

SCOTTISH MARINE BIOLOGICAL ASSOCIATION

Dunstaffnage Marine Research Laboratory

C R U I S E R E P O R T

R.R.S. CHALLENGER

CRUISE 11/80

28th July-11th August

1980

R.R.S. Challenger Cruise 11/80.

Duration of Cruise 10.00 hrs 28 July (Barry) until 07.00
11 August (Barry).

Locality Goban Spur and Porcupine Sea Bight ($49^{\circ}20'N$
to $52^{\circ}30'N$; $11^{\circ}.00 W$ to $15.00^{\circ}W$).

Scientific Staff

J.D.M. Gordon	SMBA	Principal Scientist.
J.A.R. Duncan (Mrs)	SMBA	
S.E. McLean (Miss)	SMBA	
H. MacLachlan	SMBA	
N.R. Merrett	IOS (Wormley)	
D.S.M. Billett	IOS (Wormley)	
R. Lampitt	IOS (Wormley)	
R.A. Russell (Mrs)	IOS (Wormley)	
J. Dunne	Galway University	- Irish observer.

Ship's Officers

Captain	G. Selby-Smith
Chief Officer	G. Long
2nd Officer	P. Pepler
Fishing Skipper	F. Dunning
3rd Officer	A. Brigden
Chief Engineer	C. Storer

2nd Engineer	R. Anderson
3rd Engineer	H. Peck
4th Engineer	A. Greenhorn.

Aims

- (1) To continue the seasonal sampling of the deep-sea demersal fish populations of the upper slope (500-1250 m) of the Porcupine Sea Bight using the SMBA Granton Trawl.
- (2) To continue the seasonal survey of the deep-sea fish populations of the Porcupine Sea Bight (500-4800 m) using the IOS semi-balloon trawl (OTSB 14).
- (3) To sample the benthos at two stations (4000 & 2700 m) in the Porcupine Sea Bight with the IOS epibenthic sledge (BN 1.5-3M + SBN 0.5).
- (4) To obtain samples of shark liver and ovaries for Dr. Craik (SMBA).
- (5) To collect samples of fish from deep stations for Dr. Pentreath (MAFF Radiobiological Laboratories).
- (6) To collect surface plankton samples with the IOS Neuston net.

Narrative

The scientific party joined RRS Challenger during the afternoon and evening of Sunday 27th July. Challenger locked out of Barry Dock at 10.10 hrs and set course for the Goban Spur. The weather was excellent on passage and both SMBA Granton trawl and the IOS semiballoon trawl (OTSB) were prepared for use. The first station (50801) was reached at 04.00 (30/7) and the OTSB was fished between 05.30 and 09.35 in a heavy swell. In view of the weather conditions it was decided not to shoot the Granton trawl as had been intended but to proceed to a 1600 m station and work the OTSB net. Challenger was on station (50802) at 18.45. A successful haul was made at a sounding of 1857 to 1910 m and the net was inboard at 23.22 hrs. With ever decreasing swell it was decided to steam back up the slope to begin fishing the Granton trawl. Challenger was on station 50803 at 06.00 (31/7) and the net was shot at 07.00 at a sounding of 500 m. On recovery it was found that the otter boards had locked, these were cleared and the net was fished again on the same station. The station was complete by 12.30 and Challenger steamed to the next station. At station 50804 the Granton trawl was fished at a sounding of 750 m between 13.48 and 17.30. The Granton trawl was fished again at a sounding of 1000 m (Station 50805) between 18.40 and 22.40.

Challenger then steamed back up the slope to begin a similar transect of stations with the OTSB net. The first station 50806 (500 m) was fished between 02.40 and 5.45 hrs (1/8), the second 50807 (750 m) between 07.55 and 11.30 and the third 50808 (1000 m) between 13.00 and 16.30 hrs. On completion of this station

Challenger steamed to a sounding of 1250 m and the Granton trawl was fished between 19.20 and 23.50 hrs (Station 50809). The final station (50810) on the Goban Spur was fished with the OTSB net at a sounding of 1600 m between 02.25 and 08.00 (2/8).

