

SCOTTISH MARINE BIOLOGICAL ASSOCIATION  
Dunstaffnage Marine Research Laboratory.

INSTITUTE OF OCEANOGRAPHIC SCIENCES  
Wormley  
and

HERIOT-WATT UNIVERSITY, EDINBURGH  
Department of Brewing & Biological Sciences.

CRUISE REPORT  
R.R.S. CHALLENGER

Cruise 15/1979  
9th-24th October  
1979

1. Duration of Cruise.

10.30 hrs 9th-October (Ardrossan) until 08.30 hrs  
24th October (Ardrossan). All times are British Summer Time.

2. Localities.

Continental shelf west of Scotland, Rockall Trough,  
Goban Spur (southern boundary of Porcupine Seabight), Porcupine  
Abyssal Plain and northern slopes of Porcupine Seabight.

3. Scientific staff.

P.R.O. Barnett, S.M.B.A., Principal scientist.

J.D.M. Gordon, S.M.B.A.

B.L.S. Hardy, S.M.B.A.

J. Watson, S.M.B.A.

Mrs. J.A.R. Duncan, S.M.B.A.

Miss S. McLean, S.M.B.A.

N.R. Merrett, I.O.S. Wormley.

N. Battersby, Heriot-Watt University, Edinburgh.

D. Cossar, Heriot-Watt University, Edinburgh.

4. Ship's Officers :

Captain P. Maw

Chief Officer G. Long

2nd Officer T. Morse

3rd Officer P. Pepler

Fishing Skipper F. Dunning

Chief Engineer R. Anderson

2nd Engineer I. McGill

3rd Engineer J. Richards

4th Engineer D. Hornsby

5. Aims

(1) To obtain further fish samples from the SMBA permanent station in the Rockall Channel.

(2) To continue a seasonal survey of the deep-sea demersal fish populations of the upper slope of the Porcupine Seabight using the large SMBA Granton trawl.

(3) To continue seasonal surveys of the deep-sea demersal fish populations of the Porcupine Seabight from 500 m to 4800 m using the IOS semi-balloon trawl.

(4) To collect invertebrate samples from the trawls for IOS (Wormley).

(5) To carry out comparative fishing trials between the SMBA Granton trawl and the IOS semi-balloon trawl.

(6) To obtain core samples for meiofauna studies at the SMBA shelf, Rockall Trough and Porcupine Abyssal Plain routine stations, with associated bottom photography.

(7) To obtain core samples for meiofauna distribution studies on the Goban Spur (southern boundary of the Porcupine Seabight).

6. Weather.

Excellent for most of the cruise. At no time did the work cease because of weather conditions. Initially, winds were

moderate-fresh south easterly becoming light-moderate variable during the middle stages of the cruise. On 18th October winds became fresh-strong south westerly for a few hours, but then fell away to light southerly for the rest of the work. Although during the final trawl on 21st October the wind became gale force south easterly, it did not interfere with the satisfactory completion of the programme.

#### 7. Narrative.

The scientific party joined the ship at Ardrossan during the afternoon of 8th October and Challenger sailed at 10.30 hrs on the 9th.

The first sampling station was the S.M.B.A. shelf station, A3 (Fig. 1, Table 1), and was reached at 2345 hrs on 9th October. Two successful drops with the S.M.B.A. meiofauna multiple corer were completed in an hour at this shallow station (ca. 150 m). The ship steamed W.S.W. for the first of the deep stations, stopping en route to deploy the PDR fish, and arrived at the S.M.B.A. Rockall Trough 2,900 m deep seasonal benthic station (A2) at 2305 hrs 10th October. Six successful hauls were made with the 12-core multiple corer during a ten hour period and 72 cores, the maximum possible, were obtained, providing material for both the meiofaunal and microbiological studies. A microbiological water sample from 10 m depth completed the station at 0905 hrs on 11th October.

The semi-balloon otter trawl (OTSB 14) of IOS Wormley was then prepared and shot at 1012 hrs at Fishing Station No. 1,

with Challenger towing south from coring station A2. The net's relation to the seabed was monitored with an IOS type H 10 KHz acoustic beacon (pinger) mounted on the trawl bridle behind the starboard otterboard. Signals from the pinger were picked up by an IOS towed Dolphin at the surface which carried a transducer mounted at  $30^{\circ}$  from the horizontal and pointing back towards the trawl. The pinger also monitored water temperature and the information was received, via the towed Dolphin, on the PDR aboard ship. The tow down to a depth of 2,900 m was successfully completed after nearly eight hours, when course was then set for the Porcupine Seabight. En route, a 10 m water bottle sample was taken at  $52^{\circ}05.8'N$ ,  $11^{\circ}45.5'W$  for the microbiologists at 1800 hrs on the 12th October.

