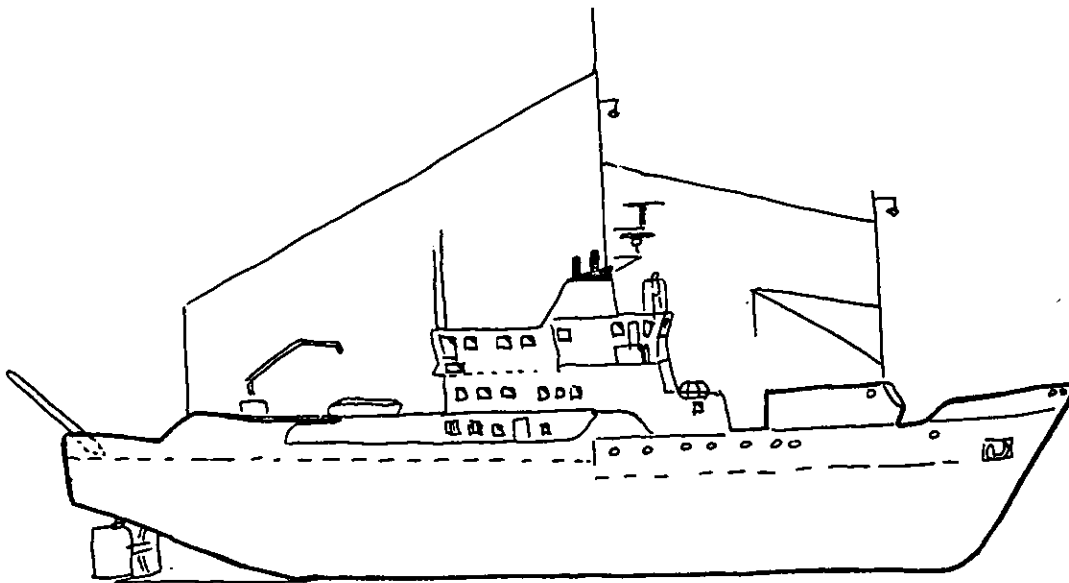


PRELIMINARY REPORT

Challenger 11/81

M. I. A. S.
24 NOV 1981
(WORMLEY)



Dr. T P Scoffin

Univ. of Edinburgh

August 1981

Challenger 11/81. Preliminary Scientific Cruise Report

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1. Area

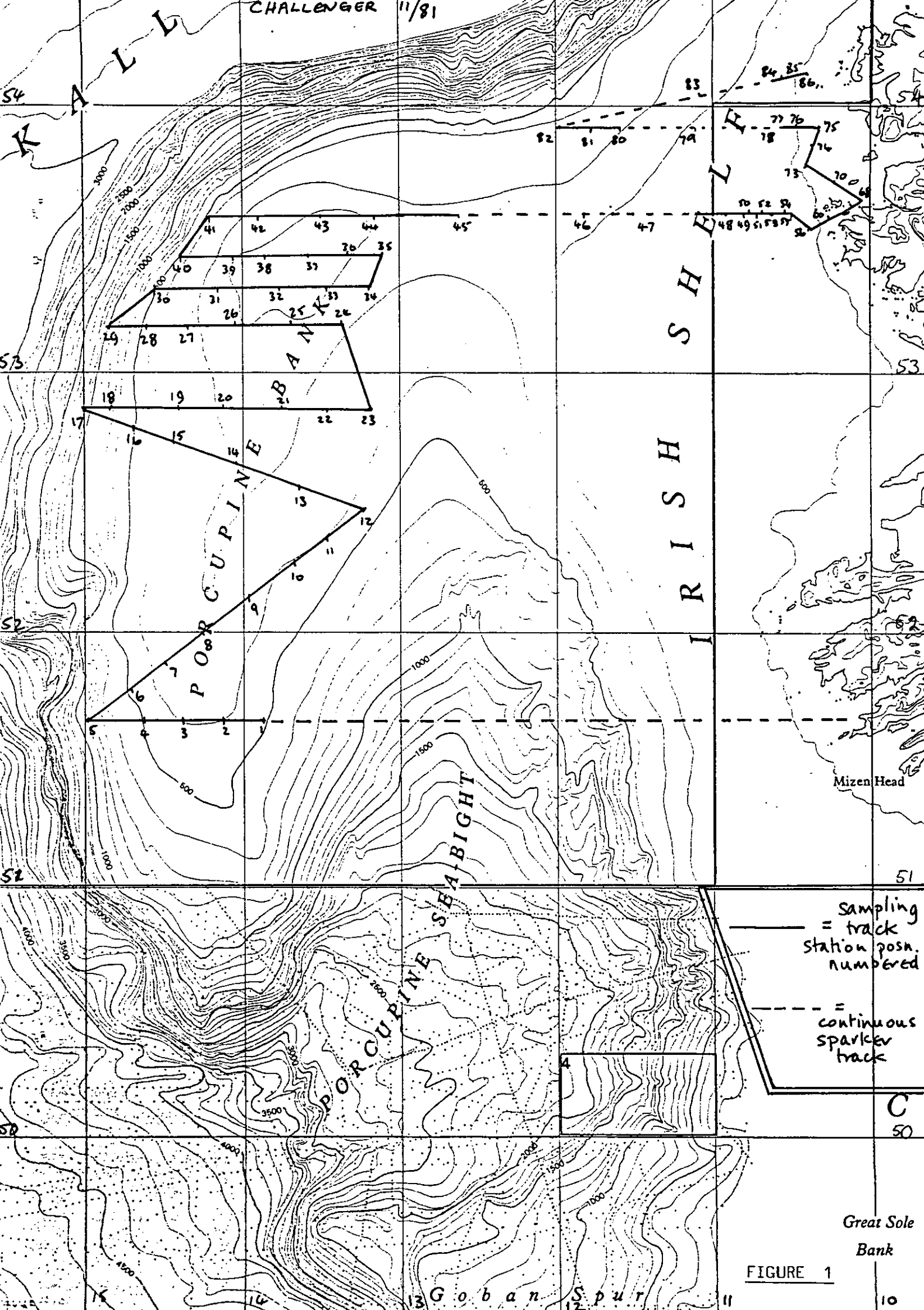
Porcupine Bank and West Irish Shelf. The cruise track is shown in Figure 1 and the data sheets in the Appendix indicate station positions and data collected at each.