Challenger then steamed to the Porcupine Abyssal Plain and the OTSB net was shot at a sounding of 4400 m at 16.40 and recovered at 02.50 hrs (3/8) (Station 50811). Challenger then steamed northwards to occupy a series of deep stations in the Porcupine Sea Bight. At Station 50812 #1 the epibenthic sledge was fished at a sounding of 4000 m between 06.00 and 12.50 hrs. The OTSB was then fished at the same station (50812 #2) between 13.15 and 22.30 hrs. A further OTSB haul (50813), at a sounding of 3500 m was made between 00.40 and 09.25 hrs (4/8). Unfortunately the net must have only bounced on the bottom and a poor catch was obtained. During this station the weather deteriorated and on arrival at station 50814 the swell was too great to allow the safe deployment of the epibenthic sledge and the OTSB was fished between 12.20 and 21.15. This produced one of the most exciting catches of the cruise both in terms of numbers and species of fish. With no improvement in the weather it was decided to abandon the epibenthic sledge work and proceed to the next station. On arrival on station 04.00 (5/10) it was decided that the swell was too great to allow any scientific work and Challenger steamed northwards to begin a series of hauls with both the OTSB net and the Granton trawl on the upper slope.

On arrival at the 1250 m station (50815) the swell had moderated sufficiently to allow the OTSB net to be shot. This was

fished between 12.00 and 17.00 and yielded a large bag of mud and silaceous sponges together with a good catch of fish. It had been the intention to work the Granton trawl at the same station but this was abandoned because on a previous cruise some difficulty had been experienced with a large bag of mud and sponge and indeed the net had been damaged. Challenger therefore steamed northwards to occupy a 1000 m station (50816) with the Granton trawl. The net was shot at 19.30 and recovered inboard at 23.05. The Granton trawl was fished again at a sounding of 750 m between 00.45 and 04.30 hrs (6/8) (Station 50817). The final Granton trawl of the cruise was fished at a sounding of 500 m between 06.15 and 09.15 hrs (Station 50818). Challenger then hove to while the Granton trawl was dismantled and the OTSB net was rigged. The OTSB was shot at 10.25 at Station 50819 (500 m) and recovered inboard at 13.02. Further stations (50820 and 50821) were worked at positions corresponding to the earlier Granton trawls at soundings of 750 and 500 m between 15.00 and 23.29 hrs. This completed the work on the upper slope of the Porcupine Sea Bight and instead of remaining in this area to carry out some experimental fishing with the OTSB net as had been intended it was decided to steam south and occupy the two stations which had been missed earlier in the cruise. Station 50822 at a sounding of 2100 m was reached at 07.00 (7/8) and despite a fairly heavy swell and 25k winds the OTSB net was shot at 0840 and recovered at 15.33. Challenger then steamed further south in the hope that the weather would moderate sufficiently to allow the epibenthic sledge to be deployed. On arrival at station 50823 at 22.50 there had been a considerable

improvement in the sea conditions and the epibenthic sledge was deployed successfully between 23.10 and 04.10. Challenger then proceeded towards the Goban Spur to carry out experimental trawling with the OTSB net at depths of about 750 m and on passage experiments were carried out with a midwater trawl fished both on the trawl warps and on the deep wire. Challenger arrived on station 50824 at 19.30. At this station it was proposed to deploy the OTSB net for short 10 min tows at 750 m for as many times as possible during daylight hours. Station 50824#1 was completed between 18.30 and 20.25. The hours of darkness were occupied by a trial with the midwater trawl between 21.00 and 00.10 hrs and an epibenthic sledge haul between 01.30 and 04.05 (stations 50824 #2 and 3 respectively. Stations 50826#4-7 were fished with the OTSB between 07.20 and 15.40 hrs at which point scientific work ceased and Challenger steamed for Barry. Challenger locked into Barry at 07.00 (11/8).

RESULTS

S.M.B.A. Granton Trawl.

As on previous cruises to the Porcupine Sea Bight it was proposed to carry out two transects of the upper slope at depths approximating 500, 750, 1000 and 1250 m. The first transect on the Goban Spur was accomplished successfully with good catches from all stations. On the second transect the 1250 m station was abandoned after an OTSB trawl at the same station yielded a large bag of mud and sponge. It was at this depth that on a previous cruise (15/79) the cod end of the Granton trawl had been damaged

and recovery of the net was a hazardous operation. The other three stations on this transect yielded good catches.

On previous cruises some comparative trawling between the Granton and OTSB nets had been achieved. On this cruise we were fortunate to be able to fish the OTSB at all the Granton stations thus giving valuable information of the relative efficiencies of the two gears. The Granton trawl was more efficient at catching larger species such as the sharks and Alepocephalids while the OTSB with its smaller mesh size and greater headline height was particularly effective in capturing juvenile stages of many species and also smaller fish such as Synaphobranchus.

In general the catches of the Granton trawl were similar to those obtained on earlier cruises and will provide valuable information on seasonal aspects of the biology of the dominant species of the upper slope.

I.O.S. Semi-balloon otter trawl (OTSB 14).