Fishing station 2, on the north-east side of the Porcupine Seabight was reached at 0054 hrs 13th October, when a short time was spent seeking the desired fishing depth of 1,000 m. The OTSB 14 trawl was used successfully and the station completed in three hours.

Challenger then steamed south to the Goban Spur, which forms the southern boundary of the Porcupine Seabight, to work a series of Granton and OTSB 14 trawl and multiple corer stations along an east-west transect between depths of 200 and 2,000 m.

The first of the Goban stations, Fishing Station 3, was reached at 1620 hrs on 13 October, when a 10 m deep water bottle sample was taken for microbiological work. The OTSB 14 trawl was then shot, towed at 1500 m and recovered after  $4\frac{1}{2}$  hours. The cod

end contained a large amount of soft mud from which fish and invertebrates were separated with difficulty. Nevertheless, the fish catch was reasonably successful.

The OTSB 14 was next used at 0035 hrs, 14th October at Fishing Station 4 in a depth of 1250 m. After  $3\frac{1}{4}$  hours another successful haul was completed which again contained large amounts of mud, but this time mixed with very large numbers of colonies of an unidentified siliceous sponge, of globular shape, containing long, sharp spicules. Again, the fish and invertebrate catch was sorted with difficulty but the haul was reasonably successful.

In contrast, Fishing Station 5, at 750 m provided a successful and clean haul of fish and invertebrates. The station was completed at 0928 hrs after nearly three hours and Challenger then steamed east to the 500 m contour to start the Granton trawling. A 10 m microbiological water sample was taken before starting the trawl. It was then found that due to loose turns on the starboard trawl winch barrel, the spliced eye had to be cut off to allow the cable end to be passed through the spooling gear to clear the loose turns. A new eye was then spliced into the cable, the entire operation delaying the trawl by about two hours.

The first Granton trawl was started at 1458 hrs on 14 October and hauled in empty at 1725 hrs. The failure was due to a turn in one wing end and a fouled quarter rope. A second attempt was made at 1905 hrs, after the net had been adjusted, but the same faults occurred again and at 2210 hrs it was decided to abandon trawling until daylight.

Challenger then steamed east for about two hours to the 200 m depth contour to start the multiple coring transect on the Goban Spur at 0017 hrs on 15th October. Weather conditions were ideal with light easterly winds and very little swell. The multiple corer was fitted with only 5 core tubes for the first two hauls at this station. There was one blank tube in each of these hauls. This was due to failures in the clips retaining the core tubes on the corer, which allowed some core tubes to slip in their housings, resulting in leakage of the upper valves during extraction from the sediment. A third haul was even worse, with three empty tubes, whilst a fourth had provided the full quota of five cores. The sediment was a fine compact sand and clearly demonstrated a weakness in the design of the retaining clips. After the first of these hauls the main wire became badly twisted and kinked and it was necessary to cut about 15 m of wire from the end and a new eye was spliced in by Mr. Dunning, the Fishing Skipper. The corer had been fitted with only one swivel for this haul, but the addition of a second swivel appeared to cure the problem in the subsequent hauls.

The 200 m coring station was completed at 0310 hrs and the ship steamed west to the 500 m deep coring station where she arrived at 0530 hrs. Two multiple core drops were completed in about 2 hours, each haul containing the complete number of 5 good cores. Improvisations on the core retaining clips were evidently successful. The 200 m and 500 m coring stations provided good material for both the microbiological and meiofauna work.

Challenger then remained near the 500 m contour for six hours whilst the Granton trawl was partially dismantled to try and cure the causes of the previous day's empty hauls. Then at 1242 hrs, 15th October, the net was streamed at Fishing Station 6 and at 1557 hrs recovered following a very successful tow. Challenger then steamed west to 750 m depth and carried out another successful haul with the Granton trawl at Fishing Station 7.

However, during the final stages of recovery of the trawl the governor of the ship's engines broke down and the doors and net were brought inboard using forward propulsion from the bow-thrust. This was completed at 2122 hrs.

