NATIONAL INSTITUTE OF OCEANOGRAPHY
WORMLEY, GODALMING, SURREY

R. V. JOHN MURRAY

Cruise 6

21 APRIL - 30 MAY 1972

TIDAL RECORDINGS NORTH AND EAST OF SHETLAND, AND GEOLOGICAL SAMPLING ALONG THE NORTH BRITISH SHELF

N. I. O. CRUISE REPORT No. 51
(Issued August 1972)

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21 April - 30 May 1972

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ITINERARY

Leg 1: 21 April - 1 May, Barry to Lerwick

Leg 2: 4 May - 19 May, Lerwick to Lerwick

Leg 3: 20 May - 30 May, Lerwick to Barry

PERSONNEL

Name	Leg	Affiliation
D. E. Cartwright (S. S. O.)	1,3	N. I. O.
R. Spencer	1,3	N. I. O.
T. J. P. Gwilliam	1,3	N. I. O.
D. Grohmann	1,3	N. I. O.
Mrs. P. Edwards	1	N. I. O.
J. Chitty	1	N. I. O.
R. E. Kirk	3	N. I. O.
K. Tipping	3	N. I. O.
J. B. Wilson (S. S. O.)	2	N. I. O.
N. Timmins	2	N. I. O.
C. D. Pelton	2	N. I. O.
P. Lindsay	2	N. I. O.
N. MacWhirter	2	N. I. O.
H. Robertson	2	I. G. S. (Edinburgh)

SUMMARY

The main itinerary was planned to enable us to complete the northern end of a chain of tidal pressure and current recordings round the edge of the Continental Shelf, which we have been making piecemeal since 1968. The completing stations required were numbers 108-111, shown on map no. 1, generally north and east of Shetland, with one current meter station (111) in the deeper water about 50 miles southwest of Florø, Norway. Legs 1 and 3 were therefore devoted to laying and recovering the recorder moorings and the passages from and to Barry, respectively. We also planned to take some current profiles at one or two anchor stations east of Shetland in about 50 fathoms depth, each occupying about two days, but bad weather prevented us from occupying more than one station for one day at the start of leg 3. The work of legs 1 and 3 will be described consecutively, below.

Leg 2 was entirely devoted to geological work with grab, dredge, and TV camera equipment at various parts of the shelf between Shetland and Lewis, (map nos. 2 and 3). The report on Leg 2 follows after that on Legs 1 and 3.

NARRATIVE - LEGS 1 AND 3

The cruise officially started 21 April, but for most of the scientific personnel, work in loading and setting up the tidal equipment on board started 5 days earlier. It should be mentioned that the chaotic state of the dockside, (under repair), and the 'John Murray' being berthed outside the 'Shackleton' most of the time made this work very difficult. We sailed from Barry at noon, 21 April. The primary object was to reach the Shetland area in the shortest time possible, in order to secure the maximum period of recording. Fortunately, the weather was favourable most of the time, allowing an average speed of about $8\frac{1}{2}$ knots (maximum $9\frac{1}{2}$ knots). We stopped for four hours in the northern Irish Sea (70 fathoms) to carry out tests on all acoustic recall systems, some of which proved low in sensitivity, and therefore required time spent in improvement. The P. E. S. fish was launched from a sliding boom, specially fitted on the forward deck. (This was for use as an acoustic transducer, not for normal echo-sounding.)

The first mooring position (107) was reached 0500Z on 25 April, in wind force 5, in which mooring operations were quite manageable hove-to. After laying both pressure and current meters at 107, we proceeded directly to 108, at which similar moorings were completed by 1500Z. We spent an hour on further acoustic tests of the gear which gave trouble earlier, then reached position 109 at 2300Z. The planned position, 61°33'N, 1°54'E, was found to be deeper than expected from the chart, so, since the pressure recorders are limited to 200m depth, we had to steam southwest for an hour or so until the 100 fathom line was passed. The mooring was completed by 0100Z on 26 April.

On switching off current-meter pingers, another pinger was heard, rather faintly, presumably from the pressure meter. In normal weather conditions we should have returned to the pressure mooring and switched it off again, but in fact a gale warning was imminent, and we decided to leave it, in order to complete the remaining moorings without undue delay. The pinger would exhaust

its batteries in about two days, but the mooring had two other subsidiary acoustic systems still usable for recovery. This proved a bad judgement. On return to 109 in May, we failed to find either mooring; possibly the pinger attracted the attention of a foreign vessel who proceeded to drag both moorings up for investigation.

We proceeded to position 111, where only current meters were moored, the depth being far too great for our pressure recorders. Despite force 6 winds and a 2 metre swell, the mooring was accomplished by 0900Z on the 26th. Soon after, the wind increased to force 8, so on arrival at 110, we hove to for the night. By morning of the 27th, the weather had improved somewhat, so we managed to complete the final moorings at position 110 by noon.

During these operations, close checks were made on both Decca and Loran C, working on Chain SL3, in order to avoid any ambiguity in returning to the sites for recovery. In general, they agreed to within half a mile or so, especially on the Norwegian Decca chain OE, but despite close watching, the Loran would occasionally slip a cycle or two without showing any warning lights. Therefore, when the two systems differed by over a mile, the only possible procedure was to re-index the Loran to a set of readings whose position was passably close to the Decca position. Our confidence in the Loran C, as a means of navigating to better than a mile accuracy, was thereby much diminished. Without good Decca fixes as back-up, it would have been most unreliable for this work.

The only remaining work was an anchored current profile station, but severe gales were expected in every sea area, so there was nothing to do except steam to a reasonably sheltered spot and wait for the weather to improve. We therefore spent most of 28 - 30 April at anchor in Bressay Sound, with local winds up to force 9. At noon of 30th there was a drop in wind speed and better forecasts for the Shetland area, so we steamed out towards a proposed anchor station near Out Skerries, where under good conditions we might have stayed for 2 days' recording. However, heavy swell made anchoring out of the question, so we gave up and went straight in to Lerwick, arriving 1600Z 30 April.

