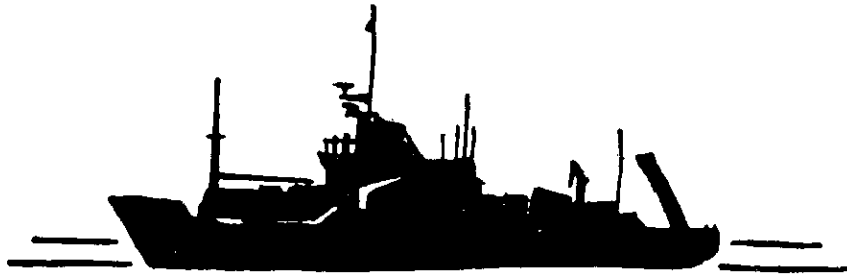


Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory



CRUISE REPORT



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DUNSTAFFNAGE MARINE LABORATORY
and the
SCOTTISH MARINE BIOLOGICAL ASSOCIATION
OBAN, ARGYLL, SCOTLAND

CRUISE REPORT

RRS CHALLENGER
CRUISE 74/1990
6-19 December 1990

Natural Environment Research Council**Dunstaffnage Marine Laboratory****R.R.S. Challenger Cruise 74/90****Leg 1: December 6th - 12th 1990 Troon to Oban****Staff (Leg1):**

Anton Edwards	DML (Principal Scientist)
Joseph M.Graham	DML
Neil MacDougall	DML
Jane Read	IOS(W)
Colin Griffiths	DML
Martyn Harvey	DML
Andrew Hinton	MoD (Taunton)
Mark Boyce	MoD (Portland)

Aims:

- 1). To work the Anton Dohrn Seamount section to maintain a WOCE time series.
- 2). To collect large volume water samples and CTD profiles at standard positions between the Sound of Mull and the shelf-edge for radiocaesium studies.
- 3). To service the DML current meter mooring in the Tiree Passage.
- 4). To compare XBT probes over the deep water.

Narrative:

DML staff (JG,NMacD,JG,JR) and MoD staff (AH,MB) joined the ship at Troon on the 5th of December. The others (AE,CG) joined around midday on the 6th. The ship sailed for Rockall at 1500Z into a strong wind. Because of the wind and associated heavy swell, the ship could not reach Rockall and diverted to more sheltered water near St Kilda. The 8th was spent dodging in this area. During the morning of the 9th, the wind reduced and, with heavy seas still running from the North-West, "Challenger" headed for station 13G west of Barra Head in order to start work on the line of CTD and Caesium sample stations across the southern end of the Minch. In view of a predicted brief amelioration in the weather, it was decided to aim to be at the Tiree Passage mooring the following morning. The weather indeed improved during passage across the Minch and, after the completion of all the Minch stations in the early morning of the 10th, the Tiree Passage mooring was lifted and relaid in beautifully calm conditions during the morning daylight hours.

A maximum of forty eight hours of seatime remained. With gales forecast in the desired shelf working area west of Barra, an

even choice had to be made between the near certainty of working some CTD stations in the sheltered waters of the mid-Minch or the possibility of working a few stations on the outer shelf. At the toss of a coin, it was decided to sail to the outer shelf. In gently deteriorating conditions, station T was reached at about 1830 on the 12th and the ship started to work westward from there to the shelf edge. Thereafter the wind increased and work stopped after station 16G (C10). With force 9 winds imminent, the ship sailed to calmer water in the Minch. CTD work resumed in gale conditions the next morning at 0930 on a line of stations N6 to N1 from Loch Dunvegan to Loch Maddy. As winds increased once more to force 10, the line was abandoned at station N2 and the vessel steamed to Oban, docking there at about 1000Z on the 12th December.

Results:

- 1). Because of bad weather and the need to service the Tیره Passage mooring, the Anton Dohrn Seamount section had to be abandoned apart from the small part that lies on the continental shelf.
- 2). All required large volume water samples at the stations between the Sound of Mull and the shelf edge were obtained, together with CTD profiles at these standard positions.
- 3). The DML current meter mooring in the Tیره Passage was recovered and relaid successfully.
- 4). Because of the abandoning of the deep parts of the Rockall Trough section, comparative tests of XBT probes could not be made there and were restricted to shelf water.