It had been intended to continue with the other two remaining Goban Spur Granton trawls without dismantling the net, since the trawl was fishing so well. However, the governor troubles appeared to be very serious and for a short time course was set for Barry before it became apparent that repairs could be effected at sea. These were accomplished successfully by 0100 hrs on 16th October and Challenger returned to the fishing stations.

The Granton trawl was again shot at 0425 hrs on 16th October at Fishing Station 8 (1000 m) to be followed by the 1250 m deep Fishing Station 9. Both trawls had been completed by 1700 hrs on the 16th and were both very successful.

Challenger remained near the 1250 m contour and two completely successful hauls were then made with the multiple corer at this depth, each with six core tubes fitted. A four-hour steam westwards then took the ship to the 1700 m contour, arriving at



0030 hrs on 17th October. Two further successful multiple corer drops, each with 6 core tubes, were made at the 1700 m station and completed by 0230 hrs.

The OTSB 14 trawl was then rigged and streamed at 0322 for Fishing Station 10 and a bottom tow made between 1700 and 2,000 m depth to provide another successful sample of fish and invertebrates. This was the end of sampling on the Goban Spur and at 0830 hrs on 17th October Challenger sailed west for the S.M.B.A. station A1 on the Porcupine Abyssal Plain.

Great difficulty was encountered in finding station A1 on this cruise due to the navigational problems described in the next section. A1 was reached, without much confidence in the ship's position, at 0027 hrs on 18th October. Weather conditions were deteriorating rapidly with strong SW winds. However, this did not prevent sampling and over a period of 17 hours six multiple corer hauls were made at a depth of 4825 m. The corer was equipped with the full quota of 12 core tubes for each haul. The first had contained one blank core tube but 11 good mud cores, the empty one being due to a recurrence of the core retaining clips trouble experienced on the Goban Spur. The remaining five hauls were completely successful, during which bottom water temperatures were measured and bottom water samples taken for salinity determinations. During the later stages of this coring it became clear that the main-wire block on the A frame was becoming overheated. It had to be cooled with the seawater hose and at one stage an application from the grease gun was necessary. Fortunately, despite a moderate swell, it was possible for this

to be done from the 'bosun's chair' and the sheave then continued to revolve reasonably quietly, allowing the coring programme to be completed. Finally a 10 m deep microbiological water sample was taken at this station.

Still with strong SW winds, OTSB 14 fishing commenced at Fishing Station 11 at 1905 hrs on 18 October, towing in a northerly direction, away from Station A1. A very successful tow was completed in 11 hours, this station being the deepest trawl of the cruise and the second time this depth and position had been fished since Dr. Gordon's first successful trawl in August 1977.

Challenger then steamed back to the Porcupine Seabight to work a series of trawling stations up the northern slopes of the seabight. A proposed station at 3400 m was abandoned because of navigational difficulties in an area where the contours were close together. Meanwhile, weather conditions had been steadily improving and Fishing Station 12, in 2,700 m depth, was reached at 1700 hrs on 19th October. A 10 m microbiological water sample was first taken, followed by the OTSB 14 trawl. After another successful haul the station was completed at 2237 hrs. Challenger then steamed northwards and between 0845 hrs and 2107 hrs on 20th October, two successful Granton trawls were made at 1250 m and 1000 m depths respectively at Fishing Stations 13 and 14. The 1250 m trawl recovered a large quantity of the same siliceous sponge that had been encountered at similar depth on the Goban Spur. Great difficulty was encountered in bringing the catch inboard and this was finally accomplished with the aid of the auxilliary wires attached to the net above the catch.

There followed a three hour steam to the east for an OTSB 14 trawl at about 1700 m and which was completed satisfactorily by 0520 hrs on the 21st. (Fishing Station 15).

Challenger then steamed west to the 750 m contour and between 1035 hrs and 1945 hrs two final Granton trawls were made at 750 m and 500 m (Fishing Stations 16 and 17 respectively). The final trawl was made under rapidly deteriorating weather conditions with SE winds of up to Force 8 at times. Nevertheless, both trawls were again successfully completed by 1945 hrs and Challenger set course for Scotland at 2018 hrs. En route, the destination was changed from Dunstaffnage to Ardrossan so that the main wire block on the 'A' frame, which had given trouble during the coring at A1, could be changed for a reconditioned block. This required crane facilities not available at Dunstaffnage.

Challenger finally docked at Ardrossan at 08.30 hrs on 24th October.