Equipment for shore-based tide recording at Baltasound, Shetland was unloaded from the 'John Murray' at Lerwick, and D. Cartwright and R. Spencer (aided part of the time by Mrs. Edwards) set the Baltasound recording station up during the interval between Legs 1 and 3. This work also involved close checks on the tide gauge in Lerwick Harbour, and some investigation of other possible sites in west Shetland Mainland.

'John Murray' left Lerwick 1330Z on 20 May to start Leg 3. Having initially very calm weather, we steamed directly to anchor station D, 100m deep, west of Unst, for current profiles. This station was occupied from 2000Z 20th to 2100Z 21st May, when increasing wind and swell made anchoring unsafe. The 25 hours continual current recordings at 20m, 50m, and 80m depth are just about adequate for analysis, though of minimal value.

The tidal moorings were still two days short of the ideal 29 days, but we

decided to start releasing them forthwith, while the weather was still tolerable - gale warnings were looming up again in the south west. The pressure meter at 107 had been trawled up by a German fishing vessel, and was awaiting collection in Cuxhaven. The current meter was located and released without trouble by 0830Z 22 May. We then proceeded directly to position 108, where both moorings were successfully recovered by 1900Z.

We arrived at position 109 at 0200Z on the 23rd. Three hours were spent transmitting to the commond-and-release-pingers of both moorings, without any success. Then, in case the navigation was inaccurate, we steamed for 6 hours on a pattern of courses surrounding the nominal position by up to 1 or 2 miles distance. Assuming both sets of pingers out of action, we then dragged chains in circles about 1 cable radius over current meter position, again with no result. At 1500Z, as a last resort, the ship's engine was de-clutched, to reduce noise to a minimum and listen for possibly very faint or distant pingers which might have been switched on during the morning's operations. De-clutching certainly lowered the noise level received at the hydrophones very noticeably. A pulse of 1 second period of immediately discernible, and some hours were spent steaming about to locate the source. But it showed no doppler shift, and it was eventually discovered that the pulse was merely cross-talk from the ship's crystal clock! There was no trace of any other pulse from underwater at the lowest noise level, so we concluded that both pressure and current meter moorings had been trawled by fishing boats or otherwise wrecked*. We left position 109 at 1730Z. All moorings at positions 111 and 110 were recovered with little trouble, in winds up to force 6, during 24 May. Then, with weather deteriorating rapidly, and extensive gales forecast, we proceeded to shelter east or west of Unst. Hopes of another anchor station receded, as the weather again worsened, as in Leg 1, over the whole of the British Isles. Finally, on 26 May we set off in heavy seas towards Barry, where we berthed at 2130Z, 29 May (two days ahead of schedule).

Despite the loss of the pressure recorder at position 109, and the inability to carry out the expected anchor stations, (neither of which was in any way due to inefficiency of ship operations), the cruise was on the whole fairly successful in its scientific objectives, not least owing to the helpful and friendly co-operation of the ship's captain, Peter Maw, and his officers and crew.

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* The current meter mooring from 109 was later trawled up complete by a French fishing vessel on 3 June at 61°10'N, 1°15'E - several miles from its original position.

D. E. C.

NARRATIVE - LEG 2

The objective of Leg 2 was to obtain quantitative samples of biogenic carbonates and other sediments from the Scottish shelf to the north of the area covered by N. I. O. cruises in 1970 and 1971 as part of the N. I. O. investigations into benthonic faunas and biogenic carbonates.

The sailing from Lerwick at the start of Leg 2 originally planned for 0900 hours on Thursday 4 May had to be postponed as it was necessary to obtain a relief 3rd engineer. A fault on the ship's main switchboard caused a further postponement. After heroic efforts by those concerned this was repaired in time for the ship to sail at 0600 hours on Friday 5 May.

The Precision Echo Sounder fish was streamed at 0715 hours and the Kelvin Hughs MS 47 Transit Sonar transducer was lowered into position at 0900 hours and the sonar switched on. The P. E. S. and side-scan sonar were run continuously for the duration of the leg.

A series of stations using the 0. 1 m^2 Smith-McIntyre Grab were worked from the starboard davit throughout the leg. The first samples were taken east of Balta Sound, Unst. Further stations were then worked northwards towards the edge of the shelf.

A track chart giving the lines of P. E. S. records and side-scan sonar records is given in Map 2 and a station position chart in Map 3. Details of the positions, the equipment used, depths etc. of each station are given in the station list at the end of the report.

Seven dredge stations (8, 9, 10, 15, 16, 20 & 21) and two towed camera stations (11 & 19) were worked in an area of a distinctive sonar pattern suggestive of iceberg action and in two areas where the Fisheries Laboratory, Lowestoft obtained live Lophelia prolifera. Although a considerable effort was made no live Lophelia was obtained. At station 17 we anchored from the stern and the I. G. S. underwater T. V. and 70 mm stereo camera system was lowered from the starboard davit to investigate the nature of the bottom towards the edge of the shelf. Some videotape record and a series of stereo photographs were obtained. The anchor was then weighed and the T. V. system was again lowered in order to observe the bottom while drifting. This was not successful however, as water entered the T. V. plug and the station was abandoned.

Two lines of grab stations were then worked from west of Unst and west of Yell towards the edge of the shelf.

An excessive amount of fresh water was apparently being used and strict water rationing was introduced on 8 May.

A series of grab and dredge stations were worked in St. Magnus Bay and on the inner shelf west of Mainland and south of Foula. The shelf south of Foula proved to be particularly rich in biogenic carbonate sediments.

Further grab and dredge stations were worked on a line from the edge of the shelf towards Papa Bank and then southwards towards North Shoal north west of Mainland Orkney.

The rationing did not significantly reduce the consumption of fresh water. Arrangements were therefore made to call at Kirkwall on the 14 May to obtain more water. We docked at 0930 hours and sailed again at 1230 hours.