2. Purpose of research and methods

The purpose of this work was to observe and collect samples of sediment and organisms from the sea bed on the shelf and shelf edge west of Ireland. The observations were made by u/w TV and film cameras and the sediment samples collected by grabbing, dredging and coring. Information on the bedforms and thickness was obtained by geophysical profiling including side scan sonar, pinger, sparker and depth recording. Further data on the deep structure will be interpreted from gravity meter recordings. Water samples were collected and filtered and the suspended sediment will be analysed in conjunction with water temperature measurement to aid interpretation of overall hydrography of the area of Porcupine Bank.

3. Operational conditions

The first two days of the cruise were stormy with winds up to force 8 prohibiting sampling along part of the first leg of the cruise track. Thereafter weather was good allowing sampling gear and the TV system to be operated



— = sampling track
 station posn. numbered

- - - = continuous sparker track

FIGURE 1

Great Sole Bank

Goban Spur

whenever required. Problems with the grab sampler meant that sea bed sampling (by dredging) took longer than expected so that a portion of the cruise track had to be omitted in order to sample Porcupine Bank adequately.

4. Personnel

<u>Name</u>	<u>Institution</u>	<u>Role</u>	<u>Main scientific interest listed in 5 below</u>
T.P. Scoffin	Univ of Edinburgh	Principal Scientist	i,iii,vi,vii,viii Coordinator
G.E. Bowes	Univ of Strathclyde	Scientist	i,viii
J.J. Cloukie	Sphere Environmental Cons.	Scientist	iii,iv,v,vi
S. Smith	Royal Scottish Museum	Scientist	iv,viii
G. Blackbourne	Univ of Strathclyde	Res Student	ii
S. Brooks	Univ of Southampton	Student	ix
J. Barling	Univ of Edinburgh	Student	
I. Curle	Univ of Edinburgh	Student	
R. Hope	Univ of Edinburgh	Student	
R. Powell	NERC Barry	Technician	
S. Howells	NERC Barry	Technician	
R. Keary	Irish Geol Survey	Irish Observer	

5. Preliminary scientific results

Introduction

The remarks below are based on the observations made during the cruise. Only cursory sediment and organism analyses were possible on the ship and are recorded in the appendix; the results of laboratory analyses will be completed in some months' time.

(i) Carbonate sediment composition

a) Porcupine Bank. (depth 161-1096 m)

Globigerina foraminifera dominate the deep waters west of the Bank with local occurrences of barnacles and corals near rocky outcrops. Towards the Bank top benthic foraminifera are introduced. At the less than 200 m contour, fragments of molluscs (mainly Nucula and Abra), bryozoans (mainly Sertella, Porella, and Domopora), and echinoderms increase in number.

