April, and work recommenced on the interrrupted eastern half of the seamount CTD section. A successful deep Agassiz trawl haul was made to the north of station M from 1058 to 1357 h, and the section continued, reaching the shelf at station R at 0200 h 20 April.

Winds had again risen to force 7 south-easterly at this time, and remained strong during the working of a third shelf section towards Barra from the north-west. After the completion of this at 1411 h, CTD lowerings were made at standard radiocaesium sampling positions between Barra Head and the Sound of Mull in improving wind and sea conditions. The final surface caesium sample was taken off Ardmore Point at 0035 h 21 April, following which the ship steamed for Loch Boisdale to effect

a section across the Sea of the Hebrides worked on the previous cruise. This was begun at 0403 h and interrupted briefly between 0545 and 0654 h for two test lowerings of the box corer. After station E3 at 0758 h, five stations were worked northwards to Loch Bracadale , Skye, the line being resumed at station E4 at 1359 h, and being completed off Moidart at 1800 h in calm weather. CHALLENGER set course for Mallaig, berthing alongside at 2010 h, 21 April.

Results: a) Hydrographic. Aim 1). The SMBA current meter mooring in 57°N, 9°W was serviced on 17 April. The current meters retrieved, from nominal depths of 30 and 108 m, appeared to have functioned correctly during the previous 73 days. Details of the mooring laid are given in Table 1.

Aim 2). A deep mooring with acoustic release and sub-surface buoyancy was laid in the vicinity of station M of the Anton Dohrn Seamount section on 16-17 April. As for the mooring laid at station F on cruise 2/1978, the mooring was streamed anchor last, but on this occasion the sub-surface float was launched after the first Aanderaa current meter was in the water, thus avoiding the most difficult moments which were found in the earlier mooring. The acoustic release had been tested beforehand to 1700 m depth at station H, and was observed to be functioning on the mooring. Recovery and replacement are scheduled for cruise 11 A, in mid-July.

Aim 3). The Anton Dohrn CTD section from Rockall to the Scottish continental shelf was completed in two parts with an overlap, stations A to M being worked during 15-17 April and stations J to R during 19-20 April. The break in the section was occasioned by faults in the CTD system, traced to the cable joint, and by the need to service the shelf-edge mooring before further deterioration of the weather occurred. Surface temperature and salinity values over the section were close to those found in early February 1978, although a shallow upper-layer had begun to form at some western stations. Over the Scottish continental slope temperatures down to 500 m depth were the lowest encountered from March 1975 to date.

Aim 4). An 8 ft. diameter toroid buoy carrying detachable PVC panels for fouling settlement studies, and supporting two similar sets of panels at depths of 5 and 10 m, was laid off Rubha Ardvule, S. Uist on the morning of 18 April. The mooring, to the design of Mr. Picken of SMBA, MATSU (Harwell) and Mr Baxter of Lowestoft, was

anchored below the 10 m panel by 25 m of 16 mm wire and 40 m of $\frac{3}{4}$" chain to a 1000 kg chain clump, in water of 48 m depth. Launching, though awkward due to the close spacing between the buoy and the two panel cages, went smoothly enough in the existing calm conditions.

Aim 5). Three east-west sections were worked on the continental shelf west of the Hebrides between Barra Head and St. Kilda during 17-18 April and 20 April, and a number of stations were also worked off the west coasts of Barra and S. Uist. In addition, on 20-21 April CTD lowerings were made in the Sea of the Hebrides at radiocaesium sampling stations between Barra Head and the Sound of Mull, and upon a previously sampled line between Loch Boisdale and Loch Moidart. Surface temperatures at the eastern stations on the latter section were up to 0.75 deg C higher than in early February 1978, but elsewhere surface temperatures were close to February levels or up to 0.5 deg C below them. In general, temperature and salinity profiles on the outer shelf had more structure than on the previous cruise, with decreased bottom temperatures. Closer to the islands, mid-water temperature minima occurred, but in the Sea of the Hebrides relatively warm bottom water was found within a sub-surface tongue of Atlantic water entering the area from the south.