Grab and dredge samples were collected from a series of stations west of Mainland and Hoy. Station 96 at the west end of the Pentland Firth yielded biogenic carbonate gravel. The proposed dredging programme in the Pentland Firth had to be abandoned as the currents were too strong. Grab and dredge samples were then collected from stations off the north coast of Scotland from Dunnet Head (station 97) to west of Loch Inchard (station 107) and from Rona (station 108) to north east of Sole Skerry (station 120). The positions of certain of these stations were based on data kindly supplied by I. G. S. and on preliminary examination of I. G. S. samples collected from the area in 1971.

Further grab and dredge stations were worked on Fair Isle Bank both north and south of Fair Isle. At station 124 sea conditions were suitable and a T. V. station was attempted. The stern anchoring was successful but when the T. V. cage was lowered from the starboard davit, the surface current was such that the cage could not be lowered with safety. The station was therefore abandoned.

The MS 47 transducer and the P. E. S. fish were retrieved inboard at 2100 hours on 18 May and we docked in Lerwick on the 19th at 0830 hours.

Weather conditions throughout the leg were reasonably good. At no time was it too rough to operate the grab or the dredge. Sea conditions made the launch and recovery of the towed camera a little difficult however. It was unfortunate that it was only calm enough to anchor on two occasions to use the T. V. camera. In all, 110 grab stations, 11 grab and dredge stations, 15 dredge stations, 2 towed camera stations and 1 T. V. station were successfully completed.

The co-operation and willingness to help shown by Captain Maw and the entire ship's company and the enthusiastic support given by the scientific party contributed greatly to the success of the operation.

J. B. W.

POSITIONS OCCUPIED IN LEGS 1 AND 3

(See Map 1)

'John Murray' Station No.	Position number	Latitude	Longitude	Approx. depth
188	107	60°52'.6 N	2°16'.1 W	190 m
189	108	61°12'.8 N	0°13'.5 W	156 m
191	109	61°28'.4 N	1°47'.0 E	170 m
193	110	60°41'.2 N	1°17'.5 E	147 m
192	111	61°22'.2 N	3°25'.3 E	375 m
345	D	60°46'.0 N	0°42'.5 W	100 m

ABBREVIATIONS USED IN STATION LIST

SMG	=	0.1m^2 Smith McIntyre Grab
Dredge	=	N. I. O. Rock Dredge
Towed Camera	=	N. I. O. Towed Camera
TV Stereo Camera	=	I. G. S. Spirotechnique Underwater TV System and 70mm Hassleblad Stereo Camera System
UCF	=	Uncorrected Fathoms
UCM	=	Uncorrected Metres

R. R. S. JOHN MURRAY CRUISE 6 - 1972 LEG 2 STATION LIST

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long	to	Lat. Long	Depth Range UCF - UCF		UCM - UCM		No. of Hauls
1	SMG	5. 5. 72	1400	1455	60°51. 2'N 0°35. 5'W	-	-	63	-	115. 2	-	2
2	SMG	5. 5. 72	1535	1550	60°52. 8'N 0°36. 2'W	-	-	52	-	95. 1	-	2
3	SMG	5. 5. 72	1640	1706	60°55. 8'N 0°38. 8'W	-	-	60	-	109. 7	-	2
4	SMG	5. 5. 72	1745	1812	61°2. 8'N 0°39. 4'W	-	-	66	-	120. 7	-	2
5	SMG	5. 5. 72	1844	1915	61°5. 4'N 0°41. 2'W	-	-	76	-	139	-	2
6	SMG	5. 5. 72	2012	2039	61°8. 3'N 0°42. 8'W	-	-	84	-	153. 6	-	2
7	SMG	5. 5. 72	2200	2238	61°15. 2'N 0°41. 1'W	-	-	91	-	166. 4	-	2
8	Dredge	6. 5. 72	1032	1215	61°38. 8'N 0°50. 4'W	61°26. 2'N 0°58. 8'W		109	109	199. 3	199. 3	1
9	Dredge	6. 5. 72	1438	1624	61°39. 1'N 0°35. 8'W	61°37. 5'N 0°18. 4'W		110	111	201. 2	184. 7	1
10	Dredge	6. 5. 72	1750	2030	61°53. 8'N 0°4'W	61°52. 2'N 0°4'E		140	130	256	237. 7	1
11	Towed Camera	7. 5. 72	0050	0150	61°52'N 0°7'E	61°51. 8'N 0°8'E		132	127	241. 4	232. 3	1

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long.	to Lat. Long.	Depth Range UCF - UCF		UCM - UCM		No. of Hauls
12	SMG	7.5.72	0945	1028	61°31.7'N 0°41.8'E	- -	102	-	186.5	-	2
13	SMG	7.5.72	1110	1132	61°30.5'N 0°32.3'E	- -	100	-	182.9	-	2
14	SMG	7.5.72	1300	1315	61°29.6'N 0°22.7'E	- -	98	-	179.2	-	1
15	SMG Dredge	7.5.72	1348	1520	61°29.2'N 0°14.1'E	61°29.9'N 0°19.1'E	100	101	182.9	184.7	2+1
16	Dredge	7.5.72	1620	1655	61°25'N 0°19.2'E	61°24.7'N 0°24.7'E	95	94	173.7	171.9	1
17	TV Stereo Camera	7.5.72	1805	2055	61°27.0'N 0°21.2'E	-	96	-	175.6	-	1
18	TV Stereo Camera	7.5.72	2335	0102	61°27.0'N 0°21.2'E	-	96	-	175.6	-	Abandoned (camera fault)
19	Towed Camera	8.5.72	0940	1320	61°28.8'N 0°59.1'W	61°24.5'N 1°1.4'W	110	102	201.2	186.5	1
20	Dredge	8.5.72	1430	1615	61°24.9'N 1°14.8'W	61°25.8'N 1°7.5'W	144	130	263.3	237.7	1
21	Dredge	8.5.72	1720	1815	61°23.8'N 1°1.3'W	61°23.6'N 1°2.0'W	104	102	190.2	186.5	1
22	SMG	8.5.72	2000	2035	61°17.2'N 0°58.5'W	-	94	-	171.9	-	2