A total of 28 Sippican and 32 Sparton XBTs were launched, of which 28 casts were intercomparisons.

Recommendations and Comments:

The CTD and hydrographic wires metering system is very poor. On several occasions it failed during or at the start of a cast. It should be improved considerably, or equipment will eventually be lost through poor depth indication.

It is often the case that operations at this time of year are curtailed because of bad weather. So it was on this occasion. The deep water objectives had to be abandoned first because of bad weather, second because of the need to take advantage of a small weather window to service the Tیره Passage mooring, and third because of more bad weather. In general, this points to the need to allow more ship time in winter than in summer if there is to be a reasonable chance of achieving the stated objectives.

Acknowledgements:

It is a pleasure to acknowledge the care and support of Captain Maw and his crew in doing this work.

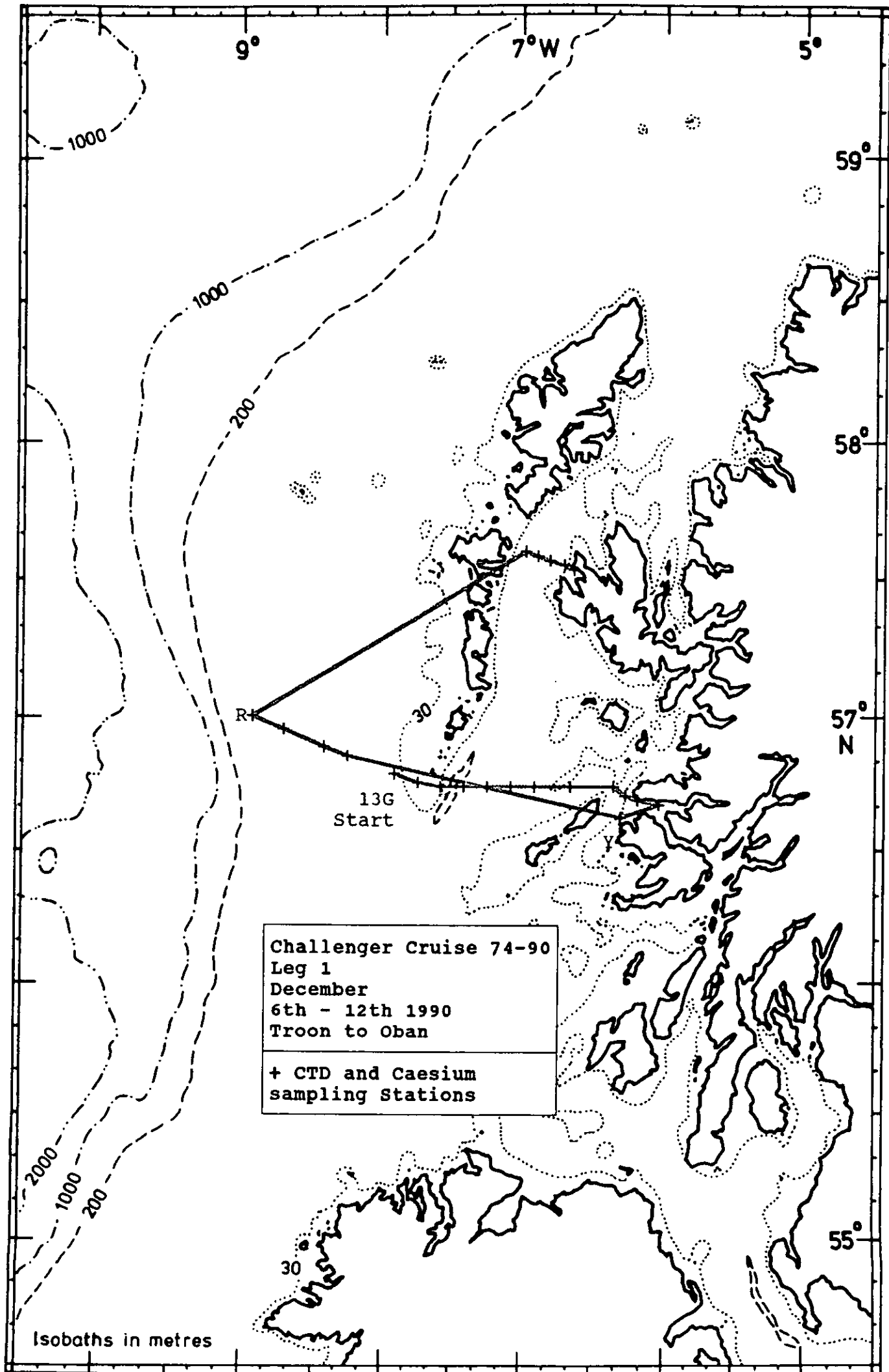
Station List:

Date	Time GMT	Station Name(s)	Lat. N	Long W	Depth m.	CTD Dip	Cs	XBTs (MoD)
9/12	1847	G13,C8	56.47	8.00	117	001	SMB	*
9/12	2030	G12	56.45	7.50	-	SS	-	-
9/12	2138	G11,C7	56.44	7.40	66	002	SMB	*
9/12	2238	G10	56.44	7.30	220	003	-	*
9/12	2337	G9 ,C6	56.44	7.20	160	004	SMB	*
9/12	0100	G8	56.44	7.10	-	SS	-	-
10/12	0153	G7 ,C5	56.44	7.00	140	005	SMB	*
10/12	0259	G6 ,C4	56.44	6.45	40	006	SMB	-
10/12	0350	G5	56.44	6.36	-	SS	-	-
10/12	0446	G4 ,C3	56.44	6.27	93	007	SMB	*
10/12	0515	G3	56.42	6.22	-	SS	-	-
10/12	0539	G2 ,C2	56.41	6.17	38	008	SMB+	-
10/12	0725	G1 ,C1	56.40	6.08	204	009	SMB+	*
10/12	1114	Y	56.37	6.24	40	010	-	-
10/12	1827	T	56.51	8.20	136	011	-	-
10/12	1922	15G,C9	56.53	8.30	127	012	SMB	-
10/12	2104	S	56.57	8.47	127	013	-	-
10/12	2216	16G,C10	57.00	9.00	135	014	SMB	-
11/12	0858	N6	57.36	7.04	90	015	-	-
11/12	0935	N5	57.35	6.59	180	016	-	-
11/12	1015	N4	57.34	6.54	50	017	-	-
11/12	1050	N3	57.33	6.48	155	018	-	-
11/12	1123	N2	57.32	6.44	150	019	-	-

CTD Disc 163:

SMB = Samples at the surface (50l), midwater (25l) and near the bottom (25l) for MAFF Lowestoft.

SMB+= Samples at the surface for SURC East Kilbride.



Staff (Leg 2):

John Gage	SMBA Principal Scientist
John Gordon	DML
Phillip Vass	South-East Fisheries Center, Miami
Robin Harvey	DML
Peter Lamont	SMBA
Grant Lawson	Southampton University
Lucy Giles	Southampton University
Andrew Blackstock	DML

Aims:

- 1) To trawl on the upper Hebridean slope in order to obtain seasonal samples of fish (SMBA Project ARP1).
- 2) To collect seasonal samples of the benthic macrofauna at the S.M.B.A. Permanent Station and of benthic megafauna and benthopelagic fish at Sta. 'M' (SMBA Project ARP2).
- 3) To obtain samples of benthic megafauna for gut contents analysis, EM microscopy and reproductive histology for collaborative studies of ARP2 with the Department of Oceanography, Southampton University .
- 4) To obtain box core samples from the seasonal samples if weather and time permitted (ARP2).

Narrative:

Challenger sailed promptly from Oban Railway Pier at 14 hrs on 12 Dec. 1990 after the 8 scientific participants for the second leg embarked had embarked in the morning. Conditions were reasonably good with a fresh, cold northwesterly wind. She proceeded on course for the first fishing station west of Barra, rounding the Ross of Mull and arriving on station on the upper Hebridean slope in soundings of about 800 m at 0410 hrs 13 Dec. and deployed the Marinovitch twin otter board (OTSB) trawl on the main wire, recovering a good fish and invertebrate catch at 0900 hrs. Challenger then steamed the short distance to the second trawl position, heaving to in soundings of 1000 m at 1020 hrs to shoot the OTSB trawl again. A small but adequate fish and invertebrate catch was obtained on recovery of the trawl at 1400 hrs. In steadily improving sea conditions Challenger then immediately steamed N.W. for Station 'M' in soundings of 2200 m depth just east of the Anton Dohrn Seamount, arriving on