There is an influence on skeletal type by both depth and substrate. The lithofacies relate closely to those found on Rockall. No barnacles or red algal facies exist on the Bank.

b) Shelf NW of Ireland (depth 24 - 360 m)

In the near-shore shallow (< 50 m) zones shelly gravels with the calcareous red alga Phymatolithon occur. In the depth zone 50 to 80 m bryozoans add to the molluscan fragments. West of the rocky ledge that runs N-S at about 80 to 120 m depth along this stretch of NW Ireland, there is a rapid transition into fine quartz-rich sand (this is reflected in the living fauna).

(ii) Terrigenous sediment

On the southern part of Porcupine Bank there is a distinctive suite of pebbles of Palaeozoic sediments and metamorphic rocks suggestive of a west Ireland origin by ice rafting. Glacial striations are common. The coarse cobbles, and boulders of fairly consistent metamorphic composition, abundant on the Bank top and the NW, may be of local origin and relate to rock outcrops seen on the TV.

Concretionary iron stained rocks were regularly located at about 500 m depth on the western margin of the Bank. These are exceedingly fossiliferous containing molluscan, brachiopod and foraminiferal skeletons. This rock has probably been forming since Tertiary times.

The Seabight and Slyne trough have abundant fine quartz sand and some clay minerals; these may be Pleistocene and Recent in origin. In shore terrigenous clasts have the appearance of glacial outwash sands and gravels mainly of a local source.

(iii) Occurrence of Lophelia coral patches

The distribution of Lophelia patches relates to depth and substrate. Rock outcrop or exposed cobbles appear essential for coral attachment. Lophelia fragments were found between 955 m and 225 m with living specimens occurring at both extremes. A smaller polyped variety may take over at the greater depths. Side scan records suggest that patches are 10 to 25 m wide, occur in clusters of 3 to 10 over about a hundred meters and these clusters are widely separated by several hundred metres. This distribution may merely reflect the occurrence of pebble patches. Lophelia patches abound more on the western than eastern margins of the bank. The solitary coral Caryophyllia is also fairly common on rocky areas.

(iv) Fauna

Below 100 m there is low variety and number of animals. On the southern and western margins between 600 m and 400 m echinoids (Cidaris, Spatangus) and anemones are common. Near 300 m burrowing crustacea are common especially Netrops and these animals thoroughly bioturbate the silty sediment over much of the bank. The fine quartz-rich sediment of the Seabight and Slyne Troughs has fewer animals but is characterised more by polychaete worms. Mollusc distribution is controlled by both depth and substrate type. The top of the bank and inshore areas have a gravel associated fauna of crabs, bryozoans, browsing chitons and sponges. Overall, the fauna has a northern aspect with some southern varieties present.

(v) Flora

Porcupine Bank lacks a benthic flora, it is too deep for light to penetrate. The photic zone as defined by the depth limit of living benthic algae appears to be about 68 m 30 kilometres offshore western Ireland and 58 m within 5 kilometres of the coast.

(vi) Breakdown of skeletons

In waters deeper than about 180 m there is a noticeable scarcity of shell fragments even though dredging reveals the presence of living molluscs on the sea bed. This skeletal breakdown could relate to several factors:- a) Hermit crabs occupy and 'wear out' all available gastropods; b) Anemones and sponges attach to and dissolve gastropod shells; c) Predatory crustacea, gastropods, fish, echinoderms and worms eat bivalves; d) Scavenging gastropods, echinoderms, amphipods, holothurians clean up shell debris; e) Boring organisms attach and corrode shells, these borers include clinoid sponges, worms, bryozoans, fungi and Natica gastropods; f) Chemical solution on the sea bed or within the sediment; g) burrowing organisms rework sediment exposing shells to renewed chemical or biological attack.

(vii) Temperature

Warm bank top temperatures of 12 to 14°C indicated an absence of upwelling on the western margin of the Bank (unlike Rockall Bank).

(viii) Sedimentary structures (Data from TV and side scan sonar)

Traction current structures were noted only in the less than 80 m zone close to shore. In the silts of Porcupine Bank a plethora of bioturbation structures - of crustacean, fish, echinoid and worm origin are found.

(ix) Subsurface results (Data from sparker)

The margins of the Celtic (trial run on route to W. Ireland) Porcupine Seabight and Slyne Troughs were revealed on the sparker profiles. The gravity data will take some time to interpret.

Possible publication topics

1. Sedimentation on Porcupine Bank and the NW Irish Shelf.
2. Molluscan assemblages of Porcupine Bank.
3. Occurrence of Lophelia on Porcupine Bank.
4. Photic limits at 54°N west of Ireland.
5. Gravity results on Porcupine Bank.
6. Role of aphotic organisms in the destruction of shells.