23	SMG	8.5.72	2130	2145	61°13.4'N 0°57.0'W	-	88	-	160.9	-	2	
24	SMG	8.5.72	2240	2300	61°8.2'N 0°57.0'W	-	84	-	153.6	-	1	
25	SMG	9.5.72	0002	0014	61°4.5'N 0°55.0'W	-	78	-	142.6	-	1	
26	SMG	9.5.72	0115	0135	60°57.7'N 05°57.1'W	-	64	-	117	-	2	
27	SMG	9.5.72	1040	1122	60°49.7'N 0°57'W	-	51	-	93.3	-	2	
28	SMG	9.5.72	1150	1224	60°51.8'N 1°5.5'W	-	58	-	106.1	-	2	
29	SMG	9.5.72	1305	1415	60°51.5'N 1°15.8'W	-	56	-	102.4	-	2	
30	SMG	9.5.72	1457	1514	60°53.2'N 1°25'W	-	65	-	118.9	-	2	
31	SMG	9.5.72	1551	1610	60°53'N 1°37'W	-	73	-	133.5	-	2	
32	SMG	9.5.72	1648	1717	60°55.5'N 1°44'W	-	73	-	133.5	-	2	
33	SMG	9.5.72	1805	1820	60°54.9'N 2°2.2'W	-	73	-	133.5	-	2	
34	SMG	9.5.72	1914	1935	60°55.2'N 2°7.8'W	-	110	-	201.2	-	2	
35	Dredge	9.5.72	2215	2345	60°52.4'N 1°23.2'W	60°51.5'N 2°19'W	150	112	274.3	204.8	1	

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long.	to	Lat. Long.	Depth Range UCF - UCF		Depth Range UCM - UCM		No. of Hauls
36	SMG	10. 5. 72	0915	0940	60°39. 4'N 1°22. 1'W	- -		48	-	87. 8	-	3
37	SMG	10. 5. 72	1020	1036	60°41. 5'N 1°28. 5'W	- -		53	-	96. 9	-	2
38	SMG	10. 5. 72	1126	1138	60°37. 8'N 1°39. 0'W	- -		62	-	113. 4	-	2
39	SMG	10. 5. 72	1300	1316	60°41. 5'N 1°48. 8'W	- -		72	-	131. 7	-	2
40	SMG	10. 5. 72	1350	1406	60°41. 1'N 1°59. 3'W	- -		71	-	129. 8	-	2
41	SMG	10. 5. 72	1448	1455	60°41. 3'N 2°10. 0'W	- -		74	-	135. 3	-	2
42	SMG	10. 5. 72	1535	1548	60°41. 2'N 2°19. 00'W	- -		77	-	140. 8	-	2
43	SMG	10. 5. 72	1635	1648	60°41. 5'N 2°30'W	- -		74	-	135. 3	-	2
44	SMG	10. 5. 72	1740	1748	60°41. 5'N 2°39. 6'W	- -		90	-	164. 6	-	2
45	SMG	10. 5. 72	1840	1859	60°41. 3'N 2°50'W	- -		109	-	199. 3	-	2
46	SMG	10. 5. 72	1939	1959	60°37. 5'N 2°42'W	- -		87	-	159. 1	-	2

47	SMG	10. 5. 72	2035	2052	60°31'N 2°42'W	- -	73	-	133. 5	-	2	
48	SMG	10. 5. 72	2130	2154	60°26. 8'N 2°41'W	- -	82	-	150. 0	-	2	
49	SMG	10. 5. 72	2222	2248	60°22'N 2°41'W	- -	93	-	170. 1	-	2	
50	SMG	10. 5. 72	2327	2347	60°15. 7'N 2°38. 5'W	- -	95	-	173. 7	-	2	
51	SMG	11. 5. 72	0045	0110	60°11. 3'N 2°37'W	- -	54	-	98. 8	-	2	
52	SMG	11. 5. 72	0935	0939	60°33'N 1°53. 4'W	- -	55	-	100. 6	-	2	
53	SMG	11. 5. 72	1020	1031	60°29. 4'N 1°45'W	- -	60	-	109. 7	-	2	
54	SMG	11. 5. 72	1110	1130	60°26. 2'N 1°38. 2'W	- -	60	-	109. 7	-	2	
55	SMG	11. 5. 72	1200	1215	60°27. 7'N 1°32. 6'W	- -	36	-	65. 8	-	1	
56	SMG	11. 5. 72	1315	1340	60°23. 6'N 1°32'W	- -	29	-	53. 0	-	2	
57	SMG	11. 5. 72	1346	1352	60°22. 6'N 1°31. 8'W	- -	36	-	65. 8	-	1	
58	SMG Dredge	11. 5. 72	1359	1410	60°22. 3'N 1°32' W	60°21. 5'N 1°35' W	42	48	76. 8	87. 8	2+1	
59	SMG Dredge	11. 5. 72	1522	1608	60°22'N 1°43. 6'W	60°21. 1'N 1°42. 6'W	40	40	73. 2	73. 2	2+1	