station for the first trawl at 19 45 hrs. Here, the old SMBA epibenthic sled was deployed with 1 mm main net, and fitted with a new gate-closing timer and release gear constructed at Oban for RVS, obtaining a rich, though slightly washed, catch of macrofauna that was washed, as usual, on deck. The new closing gear appeared to have worked satisfactorily. After steaming back to the beginning of the previous track, Challenger deployed the Agassiz trawl for the sample of mega-invertebrates and fish required, obtaining a rather modest sample despite a one-and-a-half hour tow on the seabed in which the echinoids *Echinus affinis* and *Phormosoma placenta*, and the gorgonian *Acanella arbuscula* were unusually scarce. However, specimens of the rare asteroid *Hymenaster regalis* and several *Benthopecten* were obtained together with crustaceans and many hundreds of the brittle star *Ophiomusium lymani*.

With completion of work on Sta. 'M', Challenger set course south in a warm southerly breeze and a moderate sou'westerly swell for the SMBA Permanent Station at 54° 40' N, 12° 16' W, arriving at 0500 hrs 15 Dec. The SMBA epibenthic sled (1 mm net) was immediately deployed retrieving a good catch of benthic macrofauna, particularly rich in protobranch bivalve molluscs, at 1111 hrs. After the short steam back to the start of the previous track, the second of the two new RVS epibenthic sleds was deployed rigged with the fine meshed net (0.3 mm) and the new gate-closing timer release gear. The gear was eventually recovered at 1812 hrs with no sample and a badly torn cod-end net. It was surmised from mud traces and a single stone in the cod-end bucket that the gear had bottomed correctly, but that somehow had either lost its catch, probably through the torn net, or had not fished correctly. Part of the release linkage had also disappeared, and it is possible that this contributed in some way to the poor catch. In order to allow repairs to be undertaken to the epibenthic sled, Challenger then steamed NW for the start of an OTSB haul, shooting the trawl in reasonable sea conditions at 2030 hrs and the trawl bottoming at 2900 m depth at about 2313 hrs. A good catch of fish, and mega-invertebrates was obtained, amongst the latter of which were several specimens of the red spiny crab *Neolithodes grimaldi* and the large football-shaped holothurian *Benthothuria funebris*. With repairs to the 0.3 mm epibenthic sled net completed and a new stainless steel linkage having been fabricated by the second engineer, Challenger then steamed S for the start of another attempt with the 0.3 mm mesh epibenthic sled over the Permanent Station. The gear was deployed at 0620 hrs 16 Dec. and retrieved at 1202 hrs, again with a torn cod-end net and only a very small amount of material in the cod-end bucket. It was decided to abandon work with this sled and to attempt to obtain the fine-meshed sample required using the first of the new epibenthic sleds which had been rigged with a 0.5 mm net. This was deployed at 1320 hrs after Challenger

had steamed back to her starting position for the run, the gear being eventually recovered at 1857 hrs with a satisfactory catch of macro-benthos that, as usual, was washed on deck.

With completion of the scientific programme, Challenger made course for Malin Head for the steam home to Barry via the Irish Sea. Malin Head was rounded by 1100 hrs on 17 Dec and Challenger docked at Barry at 0800 hrs on 19 Dec .

Results:

1) The catches from the trawls at about 700 and 1300 m depth were unusually small, but nevertheless were adequate to continue the seasonal studies of growth and reproduction begun on the previous Challenger cruises to Rockall in June and September. This was the first December ever biological cruise to the Rockall Trough. While the possibility exists that the small catches were the result of seasonal changes in abundance it is more probable that the failure of the EM log resulted in too fast a towing speed, with a consequent delay in the settling time of the trawl. The catch at the deeper Permanent Station was normal. There was insufficient time to sample the 2300-m deep station of the previous cruises, but a longer than usual tow with the Agassiz trawl at Station 'M' helped to provide some of the species. Otoliths for age determination were collected from a wide range of species and length ranges. *Coryphaenoides rupestris* is one of the main species being studied and it was interesting that there were few juvenile fish. No fish of any species were in spawning condition. There was a juvenile specimen of *Aphanopus carbo* which has not been found before at Rockall.

Dr Phillip Vass collected tissue samples from deep-water sharks for heavy metal analysis and studies of metallothionein-like proteins. In the event only three juvenile sharks were obtained. He also collected liver samples from a wide range of species for metallothionein studies. It is hoped that these investigations will be developed further on future cruises.

