

SCOTTISH MARINE BIOLOGICAL ASSOCIATION

Dunstaffnage Marine Research Laboratory

CRUISE REPORT

RRS CHALLENGER

CRUISE 3/82

12-26 FEBRUARY

1982

RRS CHALLENGER 3/82

Duration of cruise: 12 February 1982 (Ardrossan) to 26 February 1982 (Barry)

Locality: One trawl at the SMBA permanent station ( $54^{\circ}40'N$   $12^{\circ}10'W$ ) and thereafter trawling in the Porcupine Sea Bight and the Goban Spur ( $49^{\circ}20'N$  to  $52^{\circ}30'N$ ;  $11^{\circ}00'W$  to  $15^{\circ}00'W$ ).

Scientific Staff: J.D.M. Gordon, SMBA Principal Scientist  
J.A.R. Duncan (Mrs.), SMBA  
S.E. McLean (Miss), SMBA  
P.J. Herring, IOS (Wormley)  
N.R. Merrett, IOS (Wormley)  
R.A. Russell (Mrs.), IOS (Wormley)  
S. Burch, Salford University

Ship's Officers: Captain G. Selby-Smith  
Chief Officer K. Avery  
2nd Officer J. Seymour  
3rd Officer T. Boulton  
Fishing Skipper F. Dunning  
Chief Engineer D. Rowlands  
2nd Engineer C. Harman  
3rd Engineer H. Peck  
4th Engineer P. March

Aims of the Cruise:

- (1) To continue the seasonal survey of the deep-sea demersal fish populations of the upper slopes (300-1250 m) of the Porcupine Sea Bight using the SMBA Granton trawl.
- (2) To continue the seasonal survey of the deep-sea demersal fish populations of the Porcupine Sea Bight (300-4000m) using the IOS semi-balloon trawl (OTSB14).
- (3) To trawl for demersal fish at the SMBA permanent station in the Rockall Trough (2900 m) and collect the invertebrates for Dr. Gage (SMBA).

- (4) To make representative invertebrate collections from the Porcupine Sea Bight for IOS benthic group.
- (5) To study bioluminescence of benthic organisms.
- (6) To analyse the structural proteins and enzymes of the Holocephali using electrophoretic techniques.

Narrative: (All times GMT)

The scientific equipment was loaded on board RRS Challenger on Wednesday 10th February and the scientific party joined on the evening of the 11th in preparation for an early departure on the 12th. However gale force winds prevented the ship's departure from Ardrossan until 11.00 h (14/2). The SMBA permanent station in the Rockall Trough was reached at 18.30 h (15/2) and the IOS semi-balloon otter trawl (OTSB14) was shot over a sounding of 2900 m. The net was recovered at 00.47 (16/2) with one of the best fish catches from this station. During recovery the wind speed had increased to 30 knots from the south and Challenger made slow progress in a southerly direction towards the Porcupine Sea Bight. Challenger then remained hove to on the 300 m station (51302) until 14.00 h (17/2) when it was considered that there had been sufficient improvement in the weather to shoot the OTSB net. This station was completed by 17.00 h and Challenger remained hove to until 18.00 while the catch was sorted. Challenger then steamed to the 500 m station (51303) which was fished between 06.17 and 09.24 h (18/2). The 25 knot winds and 12 foot swell rendered it impossible to work the Granton trawl and it was therefore decided to continue fishing down the slope with the OTSB net. Stations 51304 (750 m) and 51305 (1000 m) were fished between 14.53 to 18.06 and 20.42 to 00.11 (18-19/2). Station 51306 (1250) had been marked on a previous IOS benthic cruise by transponders and an hour was spent in attempting to locate them. One was found without difficulty but the signal was subsequently lost during attempts to navigate closer and the OTSB net was