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long.	to Lat. Long.	Depth Range UCF	- UCF	UCM	- UCM	No. of Hauls
60	SMG	11. 5. 72	1645	1655	60°20. 5'N 1°46. 5'W	- -	37	-	67. 7	-	2
61	SMG	11. 5. 72	1825	1846	60°16. 5'N 1°46. 4'W	- -	38	-	69. 5	-	3
62	SMG	11. 5. 72	1955	2011	60°11. 3'N 1°45. 6'W	- -	45	-	82. 3	-	2
63	SMG Dredge	11. 5. 72	2050	2135	60°6. 2'N 1°45. 8'W	60°5. 5'N 1°44'W	45	45	82. 3	82. 3	2+1
64	SMG	11. 5. 72	2247	2302	60°5. 4'N 1°52. 2'W	- -	44	-	80. 5	-	2
65	SMG	11. 5. 72	2345	0005	60°5. 1'N 2°2. 8'W	-	48	-	87. 8	-	3
66	SMG	12. 5. 72	0040	0054	60°5'N 2°9'W	-	54	-	98. 8	-	2
67	SMG	12. 5. 72	0940	1006	60°5. 2'N 4°14. 7'W	-	86	-	157. 3	-	2
68	Dredge	12. 5. 72	1048	1127	60°8. 1'N 4°21. 1'W	60°8. 7'N 4°19. 5'W	96	94	175. 6	171. 9	1
69	Dredge	12. 5. 72	1212	1300	60°10'N 4°29. 1'W	60°10. 7'N 4°21. 5'W	138	125	252. 4	228. 6	1
70	Dredge	12. 5. 72	1425	1448	60°6. 3'N 4°29. 1'W	60°5. 4'N 4°29'W	102	100	186. 5	182. 9	1

71	Dredge	12. 5. 72	1530	1623	60°6. 3'N 4°34. 3'W	60°6. 8'N 4°34'W	139	138	254. 2	252. 4	1
72	SMG	12. 5. 72	1740	1824	60°58'N 4°23'W	- -	88	-	160. 9	-	2
73	SMG	12. 5. 72	1918	1939	60°1. 7'N 4°12. 8'W	- -	86	-	157. 3	-	2
74	SMG	12. 5. 72	2015	2033	60°0'N 4°3. 8'W	- -	64	-	117. 0	-	2
75	SMG	12. 5. 72	2116	2134	59°57. 7'N 3°55. 5'W	- -	78	-	142. 6	-	2
76	SMG	12. 5. 72	2215	2237	59°57'N 3°47. 2'W	- -	78	-	142. 6	-	2
77	SMG	12. 5. 72	2327	2346	59°53. 5'N 3°36'W	- -	76	-	139. 0	-	2
78	SMG	13. 5. 72	0032	0045	59°51. 7'N 3°27'W	-	80	-	146. 3	-	2
79	Dredge	13. 5. 72	1032	1120	59°48'N 3°12. 3'W	59°47. 9'N 3°10. 5'W	54	44	98. 8	80. 5	1
80	SMG	13. 5. 72	1245	1320	59°43'N 3°15'W	- -	38	-	69. 5	-	2
81	SMG	13. 5. 72	1412	1430	59°38'N 3°22. 8'W	-	82	-	150	-	1
82	SMG	13. 5. 72	1503	1517	59°34'N 3°27'W	- -	69	-	126. 2	-	2

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long.	to	Lat. Long.	Depth Range UCF - UCF		Depth Range UCM - UCM		No. of Hauls
83	SMG	13. 5. 72	1550	1605	59°30'N 3°31'W	-	-	68	-	124. 4	-	2
84	SMG	13. 5. 72	1640	1700	59°26. 3'N 3°33. 6'W	-	-	90	-	164. 6	-	2
85	SMG	13. 5. 72	1745	1813	59°23. 2'N 3°35'W	-	-	100	-	182. 9	-	2
86	SMG	13. 5. 72	1906	1943	59°18'N 3°37'W	-	-	64	-	117. 0	-	2
87	SMG	13. 5. 72	2045	2205	59°12. 1'N 3°48'W	-	-	68	-	124. 4	-	2
88	SMG	14. 5. 72	1548	1559	59°14. 7'N 3°7'W	-	-	31	-	56. 7	-	2
89	SMG	14. 5. 72	1630	1645	59°14. 3'N 3°13. 6'W	-	-	41	-	75. 0	-	2
90	SMG	14. 5. 72	1755	1810	59°15'N 3°27'W	-	-	52	-	95. 1	-	2
91	SMG	14. 5. 72	1857	1915	59°9. 7'N 3°26'W	-	-	42	-	76. 8	-	3
92	SMG	14. 5. 72	2012	2028	59°4. 5'N 3°26'W	-	-	38	-	69. 5	-	2
93	SMG	14. 5. 72	2111	2123	59°0. 2'N 3°25. 9'W	-	-	41	-	75. 0	-	2

94	SMG	14. 5. 72	2206	2218	58°55'N - 3°27. 5'W -		37	-	67. 7	-	2
95	SMG	14. 5. 72	2255	2306	58°50'N - 3°27. 3'W -		47	-	86. 0	-	2
96	SMG	14. 5. 72	2340	0008	58°45. 2'N - 3°28. 7'W -		50	-	91. 4	-	2
97	SMG	15. 5. 72	0922	0938	58°40'N - 3°27. 8'W -		41	-	75. 0	-	2
98	Dredge	15. 5. 72	0955	1023	58°39. 7'N 3°29'W	58°39. 7'N 3°26. 9'W	24	24	43. 9	62. 2	1
99	SMG Dredge	15. 5. 72	1149	1245	58°39. 8'N 3°38. 8'W	58°40. 2'N 3°39. 1'W	38	35	69. 5	64. 0	2+1
100	SMG	15. 5. 72	1330	1358	58°40. 4'N - 3°49. 4'W -		48	-	87. 8	-	3
101	SMG	15. 5. 72	1500	1515	58°38'N - 4°4. 9'W -		39	-	71. 3	-	2
102	SMG	15. 5. 72	1535	1545	58°37. 5'N - 4°12. 4'W -		36	-	65. 8	-	2
103	SMG	15. 5. 72	1622	1633	58°36. 5'N - 4°21. 2'W -		34	-	62. 2	-	2
104	SMG	15. 5. 72	1755	1805	58°37. 1'N - 4°32. 1'W -		24	-	43. 9	-	3
105	SMG	15. 5. 72	1902	1915	58°38. 2'N - 4°43. 8'W -		37	-	67. 7	-	2
106	SMG	15. 5. 72	2005	2016	58°38. 5'N - 4°52. 6'W -		28	-	51. 2	-	2