N.R. Merrett

Twenty successful collections were made with the OTSB 14 between 500-4000 m soundings. The only modification made to the existing gear was the mounting of the temperature telemetering beacon on the rear face of one of the trawl doors. This afforded protection for the beacon and overcame handling difficulties experienced when the beacon was mounted on one of the sweep wires connecting the wing ends of the net to the doors. Strong signals were received at the ship from the beacon in this position, with its mushroom head protruding through a hole cut in the face of the door.

Latterly, however, the pulse strength deteriorated markedly to necessitate a reversion to the original system. Nevertheless, this initial trial of a door-mounted beacon indicated the potential of such a modification.

An experiment designed to assess the sampling efficiency of the trawl was carried out at around 700 m soundings. Repeat tows of short duration indicated that about 66% of species sampled in an hour's tow were collected during the first 10 minutes. This information is of value in any comparison of the efficiency of the OTSB 14 and BN 1.5 for sampling fish diversity.

OTSB 14 fish samples

The 20 collections made between the upper slope (500m) and abyssal depths (4400 m) provided sizeable samples of a wide variety of fish species. Around 70 species were represented, of which the great majority have occurred in earlier collections in the current series from the area.

The sampling strategy was intended to augment information on the seasonal aspects of the biology of benthic and benthopelagic fishes in the Porcupine Sea-Bight area. This was accomplished and the pattern of species assemblages throughout the sounding range sampled, already established on previous cruises, was confirmed.

Samples of fish collected from soundings greater than 2000 m were collected for analysis by the Directorate of Fisheries Research, MAFF Radiobiological Laboratory, Lowestoft.

Following the mass occurrence of juvenile Kolga hyalina (Holothurioidea) in samples taken in April 1978 from 4000 m in the Porcupine Seabight, further samples of this holothurian were taken in July and September 1979, at depths ranging between 2750-4100 m in the same area. The length distributions in all cases fell within a very narrow range, the mean length increasing from 5 mm in 1973 to 8 mm in 1979, while the density of K. hyalina over the year decreased from about 35 to 15 individuals per m². Further, the dense aggregations of these holothurians present in 1978, were not apparent in the photographs taken in July 1979, although a tendency towards aggregation was again evident in September 1979. In order to continue monitoring this unique population of holothurians, the I.O.S. epibenthic sledge, complete with multinet (three nets of different mesh mounted across the width of the sledge) and supra-benthic planlton net, was trawled at two stations. At St. 50812 # 1 (4080-4100 m) the net travelled 780 m over the bottom measured by an acoustically monitored odometer, producing a small catch dominated by the ophiuroid Ophiocten latens and completely devoid of K. hyalina. However, at St. 50823 (2830 m) several thousand K. hyalina were present in a catch that contained little else apart from clinker. With the exception of the Kolga, this was a surprisingly small catch considering that the net travelled 909 m over the bottom. Unfortunately, the sample will be of limited value due to faulty preservation. Several specimens preserved separately, however, confirm an impression formed at the time of preservation, that the holothurians were all about the same size

(7.5-14.0 m) and slightly larger than the specimens of K. hyalina taken in 1979.

A third epibenthic sledge haul was made at St. 50824#3 (845-870 m) using a single net (mesh 4.5 mm) in order to compare invertebrate megafauna densities obtained from photographs during each haul with values calculated using the odometer and hence the area sampled. The sledge was trawled for 1751 m on the bottom and produced a catch dominated by the echinoids Spatangus raschi, Cidaris cidaris and Phormosoma placenta. Crustaceans and the coral Lophelia pertusa were also quite common.

Biochemistry of Shark Livers

J.C.A. Craik

Livers of deep-sea sharks comprise 25-30% of the body weight and contain 70-90% lipid; this lipid is largely the hydrocarbon, squalene. (By contrast, in inshore shark species, these figures are 5-8% and 20-40% respectively, and the liver lipid contains only traces of squalene). The large, squalene-filled liver confers neutral buoyancy on the shark and is thus analogous to the swimbladder of the teleost. This adaptation allows different shark species to exploit different depths of the ocean.

Another function of the liver, common to the females of all egg laying vertebrate species, is the synthesis of yolk protein which is transported to the ovary by the blood plasma. The yolk protein is a complex lipophosphoprotein, the lipid of which has a characteristic composition high in phospholipid.

The work now being undertaken with the shark species obtained on the cruise has the following objectives:

1. Analysis of liver lipid, with particular reference to the hydrocarbon (squalene) content and the phospholipid content. Comparison of species.
2. Analysis of yolk lipid of the one species from which mature eggs were obtained (C. coelolepis) : comparison with lower lipid of the same species.

The following species were obtained and it is hoped that (time and money permitting) all will be examined. Deania calcea, Scymnodon ringens, Centroscymnus coelolepis, Galeus melastomus, Centrophorus squamosus, Etmopterus spinax, Dalatias licha.