## 8. Results.

### a. General.

The cruise was remarkable in view of the general weather conditions off the west coast of Scotland and Ireland during the cruise period. It is true to say that Challenger was always in the best position for weather conditions along the entire route. As a result the entire sampling programme was accomplished without much difficulty and the cruise was very successful.

Lack of success was encountered through the shortcomings of the navigational systems available on board, particularly in the

southern parts of the cruise. This affected the coring and fishing very significantly. The absence of the dual channel Magnavox satellite navigator and the failure of the older ITT satellite navigator meant complete reliance on Decca and Loran. At Station A1, on the Porcupine Abyssal Plain, only the Loran system could be used, and only when set on extended range. After the coring had been completed at A1 and the ship returned to the Porcupine Seabight it became clear that the position occupied as A1 may have been as far away as 20 miles to the north east of the A1 occupied during the previous cruise in May 1979, when the Magnavox was available. This makes nonsense of vertical wire work in which detailed studies of deep sea biology at a designated station are being carried out, since any differences between samples taken on the two dates may be due to either seasonal or distributional effects, thus defeating one of the objects of the cruise.

Similarly, for the fishing, it is desirable that positions are recorded with accuracy for the OTSB 14 trawling where knowledge of the distance towed over the bottom is important for estimating the biomass of the fish populations.

b. Granton trawling (account by Dr. J. Gordon).

After some initial difficulties in rigging and fishing, the S.M.B.A Granton trawl was successfully used at 8 stations, 4 on the Goban Spur and 4 on the western slopes of the Porcupine Seabight. The depths samples were 500, 750, 1000 and 1250 m which correspond with the stations worked in June on Challenger Cruise 8/79. The

catches on the Goban Spur were similar to those taken in June. On the western slope of the Seabight the catches were also similar although there was a notable reduction in the numbers of the macrourid, Coryphaenoides rupestris at the 1000 and 1250 m stations. The 1250 m station yielded a large catch of sponges and mud which was brought inboard with considerable difficulty. Unfortunately the fine mesh liner to the codend was damaged and the remaining hauls were carried out with a larger codend mesh size. The total weight of fish caught amounted to 1382 kg and was composed of about 55 species.

The catch rate of sharks, chimaerids and scabbard fish was considerably less than would have been expected further north on the Hebridean Terrace. Representative samples of the invertebrates were collected for I.O.S. Wormley.

c. Semi-balloon otter trawling (account by Mr. N. Merrett).

Nine tows of the semi-balloon otter trawl (OTSB 14) were made during the cruise, one at 2880 m soundings in the Rockall Trough and the remainder in the Porcupine Sea-Bight region. The latter sampled soundings from 743 m on the slope to 4737 m in the Porcupine abyssal plain, to the southwest of the Sea-Bight. The collections yielded 371 kg of fish, which represented individual catches of 0.5-1.7 kg/1000 m<sup>2</sup>. The peak catch occurred from 1263 m soundings and was largely due to the capture of a 34 kg skate, Raja nidarosiensis. In all more than 1000 fishes were collected. They represented about 50 species from around 20 families. Such species diversity is very similar to that found previously from the area. The dominant families sampled by the OTSB 14 are the

Synphobranchidae, Notacanthidae, Alepocephalidae, Moridae, Macrouridae and Trachichthyidae. Comparison of the catches of the OTSB with the larger Granton trawl indicate that another dominant family in the fish fauna of the area, the squalid sharks, are sampled very inadequately by the smaller net. Noteable among the OTSB 14 samples, however, was the unusually high diversity of alepocephalid species. At least, nine species occurred, of which Alepocephalus? agassizi, Conocara murrayi, Bathytroctes microlepis and Narcetes stomias are additions in the current series of collections in the Sea-Bight. Once again, blood samples from holocephalans were collected for analysis at Salford University.

Invertebrates were another major component of the OTSB 14 samples. Representative collections were made from each tow. The dominant organisms from most depths were echinoderms, although siliceous sponges and hermit crabs housed in colonial anemones were sometimes abundant. The catch of a very large sponge from c.1900 m on the Goban Spur was notable, for it measured 650 mm in height and 450 mm in diameter.

d. Meiofauna coring (Dr. P. Barnett, Dr. B.L.S. Hardy & Mr. J. Watson).