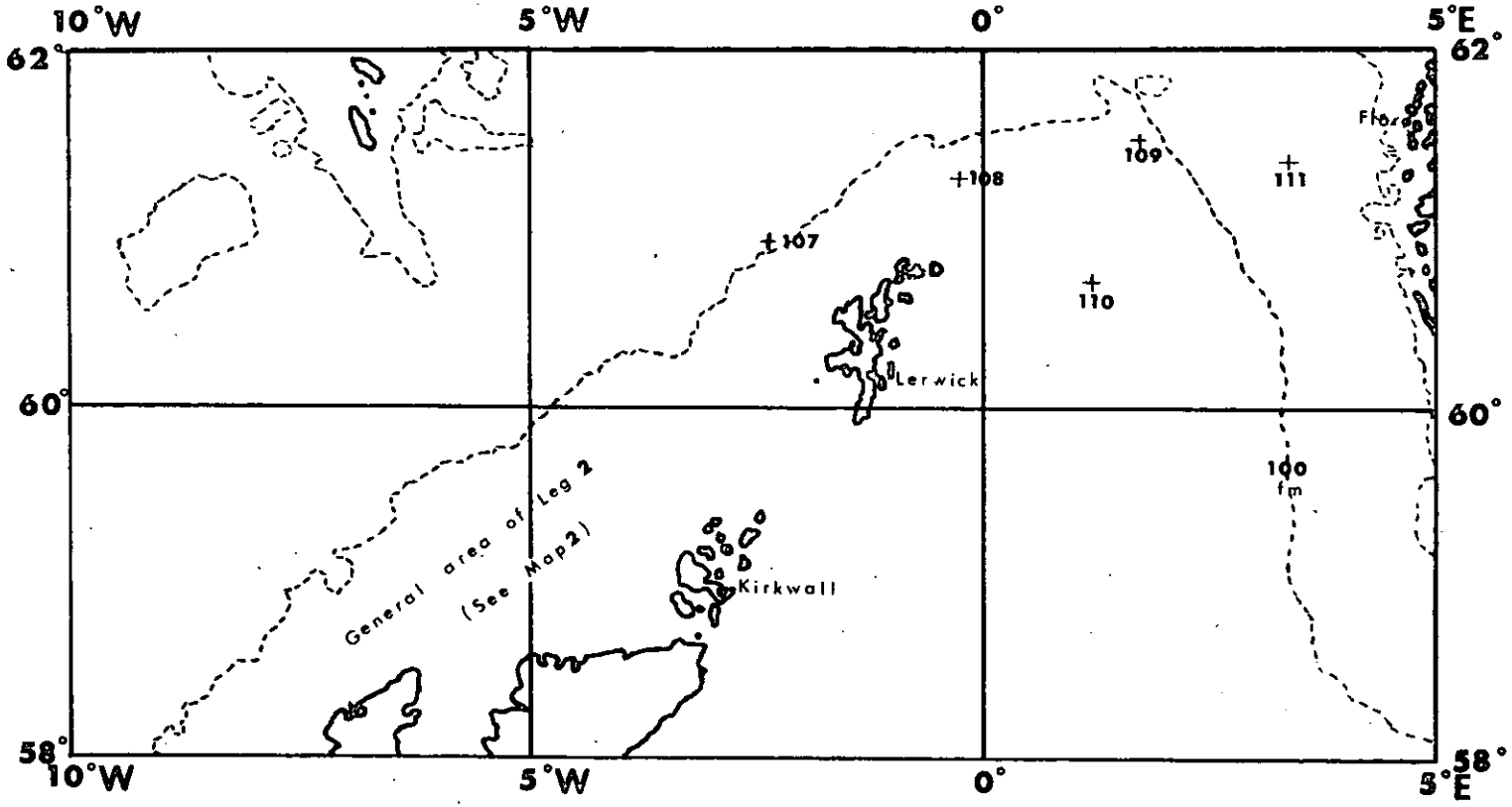
Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long	to Lat. Long.	Depth Range UCF - UCF		UCM - UCM		No. of Hauls
107	SMG Dredge	15. 5. 72	2325	0025	58°29. 5'N 5°14. 2'W	58°29. 8'N 5°15. 9'W	38	38	69. 5	69. 5	3+1
108	SMG Dredge	16. 5. 72	0915	0955	59°6'N 5°48. 3'W	59°6. 3'N 5°48'W	38	38	69. 5	69. 5	2+1
109	SMG	16. 5. 72	1055	1115	59°8. 3'N 5°39. 8'W	- -	44	-	80. 5	-	2
110	SMG	16. 5. 72	1152	1210	59°10. 6'N 5°31. 1'W	- -	44	-	80. 5	-	2
111	SMG	16. 5. 72	1248	1307	59°9. 2'N 5°23. 2'W	- -	52	-	95. 1	-	2
112	SMG	16. 5. 72	1341	1355	59°7. 5'N 5°14. 1'W	- -	50	-	91. 4	-	2
113	SMG	16. 5. 72	1435	1451	59°6. 3'N 5°4. 4'W	- -	30	-	54. 9	-	2
114	SMG	16. 5. 72	1535	1549	59°5'N 4°54'W	- -	27	-	49. 4	-	2
115	SMG	16. 5. 72	1625	1638	59°2. 5'N 4°45. 7'W	- -	48	-	87. 8	-	2
116	SMG	16. 5. 72	1815	1837	59°0. 4'N 4°36. 3'W	- -	33	-	60. 4	-	2
117	SMG	16. 5. 72	1930	1945	59°3. 4'N 4°27. 2'W	- -	30	-	54. 9	-	2