Acknowledgements

This was a very successful cruise and the willing co-operation of Captain Selby-Smith and the ship's company was very much appreciated. Special thanks are due to the fishing skipper, Mr. Frank Dunning, for his long hours and expert assistance with the handling of the trawls. We also acknowledge the help of R.V.S. in the planning of the cruise.

JOHN D.M. GORDON

28th November, 1980.

CHALLENGER CRUISE 11/80 STATION LIST

Discovery station collection No.	SMBA reference No.	Gear	Date	Duration on bottom (min)	Position (starting)	Sounding (m)	Temperature (°C)	Distance (n. mi)
50801	-	OTSB 14	30/7/80	89	49°35.0'N 12°11.4'W	1285-1245	7.1	3.0
50802	-	OTSB 14	30/7/80	70	49°39.5'N 12°36.9'W	1857-1910	3.5	2.4
50803	56	Granton trawl	31/7/80	60	49°26.4'N 11°27.5'W	460-495	-	4.1
50804	57	Granton trawl	31/7/80	60	49°24.8'N 11°32.8'W	685-720	-	4.3
50805	58	Granton trawl	31/7/80	60	49°36'N 11°51.2'W	1010-1040	-	4.3
50806	-	OTSB 14	1/8/80	79	49°26.6'N 11°26.8'W	510-515	9.9	2.8
50807	-	OTSB 14	1/8/80	78	49°24.2'N 11°36.6'W	790-795	9.2	2.6
50808	-	OTSB 14	1/8/80	61	49°34.9'N 11°48.9'W	955-964	8.3	2.0
50809	59	Granton trawl	1/8/80	60	49°31.9'N 12°09.7'W	1250-1260	-	3.9
50810	-	OTSB 14	2/8/80	89	49°34.1'N 12°41.9'W	1605-1694	3.9	2.8
50811	-	OTSB 14	2/8/80	145	49°38.6'N 14°34.2'W	4400-4350	2.2	5.0
50812#1	-	Epibenthic sledge (IOS)	3/8/80	31	49°45.4'N 14°10.3'W	4080-4100	-	780m =
#2	-	OTSB 14	3/8/80	c.150	49°52.7'N 14°17.3'W	4035-4140	-	c6.5
50813	-	OTSB 14	4/8/80	c.150	50°13.6'N 14°07.9'W	3640-3715	-	-
50814	-	OTSB 14	4/8/80	c.240	50°19.7'N 13°32.1'W	3000-2715	-	-
50815	-	OTSB 14	5/8/80	c. 65	51°36.1'N 13°04.2'W	1280-1344	-	-

covery station lection No.	SMBA reference No.	Gear	Date	Duration on bottom (min)	Position (starting)	Sounding (m)	Temperature (°C)	Distance Run (n. miles)
50816	60	Granton trawl	5/8/80	60	51°46.1'N 13°04.7'W	1010-1025	-	3.9
50817	61	Granton trawl	6/8/80	60	51°55.2'N 13°15.3'W	750-765	-	-
50818	62	Granton trawl	6/8/80	60	52°00.0'N 13°31'W	515-520	-	3.3
50819	-	OTSB 14	6/8/80	75	52°04.5'N 13°29.2'W	500-512	9.5	2.0
50820	-	OTSB 14	6/8/80	69	51°55.4'N 13°18.7'W	714-725	9.4	3.4
50821	-	OTSB 14	6/8/80	84	51°48.2'N 13°04.9'W	982-990	7.7	3.3
50822	-	OTSB 14	7/8/80	150	50°56.7'N 13°11.6'W	2095-2150	-	6.7
50823	-	Epibenthic sledge (IOS)	8/8/80	24	50°11.7'N 13°31.7'W	2830	-	909m = 0.5
50824#1	-	OTSB 14	8/8/80	12	49°20.1'N 11°35.5'W	730-740	9.5	0.4
#2	-	SMBA Midwater trawl	8/8/80	-	c 49°24'N 11°27'W	variable	-	-
#3	-	Epibenthic sledge (IOS)	9/8/80	54	49°26.0'N 11°36.3'W	845-870	-	1751m = 0.9
#4	-	OTSB 14	9/8/80	13	49°28.3'N 11°34.6'W	720-730	9.5	0.8
#5	-	OTSB 14	9/8/80	16	49°25.8'N 11°31.0'W	632-660	9.8	0.4
#6	-	OTSB 14	9/8/80	16	49°27.2'N 11°30.9'W	565-590	9.8	0.5
#7	-	OTSB 14	9/8/80	14	49°24.6'N 11°28.9'W	725-730	9.3	-