As part of the continuing study by SMBA of the meiofauna, particularly benthic harpacticoid copepods, of the deep sea, multiple core samples were taken at Stations A1, A2 and A3. The last two stations have been visited regularly since 1975 in a continuing sampling programme designed specifically to investigate the seasonal and longer term changes in harpacticoid copepods on the continental shelf and in the deep sea. The sampling at the deepest station,

A1 (4,825 m), was the fourth such visit since 1975 and has provided further valuable material for the study of harpacticoids on the abyssal plain. It is unfortunate that the navigational problems described earlier may mean that core sampling on the present cruise may have been up to 20 miles away from the station A1 occupied on previous cruises.

As a continuation of studies of the distribution of harpacticoid copepods down the continental slope, and of foramenifera by the Geology Department of University College Wales, Aberystwyth, the transect of four core stations was worked on the Goban Spur at 200, 500, 1250 and 1700 m. This has provided valuable samples to compare with transects worked on several previous cruises on the northern slope of the Porcupine Seabight, the Hebridean Terrace, the eastern slope of the Rockall Bank, and across the Wyville-Thomson Ridge.

No bottom photography of the multiple corer sampling the seabed was possible on this cruise. The Shipek 70 mm camera supplied by R.V.S. Barry did not have the magnetic trip for the bottom contact switch and was unusable.

e. Microbiology (Mr. N. Battersby and Mr. D. Cossar).

As part of Professor C. Brown and co-workers' (formerly at University of Dundee, now at Heriot-Watt University, Edinburgh) studies of the microbiology of the deep sea and shelf sediments, started in 1975, core samples were successfully obtained from all core stations.

In Mr. Battersby's work a total of four experiments were

carried out during the cruise in an investigation of anaerobic, bacterial respiration in sediments from sampling stations A1, A2 and A3.

Two of the experiments were identical to those performed by Prof. C.M. Brown and N. Wardell (Heriot-Watt) during the May "Challenger" cruise 6/79 earlier this year, and investigated the rates, products, types and numbers of bacteria involved in nitrate respiration in the sediments. Earlier data showed that the main product of nitrate respiration in the sediments is nitrite and that the bacteria involved are predominantly of the fermentative Aeromonas/Vibrio type. It is hoped to produce these results with data from this cruise and to check for seasonal differences.

The remaining two experiments examined sulphate respiration in the sediments by sulphate reducing bacteria (SRB's). Sediment from the sampling stations was incubated with labelled sulphate (the radioisotope  $^{35}\text{SO}_4^{2-}$ ) and the amount of reduced product ( $\text{H}_2$   $^{35}\text{S}$ ) measured, after varying time intervals, to give an estimation of sulphate reduction activity in the sediments. Isolations of SRB's were also attempted in selective media containing a total of 13 different electron donors in the hope of obtaining marine SRB strains and examining their range of possible electron donors for sulphate reduction. With Mr. Battersby's work on sulphate reducing bacteria in the sediments it is too early to say whether any growth has occurred.

Mr. Cossar's work on batch enrichments in a benzoate medium are showing possibilities of growth but perhaps only due to the



utilisation of carbon compounds present in the inoculum rather than growth on benzoate. There may be some pinpoint (?) colonies on the benzoate agar plates prepared early in the cruise from Station A3. There are approximately  $10^3$  bacteria on nutrient-rich marine agar (2216) plates from station A3 shelf sediment. There is every indication that the work done on growth at surfaces will show positive results. The experiments were designed to investigate the growth at surfaces by the selective colonisation by marine bacteria of glass slides placed in sealed core samples for various periods of incubation.

Most of the results will be processed in the laboratory after the cruise so that it is not possible at this stage to judge the success of the microbiological work aboard ship.

#### Acknowledgements.

This was a long cruise for Challenger in which no time was lost through bad weather and only two or three hours due to breakdowns. The willing co-operation of Captain Maw and the ship's company were largely responsible for the success of the cruise and we acknowledge their help with great gratitude. A special word of thanks is due to the Fishing Skipper, Mr. Frank Dunning, for his long hours on deck preparing and carrying out the trawling.

We acknowledge gratefully the assistance of Mr. C. Adams and Mr. I. Innes of RVS, Barry, in planning this cruise.