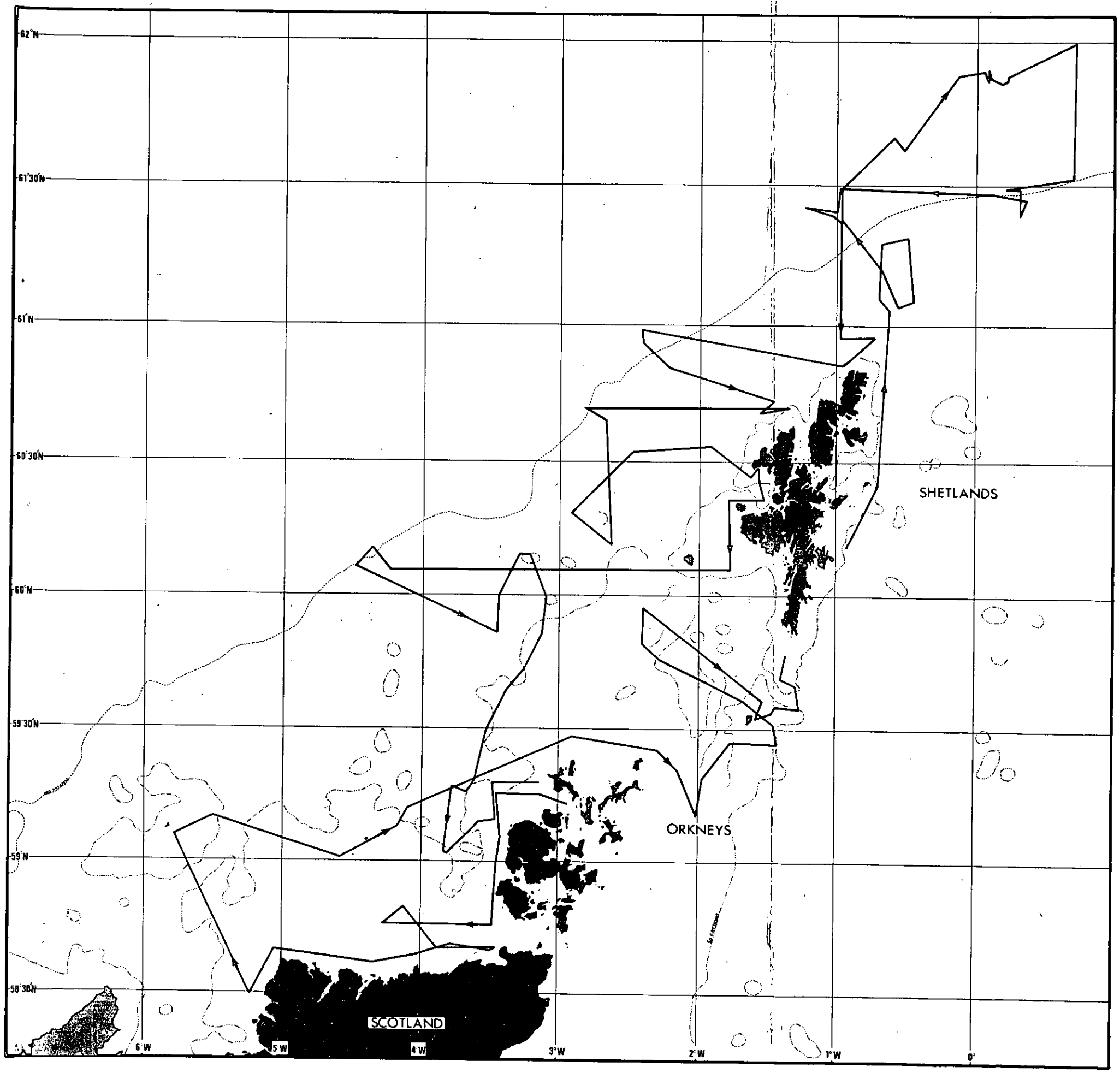
118	SMG	16. 5. 72	2030	2045	59°5. 8'N 4°17. 2'W	- -	30	-	54. 9	-	2
119	SMG	16. 5. 72	2125	2145	59°7. 7'N 4°10'W	- -	50	-	91. 4	-	2
120	Dredge	16. 5. 72	2230	0026	59°12. 7'N 4°5. 8'W	59°11. 8'N 4°6'W	63	63	115. 2	115. 2	1
121	SMG Dredge	17. 5. 72	0950	1027	59°25. 2'N 2°28. 2'W	59°25. 5'N 2°29'W	20	20	36. 6	36. 6	2+1
122	SMG	17. 5. 72	1113	1130	59°25. 1'N 2°30'W	- -	29	-	53. 0	-	1 (stn. abandoned)
123	SMG Dredge	17. 5. 72	1204	1300	59°20. 7'N 2°9. 2'W	59°20. 4'N 2°9. 1'W	42	42	76. 8	76. 8	2+1
124	TV Stereo camera	17. 5. 72	1315	1450	59°20. 9'N 2°9. 0'W	- -	42	-	-	-	(stn. abandoned)
125	SMG Dredge	17. 5. 72	1518	1645	59°15'N 2°4. 5'W	59°12. 1'N 2°2. 7'W	53	44	96. 9	80. 5	2+1
126	SMG	17. 5. 72	1804	1826	59°18. 7'N 1°57. 6'W	- -	54	-	98. 8	-	2
127	SMG	17. 5. 72	1923	1937	59°23. 2'N 1°50. 9'W	- -	56	-	102. 4	-	2
128	SMG	17. 5. 72	2020	2039	59°26. 6'N 1°46'W	- -	49	-	89. 6	-	2
129	SMG	17. 5. 72	2131	2147	59°26. 2'N 1°36. 1'W	- -	42	-	76. 8	-	3
130	SMG	17. 5. 72	2230	2251	59°26. 2'N 1°25. 2'W	- -	52	-	95. 1	-	2