Aim 6). Surface water samples were collected for radiocaesium analysis by the Fisheries Radiobiological Laboratory, Lowestoft at ten standard positions between the shelf-edge and the Sound of Mull. CTD observations were made at all stations except the easternmost, as noted under Aim 5.

b) Benthic. Aim 7). Two hauls of the abyssal macrobenthos were obtained using the epibenthic sledge in order to continue the seasonal time series on the SMBA Permanent Station. (See Table 2 for details of all hauls during the cruise). The first was recovered showing evidence of washing, possibly owing to heaving too fast during recovery, although the mouth closing gate had closed correctly. A second haul was made later and recovered a large quantity of apparently little-washed material (although when sieved, only a relatively small number of animals were collected). Preliminary examination of the first haul has revealed a rich sample with a large number of bivalves present.

Aim 8). Two trials of the mk II 0.25 m^2 box corer at the permanent station were unsuccessful. However, the lack of any tension indication on the main wire hampered this operation. Although there was

good evidence of the gear having bottomed and closed correctly, only small quantities of washed sediment were recovered from the sample box. Poor seating of the box against the spade after closure may have caused loss of sediment during the recovery to the surface. Later, in shallow water off Loch Boisdale (S. Uist), a good sample was collected from 145 m depth, although there was some evidence of washing even during this short recovery. The opportunity was also taken to test the X25 subcorer sample box; this worked well, although subcore removal proved more difficult than expected.

Aim 9). A single deep haul using the large Agassiz trawl at the permanent station yielded a good sample (Table 3), but with no Ophiomnsium lymani (the brittle star species required for seasonal studies). An opportunity was therefore taken for another Agassiz haul in the deep water between Anton Dohrn seamount and the Hebridean Slope. An extremely rich and varied collection of fauna was obtained from this position (Table 3). This haul yielded, besides a large number of Ophiomnsium lymani, a rich collection of gastropods and echinoderms - including large numbers of the sea star Hymenaster pellucidus. If this latter identification is correct, this seems to be a remarkable extension to "warm-water" of its known Arctic/Norwegian Sea distribution.

Aim 10. A single deep haul using the combined RMT-7 and RMT-1 pelagic nets yielded a large sample of bathypelagic plankton from the permanent station. The purpose of this haul was somewhat exploratory in seeking pelagic larval stages of the species studied from the benthic time series. However, examination of the RMT-1 sample by Dr Tyler has revealed the presence of numerous ophiopluteus larvae of brittle stars. These larvae have been identified as "Ophiopluteus ramosus" Mortensen (for which the adult is unknown). There is strong evidence to consider that these represent the ophioplutei of Ophiura ljungmani, a deep sea species whose reproduction is currently under study by Dr Tyler and Dr Gage, and thus may represent the first known pelagic larval stage of a deep sea brittle star.

Aim 11). This aim was not attempted due to lack of opportunity.

Miscellaneous) As in early February, heavy fishing, presumably for blue whiting, was taking place on 18 April along a narrow band of the continental slope west of St. Kilda, at station B8. The lights of 20 vessels, apparently Scandinavian or continental, were visible and were shown by the radar to be orientated along the isobaths. The Atlas

sounder showed dense fish traces just above the bottom against the slope in depths of about 350 m. These deepened to about 400 m as the bottom fell away. It would appear that the relatively gentle gradients of the slope at 58°N allow the fish a greater area of contact with the bottom at their normal swimming depth than in regions further south, and permits their capture with bottom trawls.

D.J. Ellett & J.D. Gage.
2 May 1978.

Table 1. Details of current meter moorings set during CHALLENGER cruise 6/1978

Station	M	R
Position	57°12.9N 10°34.0W	57°01.9'N 09°01.0'W
SMBA mooring no.	40	39
Sounding (m.)	2280	145
Nominal depth of sub-surface float (m.)	206	37
Nominal meter depths (m.) (P: pressure sensor) (All have temperature sensors)	219P 620P 1120 1870	50 120
Sampling frequency	20 min	10 min
Laid at (GMT)	2335 h 16 April 1978	1137 h 17 April 1978

Table 2. Benthic sampling stations worked (all depths given corrected using Matthews (1939) 'Tables of the velocity of sound in pure water and sea water'