Peter Barnett

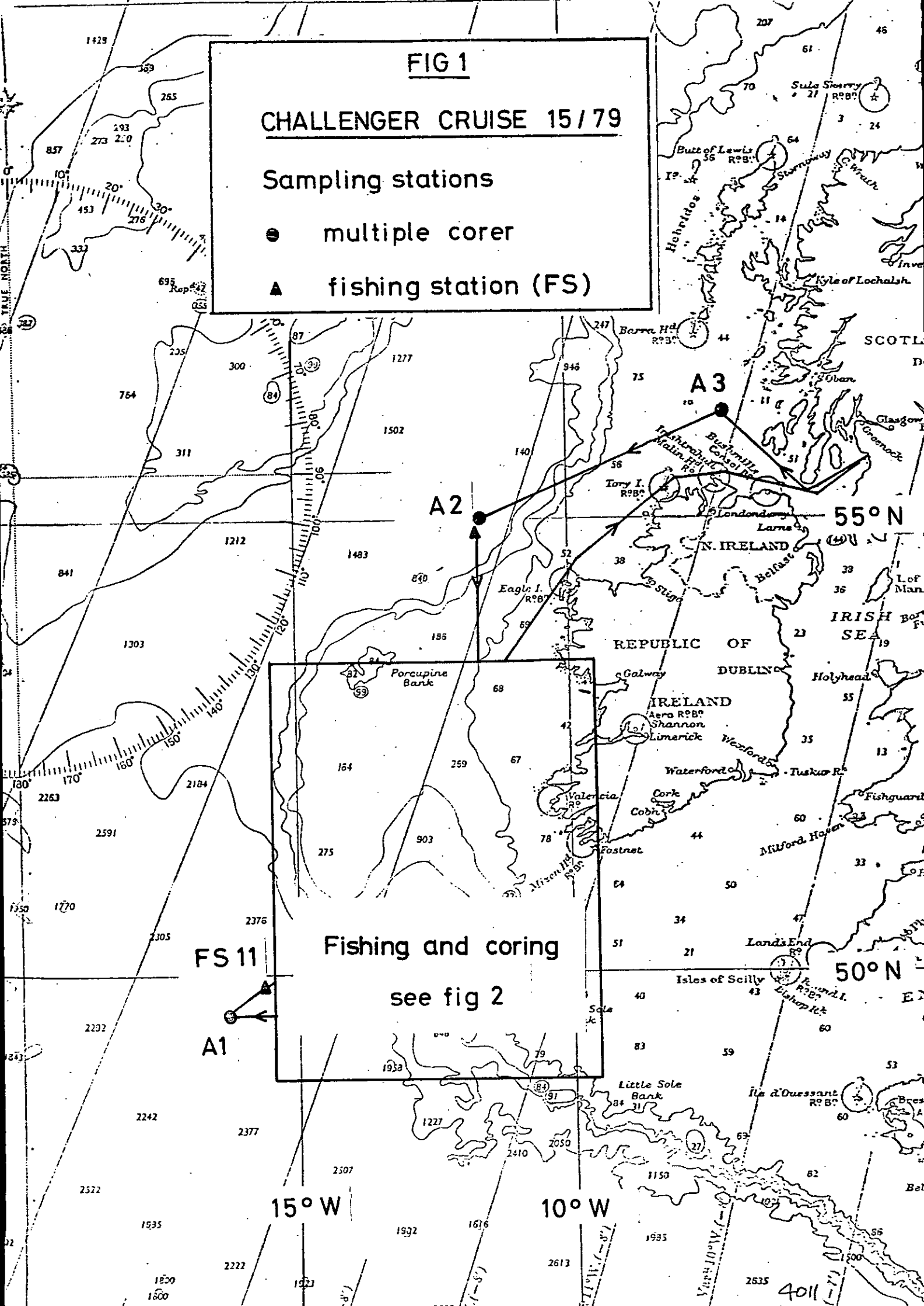
24 October 1979.

**FIG 1**

**CHALLENGER CRUISE 15/79**

Sampling stations

- multiple corer
- ▲ fishing station (FS)