Station No.	Gear Used	Date	Time (BST) From	To	Lat. Long.	to Lat. Long.	Depth Range UCF - UCF		UCM - UCM		No. of Hauls
131	SMG	17. 5. 72	2330	0015	59°24. 3'N 1°10. 8'W	- -	48	-	87. 8	-	2
132	SMG Dredge	18. 5. 72	0917	1010	59°45. 2'N 1°53. 2'W	59°46. 2'N 1°58'W	58	56	106. 1	102. 4	2+1
133	SMG	18. 5. 72	1125	1139	59°43. 1'N 1°47. 1'W	- -	58	-	106. 1	-	2
134	SMG	18. 5. 72	1232	1257	59°39. 8'N 1°39. 1'W	- -	60	-	109. 7	-	2
135	SMG	18. 5. 72	1343	1350	59°36. 1'N 1°32. 3'W	- -	50	-	91. 4	-	2
136	SMG	18. 5. 72	1441	1452	59°32. 7'N 1°34. 2'W	- -	38	-	69. 5	-	3
137	SMG	18. 5. 72	1534	1543	59°34. 5'N 1°26'W	- -	54	-	98. 8	-	2
138	SMG	18. 5. 72	1630	1641	59°34. 2'N 1°15. 7'W	- -	55	-	100. 6	-	2
139	SMG	18. 5. 72	1818	1830	59°39. 3'N 1°16'W	- -	54	-	98. 8	-	2
140	SMG	18. 5. 72	1915	2000	59°41. 4'N 1°23. 7'W	- -	44	-	80. 5	-	3
141	SMG	18. 5. 72	2041	2105	59°46. 3'N 1°20. 5'W	-	46.	-	84. 1	-	2

MAP 1

Positions of Current and Pressure Recorders for Legs 1 & 3



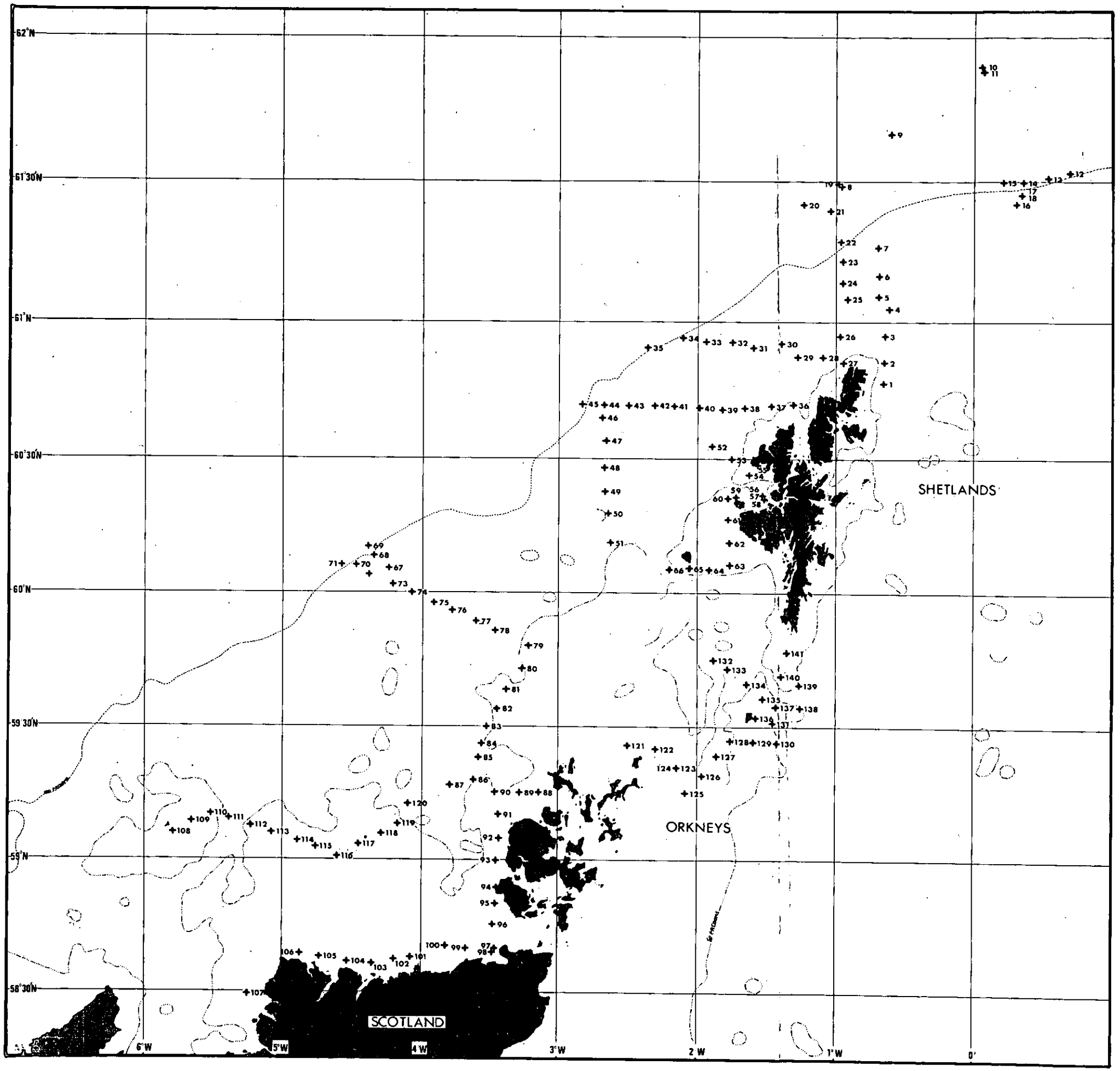

62°N
61°30'N
61°N
60°30'N
60°N
59°30'N
59°N
58°30'N
SHETLANDS
ORKNEYS
SCOTLAND
6°W
5°W
4°W
3°W
2°W
1°W
0°

MAP 3

Station Positions Leg 2

Details of each station are to be found
in the Station List

Contours are in fathoms


62°N
61°30'N
61°N
60°30'N
60°N
59°30'N
59°N
58°30'N
6°W
5°W
4°W
3°W
2°W
1°W
0°
SHETLANDS
ORKNEYS
SCOTLAND