shot in the vicinity at 05.00 and recovered 08.24 (19/2). During the recovery there was a marked deterioration in the weather conditions and Challenger remained hove to in winds gusting up to 50 knots. By 18.00 the wind speed had decreased to 15 knots and the OTSB was fished at station 51307 (1500 m) between 19.30 and 23.42 (19/2) in a somewhat confused swell. Challenger then steamed to station 51308 (1750 m) and in greatly improved sea conditions the OTSB net was fished between 01.35 and 06.50 h (20/2). The improved sea conditions posed the dilemma of whether to risk steaming northwards to work the Granton trawl at soundings between 300 and 1000 m or to abandon this transect and steam southwards in the hope of ever improving weather. In the end the latter was chosen and Challenger steamed south to the 4000 m station which was also marked by IOS transponders. Station 51309 was reached at 18.00 (20/2) and the transponder was located without difficulty. The OTSB was shot at 18.35 and recovered at 03.42 (21/2) and Challenger remained hove to whilst the catch was sorted. Challenger then steamed towards the Goban Spur to work the Granton trawl. On passage there was sufficient time to work the OTSB at two stations, 51310 (2500 m) and 51311 (2000 m) between 09.00 and 14.54 and 16.25 to 20.56 h (21/2) respectively and still arrive on station for the first Granton trawl at first light (22/2). Station 51312 (750 m) was reached at 05.49 h and the preparations of the net were completed to allow it to be shot at 07.09 and recovered at 10.54. Challenger then steamed to station 51313 and the Granton trawl was fished between 15.00 and 19.44 over a sounding of 1250 m. Some problems were encountered with a lack of power for towing at the desired speed but fortunately there was no damage to the net. The remainder of the night was spent fishing the

OTSB net over a sounding of 1500 m (station 51314). On recovery the swivel on the main wire was found to have siezed which resulted in several bad kinks in the wire when tension was released. In order to retrieve the net the towing links had to be cut. The kinked end of the main wire was removed and respliced on passage to station 51315 (1000 m). The Granton trawl was shot at 08.54 and recovered at 13.58 h (23/2) and on this occasion the swivel on the port trawl door had siezed causing kinks in the warp on the winch drum. To remove these kinks it was necessary to cut the splice the clear the warp from the spooling gear before resplicing. Station 51316 (500 m) was therefore delayed until 17.34 and the net was not inboard until 21.12. Challenger then steamed upslope to work the final Granton trawl at 300 m (51317). The net was shot at 22.36 and recovered at 01.35 (24/2). While dismantling the net it was noticed that the starboard swivel had partially siezed but fortunately there was no damage to the warp. The OTSB net was rigged and Challenger steamed out to occupy a 700 m station (51318) with this net. The net was shot at 07.56 and recovered with yet another siezed swivel at 10.56 (24/2). The final station (51319) at 300 m was fished between 12.29 and 15.00 and after securing the gear Challenger steamed for Barry arriving at 08.00 on the 26th February.

### Results

#### (1) Granton trawl

The poor weather at the beginning of the cruise resulted in the northern transect being abandoned but the fishing on the Goban Spur was excellent. The species composition and weights of most catches

compared favourably with previous cruises except for the haul at 1250 m which was notable in yielding a very large catch of the smooth-head Alepocephalus bairdii. Their total weight of 676.5 kg represented 91.5% of the total catch at this station. The new station at 300 m yielded a poor catch composed of 11 species none of which was abundant. This was somewhat surprising as a number of commercial trawlers were fishing in the same area and one can only suppose that they were fishing for Nephrops norvegicus which would escape the large rollers used on our net.

(2) Semi-balloon otter trawl N.R. Merrett

Samples were taken with the semi-balloon trawl from 13 stations in the (mid) sounding range 265-4222 m. These collections comprised nearly 18 hours of towing the net on the bottom over a distance of almost 43 miles. During the course of sampling, in situ temperature measurements were telemetered acoustically to the ship from a monitor mounted behind one trawl door.

Around 7000 fishes were caught, weighing 666 kg, and the data from these were worked up on board. The largest single catch was of 123 kg and came from 790 m sounding. The relative weight per 1000 m<sup>2</sup> swept by the net was 1.8 kg for this tow, although there was little variation in this value among samples taken between 685-1452 m.

A total of some 70 species were represented, with a range of diversity of 11-20 species per tow in all but the deepest sample. Such species richness was predictable from the evidence gained from previous cruises in this continuing seasonal sampling series. Similarly, sounding distribution patterns of species were found to be

broadly as expected, although preliminary analysis suggests that some seasonal variations may be evident. In addition, it is apparent that a considerable proportion of species are in breeding condition at this period of the year.

(3) Bioluminescence P.J. Herring

Investigations on the luminescence of echinoderms have confirmed earlier observations on species of Laetmogone, Pectinaster, Plutonaster and Ophiomusium and image-intensified videotapes have been used to record the detailed distribution of luminescence on the asteroids. A luciferin-luciferase system has been extracted in acid methanol and the systems from the three species cross-react with one another though not with the Cypridina system.