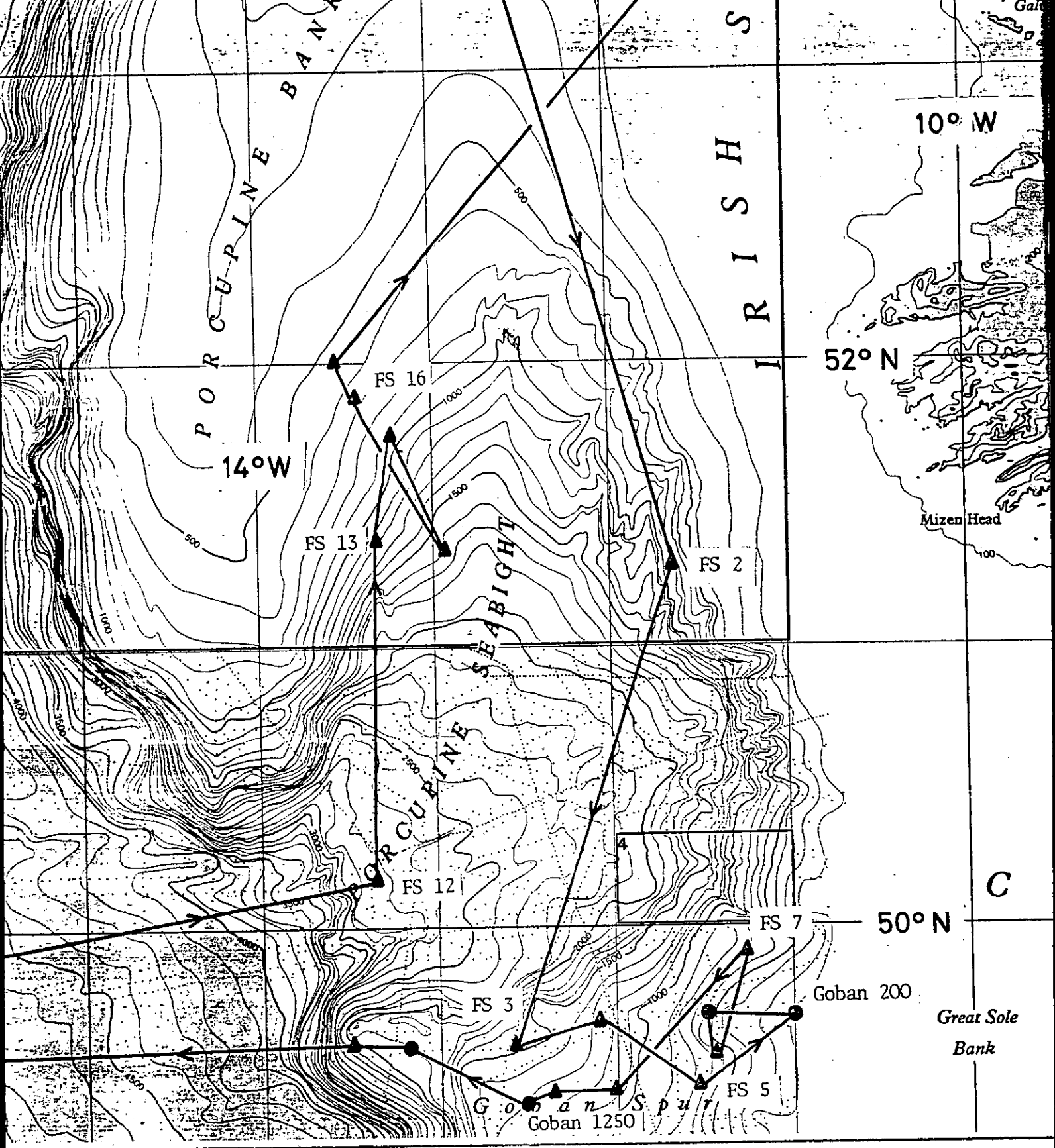


FIG 2

CHALLENGER CRUISE 15/79

Sampling stations in Porcupine Seabight and on  
Goban Spur

- ▲ fishing station (FS)
- multiple corer

Table 1. Challenger Cruise 15/1979

Summary of sampling stations

S.M.B.A. Cruise Reference	I.O.S. Discovery Collection No.	Gear	Date	Time on bottom (either mins. duration or B.S.T.)	Position (approx.)		Depth m.	Bottom water	
					N	W		Temp. °C	Salinity ‰
A3		Multiple Corer 1	10/10/79	0006 hrs.	56°02.4'	07°39.5'	158	9.77	35.285
		" " 2	"	0044 "			"		35.281
A2		Multiple Corer 1	10/10/79	2359 hrs.	55°03.5'	12°03.5'	2880	2.76	34.959
		" " 2	11/10/79	0159 "					
		" " 3	"	0342 "				2.68	
		" " 4	"	0520 "					
		" " 5	"	0653 "					
		" " 6	"	0827 "					
		Water bottle	"	0840 "			10		

Table 1 cont.