Appendix

The data collected for each Station is shown in the appendix which was prepared during the cruise. Note all depths should be reduced by 4m to correct for the depth of transponder of the precision echo sounder. Abbreviations are as follows:-

Rd = rock dredge, Ad = anchor dredge, Pd = pipe dredge, G = grab,
D = dead, A = alive, L/s = limestone, S/s = sandstone.

Station	Date / time	Position (lat / long)	Depth (m)	Bottom sample	Water sample	T.V / still camera	Constituent composition percent	CORAL	Biota (T.V. / dredge)	Terrigenous	C. CO ₂ % in sand	Remarks Geophysics
57	31.7.81 09:30	53°32.9'N 10°19.4'W	90- 95	g x 6					No biota recorded by SMS			MS 47
58	31.7.81 10:35	53°33.4'N 10°18.6'W	83- 86	g x 3					No biota recorded by SMS			MS 47
59	31.7.81 11:00	53°33.7'N 10°18.3'W	70- 75	g x 5					No biota recorded by SMS			MS 47
60	31.7.81 12:30	53°34.5'N 10°15.0'W	60- 72	g x 7					No biota recorded by SMS			MS 47
61	31.7.81 13:40	53°35.0'N 10°13.6'W	57 58	g x 2					No biota recorded by SMS			MS 47
62	31.7.81 14:20	53°35.1'N 10°12.2'W	55	g x 2					No biota recorded by SMS			MS 47
63	31.7.81 14:40	53°35.1'N 10°11.7'W	55	AD					No biota recorded by SMS			MS 47
									Sand, 15% Gtz, 10% Gtz Moll, Damaged, sponges + forams			75
									90% Moll. Anus + Gtz sponges bryozoans, bryozoans			95

Station	Date / Time	Position (lat/long)	Depth (m)	Bottom Sample	Water Sample	T.V. / Still Camera	constituent composition: percent	CORAL	Biota (T.V./dredge)	Terrigenous	CaCO ₃ % in sand	Remarks Geophysics
64	31.7.81 14:50	53°35.1'N 10°12.0'W	0	Ad					Mostly with shells of molluscs & brachiopods. Mytilus sp. is common. -) Sp. with c. 4 sp. (T. l. sp.) Pogonina - Gaudin Terebra sp. - 1 sp. in shell Gastropoda - 1 sp. in shell Sipuncula - 1 sp. in shell		90	MS47
65	31.7.81 15:02	53°35.2'N 10°10.6'W	38	Ad			Molluscan, bivalve, large ech. spine, + spongy debris		No biota recorded by S.M.S.			MS47
66	31.7.81 15:42	53°35.6'N 10°07.7'W	35			T.V. 35 mins (tape 4) S.C. (col.) some	No Sample		T.V. Luidia common			MS47
67	31.7.81 16:45	53°55.8'N 10°05.9'W	28	Ad		T.V. (a) 10 mins (tape 4) S.C. NONE T.V. (b) 20 mins S.C. (col.) some	Calcareous algae, Moll debris, Gravel		T.V. Luidia common - also P. canaliculata, and Murch. Alacris. P. canaliculata Ophiocoma regia abundant Many molluscs but not collected or reported.			MS47
68	31.7.81 18:10	53°38.2'N 10°04.9'W	40-50	Ad x 7					Large echinoderms in rubble (N. g. sp. common) biota No other biota Large Ophiocoma sp. Alpheidae			MS47
69	31.7.81 20:50	53°40.5'N 10°09.8'W	60-70	Rd Pd Rd Pd					No biota recorded by S.M.S.			MS47
70	31.7.81 22:20	53°43.3'N 10°15.7'W	90	Rd Pd					No biota recorded by S.M.S.			MS47
							Rd + moll debris					