Date	Operation no.	Approx. times of gear on bottom Hrs. B.S.T.	SMBA Stn. No.	Positions at start and finish of haul	Depth (m)	Gear	Result
13-14 April '78	1	2137-0016	140	54°40'N,12°17'W -54°45'N,12°17'W	2912	Epibenthic Sledge (ES)	Washed, though apparently rich, sample
14 April '78	2	0400-0540	141	54°40'N,12°16'W -54°44'N,12°14'W	2912	Agassiz Trawl (AT)	Satisfactory haul but r Ophiomusium lymani
" " "	3	-	142	54°47'N,12°17'W -54°28'N,12°08'W	-	Combination RMT 7 + 1 pelagic nets	Good samples
" " "	4	2240-2343	143	54°38'N,12°14'W -54°40'N,12°13'W	2892	ES	Extension bag full
19 " "	5	1250-1420	144	57°13'N,10°21'W -57°13'N,10°17'W	2240	AT	Very rich haul
21 " "	6	0451	145	57°03'N,07°01'W	145	Spade box corer (SBC)	Good core; a little washing
21 " "	7	0545	146	57°03'N,07°01'W	145	SBC	Twenty-five subcores obtained

Table 3. List of preliminary identifications of benthic fauna in Agassiz Trawl (AT) hauls.

(Numbers of specimens in brackets)

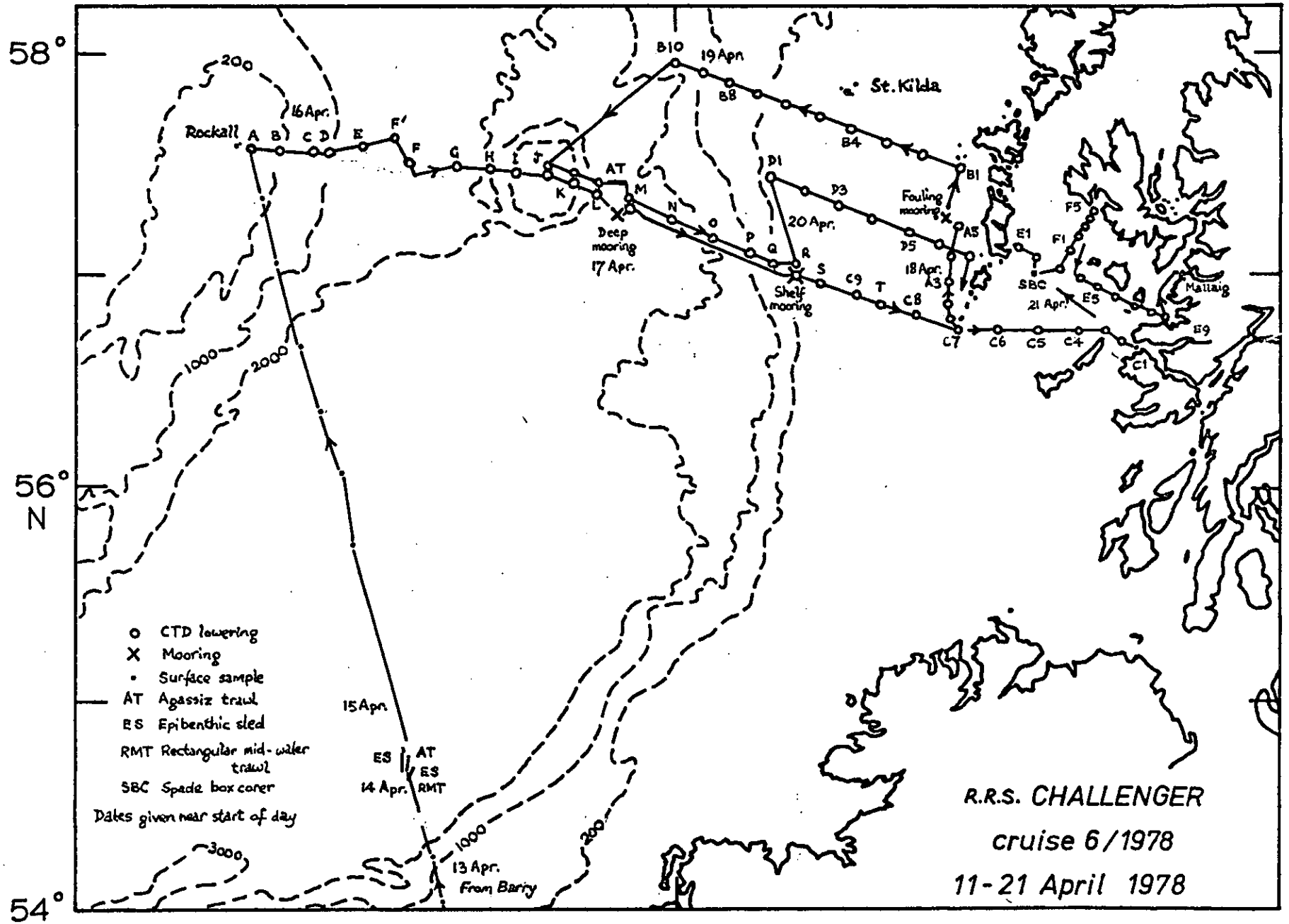
AT 141	AT 144
Porifera	Porifera
spp. frags.	Sp(p.) (frags.)
and frags. incertal sedis	Gorgonacea
Actinaria	Acanella arbuscula (Johnson) (many)
sp. (1)	
Polychaeta	Pennatulacea
Lagisca hubrechti (McIntosh) (1)	Umbellula lindahli? Kolliker (1)
Sipuncula	Distichoptilum gracilis Verrill (frag.)
sp. (1)	Anthoptilum sp. (1)
sp. (in dead gastropod shell)	Madreporaria
Vermes	Caryophyllia ambrosia Alcock (1)
sp. indet. (1)	Fungiacyathus marenzelleri Vaughan (49)
Crustacea	
spp (probably pelagic)	Actinozoa
Gastropoda	Phelliactis robusta Carlgren (6)
sp. (4)	Nemertea
sp. (2)	sp. (1)
sp. (1)	?sp. (found in dead gastropod shell)
spp. (dead shells)	
Cephalopoda octopoda	Polychaeta
sp. (1)	Lagisca hubrechti (McIntosh) (33)
Ophiuroidea	? Fauveliopsidae sp. (3)
Ophiura ljungmani (Lyman) (51)	(each found in an old gastropod shell)
Asteroidea	
Porcellanaster caeruleus? Wyv. Thomson (2)	Sipuncula
	sp. (1)
Pseudarchaster parelii Düben & Koren (7)	Pogonophora (1 + tube)
Echinoidea	
Echinosigra paradoxa Mortensen (frag)	Crustacea Decapoda
Holothuroidea	Coridea sp. (1)
Ypsilothuria sp. (32)	Polycheles sculptus (S.I. Smith) (12)
spp. (decomposed after fixation)	Munidopsis curvirostra? Whiteaves (4)
	Galacantha rostrata (A.M-Edw. including one ripe ♀) (2)
Fish	sp. indet. (frag)
Phycis	spp. (probably pelagic)
spp.	Gastropoda
	Sp. (32)
	Philinidae sp. (6 + dead shells)
	Sp. (5)
	Sp. (4)
	Sp. (3 + dead shells)
	Sp. (1 + dead shells)
	Sp. (1)
	Sp. (1)
	Spp. (dead shells)
	Bivalvia
	Malletia obtusa G.O. Sars (7 + dead shells)
	Asteroidea
	Hymenaster pellucidus? Wyv. Thomson (287)