I.M.B.A. Cruise Reference	I.O.S. Discovery Collection No.	Gear	Date	Time on bottom (either mins. duration or B.S.T.)	Position (approx.)		Depth m.	Bottom water	
					N	W		Temp. °C	Salinity ‰
F.S.1 **	50701	OTSB 14 ***	11/10/79	120 min.	54°34'	11°54'	2870-2890	2.8	
" 2	50702	OTSB 14	13/10/79	45 "	51°17'	11°38'	755-815	9.3-9.7	
" 3	50703	OTSB 14	13/10/79	69 "	49°33'	12°34'	1575-1625	4.7-4.8	
" 4	50704	OTSB 14	13/10/79	72 "	49°40'	12°07'	1260-1265	7.0-7.2	
" 5	50705	OTSB 14	14/10/79	49 "	49°24'	11°32'	740-745	9.9	
		Water bottle 1	14/10/79	1354 hrs.	49°15.5'	11°30'	10		
Goban 200		Multiple Corer 1	15/10/79	0020 hrs.	49°39'	11°00'	200		35.532
		" " 2	"	0220 "	49°40.5'	10°57.5'			
		" " 3	"	0242 "	49°42'	10°56.5'			
		" " 4	"	0304 "	"	"		11.08	
Goban 500		Multiple Corer 1	15/10/79	0555 "	49°39'	11°29'	500	10.30	35.540
		" " 2	"	0628"	"	"			

\*\* F.S. = Fishing station.

\*\*\* O.T.S.B. = Otter trawl, semi-balloon.

Table 1 cont.

S.M.B.A. Cruise Reference *	I.O.S. Discovery Collection No.	Gear	Date	Time on bottom (either mins. duration or B.S.T.)	Position (approx.)		Depth m.	Bottom water	
					N	W		Temp. °C	Salinity ‰
**F.S.6 (48)	50706	Granton Trawl	15/10/79	45 mins.	49°31'	11°27'	510-550		
F.S.7 (49)	50707	Granton Trawl	15/10/79	45 "	49°54'	11°16'	770-790		
F.S.8 (50)	50708	Granton Trawl	16/10/79	45 "	49°23.2'	12°01'	1050-1065		
F.S.9 (51)	50709	Granton Trawl	16/10/79	45 "	49°23.5'	12°21.5'	1260		
Goban 1250		Multiple Corer 1	16/10/79	1907 hrs.	49°20'	12°29'	1270	7.60	35.469
		" " 2	"	1955 hrs.	"	"			
Goban 1700-		Multiple Corer 1	17/10/79	0112 hrs.	49°32'	13°10'	1685	4.45	35.094
		" " 2	"	0206 "	"	"	1700		
F.S.10	50710	OTSB 14 ***	17/10/79	ca. 81 min.	49°33.5'	13°28'	1800-2000	5.0-3.9	

\* Numbers in brackets are Dr. Gordon's S.M.B.A. trawling references.

\*\*\* O.T.S.B. = Otter trawl, semi-balloon.

\*\* F.S. = Fishing station.

Table 1 cont.

S.M.B.A. Cruise Reference	I.O.S. Discovery Collection No.	Gear	Date	Time on bottom (either mins. duration or B.S.T.)	Position (approx.)		Depth m	Bottom water		
					N	W		Temp. °C	Salinity ‰	
A1		Multiple Corer 1	18/10/79	0214 hrs.	49°30'?	16°30'?	4820		34.943	
		" " 2	"	0425 "						2.38
		" " 3	"	0658 "						2.59
		" " 4	"	1107 "						
		" " 5	"	1316 "						
		" " 6	"	1524 "						
		Water bottle	"	1729 "					34.935	
F.S.11	50711	OTSB 14	18/10/79	ca. 150	49°53'	15°36'	4795-4780	2.6		
F.S.12	50712	OTSB 14	19/10/79	ca. 70	50°10.5'	13°21'	2775-2700	2.9		
F.S.13 (52)	50713	Granton Trawl	20/10/79	45	51°22'	13°18'W	1245-1275	-		
F.S.14 (53)	50714	Granton Trawl	20/10/79	45	51°44.5'	13°14.8'	925-960	-		
F.S.15	50715	OTSB 14	21/10/79	60	51°19.5'	12°57'	1635-1720	4.2		
F.S.16 (54)	50716	Granton Trawl	21/10/79	45	51°52.5'	13°26'	745-750	-		
F.S.17 (55)	50717	Granton Trawl	21/10/79	45	52°00'	13°33'	510-500	-		