Studies of a number of pennatulids have shown that the physiology of the luminescent responses of individual polyps to electrical stimuli are basically similar. The flashes show summation at frequencies greater than 1/second and facilitation to trains of stimuli. The photocytes have a characteristic fluorescence though the luminescence is not as green as that of shallow water species. Specimens of an as yet unidentified umbellulid had an especially bright luminescence which was conspicuously green on most of the stem but clear blue on the distal portion and around the base of the polyps.

Additional observations have been made on the bacterial photophase of certain sepiolid squids and the epidermal photophores of the shark Etmopterus spinax and material preserved for histological analysis.

(4) Protein and enzyme electrophoresis S. Burch

The main aim of this project was to study the inter and intra specific relationships of the Holocephali by analysis of structural proteins and enzymes using electrophoretic techniques. Laboratory work has shown that some proteins, particularly esterase, are denatured by deep-freezing and therefore this cruise presented a unique opportunity to study fresh material using isoelectric focusing (IEF). Serum, eye-lens, liver, muscle and heart proteins from three species of Holocephalans, two rays, six sharks and a range of teleosts (especially macrourids) were analysed during the cruise.

( ) Juveniles of the flatfish Lepidorhombus whiffiagonis and L. boscii are often difficult to distinguish if the distinctive colour patterns of the latter are abraded during hauling the trawl. The IEF technique clearly demonstrated the differences between some tentatively identified specimens by variations in their structural proteins and lactate dehydrogenase isozyme patterns.

Acknowledgements

Despite the loss of 48 hours in Ardrossan and a further 31 hours hove to, not to mention reduced steaming speeds between stations in the early part of the cruise, we can consider ourselves fortunate in achieving 14 OTSB stations and 5 Granton trawls. This would not have been possible without the willing co-operation of Captain Selby-Smith and the entire ship's company. Special thanks are due to the fishing skipper, Mr. Frank Dunning, for his expert assistance, and long, patient hours on watch.

JOHN D.M. GORDON

2/3/82.



CHALLENGER CRUISE 3/82      STATION LIST

Station No.	SMBA Ref. No.	Gear	Date	Duration on bottom (mins.)	Position	Sounding (m)	Temperature (°C)	Distance run (n. miles)
51301	-	OTSB14	15/2/82	95	54°35.6'N 12°14.4'W	2925	-	c. 4.1
51302	-	OTSB14	17/2/82	91	52°41'N 13°31.2'W	2800-270	9.9-10.2	-
51303	-	OTSB14	18/2/82	102	52°09.2'N 13°21.3'W	540-460	10.1	4.1
51304	-	OTSB14	18/2/82	97	51°51.1'N 13°19.6'W	820-760	9.5	4.2
51305	-	OTSB14	18/2/82	65	51°50.2'N 13°05.1'W	1005-965	8.5	2.8
51306	-	OTSB14	19/2/82	50	51°43.8'N 12°52.6'W	1230-1205	6.7	1.9
51307	-	OTSB14	19/2/82	70	51°26.4'N 13°01.4'W	1490-1415	5.3	2.9
51308	-	OTSB14	20/2/82	70	51°13.0'N 13°02'W	1715-1770	4.1	2.9
51309	-	OTSB14	20/2/82	152	49°34.9'N 14°00.6'W	4190-4255	2.6	6.2
51310	-	OTSB14	21/2/82	105	49°52.2'N 12°56.9'W	2500-2455	3.0	4.1
51311	-	OTSB14	21/2/82	87	49°50.7'N 12°22.9'W	2010-1940	3.7-3.6	2.8
51312	70	Granton trawl	22/2/82	90	49°27.0'N 11°37.0'W	780-685	-	5.6
51313	71	Granton trawl	22/2/82	90	49°32.7'N 12°11.7'W	1265-1225	-	4.5
51314	-	OTSB14	22/2/82	60	49°31.8'N 12°29.1'W	1425-1455	5.2-5.5	2.4
51315	72	Granton trawl	23/2/82	90	49°32.8'N 11°52.1'W	980-1050	-	5.1
51316	73	Granton trawl	23/2/82	90	49°21.8'N 11°26.1'W	445-525	-	6.0
51317	74	Granton trawl	23/2/82	90	49°29.5'N 11°17.3'W	290-230	-	5.1
51318	-	OTSB14	23/2/82	59	49°23.2'N 11°34.2'W	705-665	10.0-10.2	2.5
51319	-	OTSB14	23/2/82	57	49°27.7'N 11°17.5'W	275-255	11.3	2.3