Station	Date / time	Position (lat/long)	Depth (m)	Bottom sample	Water sample	T.V. / still camera	constituent composition - percent	CORAL	Biota (T.V./dredge)	Terrigenous	CaCO ₃ % in sand	Remarks Geophysics
71	31.7.81 23:00	53°45.7'N 10°20.1'W	90	Dredge left Pd					No. Sample			MS47
							Only litter boulders					
72	1.8.81 00:40	53°45.0'N 10°25.6'W	95	Pd			Clean Sand, Moll. bryoz. ech spines, Serpulids		1 Sample			MS47
											90	
73	1.8.81 02:00	53°45.9'N 10°28.9'W	50-82	Pd 91.20		T.V. 022500125 (PAPS) 5.C (col)	Sand, Molluscan frags (+ ech spine + benthic form)		Rink directly species of Hydras bryozoa, small molluscs esp. <i>Hydrobia</i> Moll. bryozoa, ech spine T.V. arthropods <i>Phragmites</i> <i>Caloglyphus smithii</i> Ophiuroid fragments common Asterias tuberos.			MS47
74	1.8.81 11:40	53°52.4'N 10°24.2'W	104	Pd Pd			Bivalve fragments (+ boulders)		Rink directly species of Hydras. Serpulids common small common molluscan bryozoa			MS47
75	1.8.81 12:40	53°54.1'N 10°21.0'W	85	Pd			Riv. frags + bryozoa, Serpulids benthic forms, bryozoa, spine		No. biota recorded by SMS.			MS47
											90	
76	1.8.81 13:50	53°55.0'N 10°27.2'W	120	Pd & R			Benthic forms, Moll frags, spines		(1) Many small bryozoa abundant, small molluscs (Hydrobia) some small & deep-sea T.V. bryozoa - <i>Toricella</i> molluscs, small bryozoa (2) Distribution extract (3) Molluscs bryozoa			MS47
											10	
77	1.8.81 14:50	53°55.3'N 10°34.6'W	150	Pd			Benthic forms, bryozoa, Moll spines		(1) Many small bryozoa (2) Molluscs (Hydrobia) some small & deep-sea T.V. bryozoa - <i>Toricella</i> molluscs, small bryozoa (3) Distribution extract (4) Molluscs bryozoa (5) Molluscs bryozoa (6) Molluscs bryozoa (7) Molluscs bryozoa (8) Molluscs bryozoa (9) Molluscs bryozoa (10) Molluscs bryozoa			MS47
											10	

Station	Date / time	Position (lat / long)	Depth (m)	Bottom sample	Water sample	T.V. / still camera	constituent composition - percent	CORAL	Biota (T.V / dredge)	Terrigenous	CaCO ₃ % in sand	Remarks Geophysics
78	1.8.81 16:10	53°54.9' N 10°43.5' W	135	Rd Pd			Sand, 90% OR + Moll frags.		Many Sponges & Asponges 4 Pterinea + Haliotis 1 Anem. Anemone 1 Anem. virginica		10	M347 off at 16:30
79	1.8.81 19:10	53°54.9' N 11°04.2' W	195	Rd Pd			Sand 70% gtz with some shells, brnt from + shell.		20 1 large medusa 3 small asponges, 2 small sponges 5 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges		10	sparker out:- 16:40 → 19:07 gravity paper high speed - 17:20.
80	1.8.81 23:00	53°55.1' N 11°35.7' W	320	Rd Pd			50% gtz 30% ? clay, brnt Pd + brnt from + glass		2 small lobsters, 5 small asponges, 2 small sponges 2 small lobsters, 3 small asponges, 2 small sponges 1 small lobster, 2 small asponges, 2 small sponges 1 small lobster, 2 small asponges, 2 small sponges		20	sparker out:- 20:10 → 23:10
81	2.8.81 00:40	53°54.6' N 11°45.9' W	340	Rd Pd			80% gtz 10% + clay Pd, + brnt from. Est sp.		20 9 small lobsters, 3 sponges 8 small lobsters, 3 sponges 8 small lobsters, 3 sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges		10	gravimeter paper to low speed 0:15.
82	2.8.81 02:50	53°54.5' N 11°57.6' W	365	Rd Pd	WS	T.V. 00:10 → 05:15 (tape 5) S.C. (cont.)	Pd + brnt from, 80% gtz shell frags, Est sp, glass.		20 3 med lobsters, 4 small sponges, 1 large sponge 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges		20	gravimeter paper to high speed 04:00
83	2.8.81 11:30	54°02.9' N 10°59.2' W	220	Rd Pd			70% OR, Pd + brnt from + shell frags + Est sp.		20 1 large med, 2 small sponges, 1 large sponge 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges		15	sparker out:- 00:00 → 10:48
84	2.8.81 14:10	54°05.0' N 10°34.7' W	155	Rd Pd			90% OR shell frags + str. fossils.		20 1 large med, 8 sponges 3 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges 1 sponges, 2 small sponges		5	sparker out:- 12:20 → 14:12

Station	Date / time	Position (lat / long)	Depth (m)	Bottom sample	Water sample	T.V. / still camera	constituent composition: percent	CS SL	Biota (T.V / dredge)	Terrigenous	CaCO ₃ % in sand	Remarks Geophysics
85	2.8.81	54°05.6'N		depth 105A								
	15:50	10°20.3'W	110	9 x 21					Xb sample			
86	2.8.81	54°06.7'N		9 x 5					Flora sample			
	20:30	10°16.6'W	78						Flora sample			
87												
88												
89												
90												
91												