2) Although the catch with the Agassiz trawl was unusual in some respects, being deficient in certain species (see above under Narrative), the haul yielded useful amounts of species currently being studied by SMBA and Southampton (see under 3) below). The epibenthic sledges in general performed satisfactorily. The new timer/release system that has been developed for this gear on behalf of RVS performed well. However, problems were experienced with the damage occurring to the extension net of the 0.3 mm epibenthic

sledge. As similar damage occurred in two hauls it was surmised that the damage might have been caused by the way the sledge was rigged.

Unfortunately, there was no time to further investigate this on the cruise. The other two epibenthic sledges rigged with 1 mm and 0.5 mm nets, respectively, provided satisfactory samples that on preliminary investigation have yielded species characteristic of the time series from the Permanent Station. These samples will be of particular value in representing a previously unsampled month of the year.

As on previous cruises, invertebrate material from the OTSB hauls was sorted and a selection of fauna, particularly echinoderms, retained for more detailed examination in the laboratory.

3). The Agassiz sample from Sta. 'M' provided a small sample of the gorgonian *Acanella arbuscula* for a continuing study of reproductive seasonality. Similar studies will be carried out on epibiont fauna of *Acanella*, such as the anemone *Amphianthus dohrni*. Material of the echinoids *Echinus affinis* and *Phormosoma placenta* collected by the Agassiz trawl and OTSB was processed on board in a continuing study of feeding in relation to seasonal flux of organic material from the surface. The animals were dissected, and the gut contents, (along with gonad and other soft parts) frozen for later investigation of calorific content, analysis of particle size and identification of contents. A specimen of each species was dissected and the tissues fixed for later EM studies of gut microstructure. A collection of the sea cucumber *Benthothuria funebris* was measured on board for later analysis of size frequencies and gonad material dissected out and fixed for later EM/histological studies.

Samples of the fish *Coryphaenoides rupestris* and *Synaphobranchus kaupi* were collected for study of possible physiological differences between fish from different depth ranges. Liver, gonad and guts were dissected from the samples, half of which were frozen and the remainder preserved in order to allow comparison between methods of preservation and its effects on physiological analysis of samples.

4) Shortage of time and weather conditions did not allow any attempt at box coring.

Recommendations and comments:

Some deficiencies in the ships equipment need mentioning. Notable of these was the failure of the EM log. The usual accuracy of this system is important when shooting trawls and its failure may well have adversely affected results

obtained. It also affected the accuracy of fixes obtained from Transit satellite navigation dead reckoning. Fixes were obtained with GPS, although the present position of the GPS unit is very awkward to read and it badly needs re-siting on the bridge with a readout in the scientific plot. The failure of the TV deck camera system on the vessel should, for safety reasons, particularly in winter at night, be corrected as soon as possible. No large swivels were supplied for use with the OTSB.

Acknowledgements:

With all the important scientific aims successfully accomplished on a cruise to the open North Atlantic in December, this represents a very satisfactory conclusion. Biological sampling from the deep sea at northerly latitudes will always, but particularly in winter, be a highly weather-dependent and risky mission. We are most grateful to Captain Maw and his officers and crew for their skill and unstinting support that allowed the opportunities provided on this short cruise to be exploited both productively and enjoyably.

Station list:

(Position given at mid-point of track of gear on sea bed)

Date	SMBA Station No.	Gear	Latitude	Longitude	Mean Depth, m
13 Dec.	74/90/1	OTSB(S)	56 ⁰ 39.4' N	09 ⁰ 07.3' W	714
13 Dec.	74/90/2	OTSB(S)	56 ⁰ 33.5' N	09 ⁰ 33.2' W	1376
13 Dec.	407	Epibenthic sled (ES)			2250
14 Dec.	408	Agassiz trawl (AT)			2240
15 Dec.	409	ES	53 ⁰ 43' N	12 ⁰ 08' W	2903
15 Dec.	74/90/3	OTSB(S)	54 ⁰ 43.7 N	12 ⁰ 22.7' W	2893
16 Dec.	410	ES	54 ⁰ 41' N	12 ⁰ 12' W	2906
16 Dec.	411	ES	54 ⁰ 40' N	12 ⁰ 06' W	2906