H. giganteus ? Bell (1)
Pontaster tenuispinus (Düben & Koren) (123)
Bathybiaster vexillifer Wyv. Thomson (22)
Dytaster grandis Verrill (10)
Pseudarchaster Parelü (Düben & Koren) (1)

Ophiuroidea
Ophiomusium lymani Wyv. Thomson (many hundreds)
Ophiacantha bidentata (Retzins)(many)

Echinoidea
Echinus elegans Düben & Koren (41)
Hemiaster expergitus? Lovén (1)

Holothuroidea
Ypsilothuria sp. (many)


58°
56° N
54°
15°
10° W
5°
200
1000
2000
3000
Rockall
16 Apr.
15 Apr.
14 Apr.
13 Apr.
From Barry
19 Apr.
20 Apr.
18 Apr.
21 Apr.
17 Apr.
Deep mooring
Shelf mooring
Fouling mooring
St. Kilda
SBC
Mallaig
A B C D E F F' G H I J K L M N O P Q R S T
AT
B10 B8 B4 B1
D1 D3 D5
A5 A3
C9 C8 C7 C6 C5 C4 C1
E1 F1 F5 E5 E9
CTD lowering
Mooring
Surface sample
AT Agassiz trawl
ES Epibenthic sled
RMT Rectangular mid-water trawl
SBC Spade box corer
Dates given near start of day
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