R.R.S. JOHN MURRAY

Cruise 5/72

University College London

Department of Geology

SUMMARY

An intensive geological and geophysical investigation, which has included shooting 5 seismic refraction lines, of the Hebridean continental margin and adjacent part of the Rockall Trough in the vicinity of 57°- 58°N has been made by University College London personnel. The region had previously received only scant attention from other research groups. In addition, coring and dredging have been carried out and magnetometer, sparker, echo-sounder and sidescan records have been obtained on passage from Barry to the main working ground. A small area in the vicinity of 56° 05'N, 7° 08'W was surveyed during the course of testing seismic refraction equipment. A track chart is presented in Figure 1 and a list of stations in Table 1.

PERSONNEL

(i) Barry (March 18) - Oban (March 21). Equipment testing leg.

T. Fitton	R.V.B.
I. Innes	R.V.B.
E.J.W. Jones	U.C.L.
M.C. Kennard	U.C.L.
N.J. Preston	U.C.L.
J. Retallick	U.C.L.
J.E. Robinson	U.C.L.
K. Stephens	U.C.L.

(ii) Oban (March 21) - Oban (March 27)

T. Fitton	R.V.B.
I. Innes	R.V.B.
E.J.W. Jones	U.C.L.
N.J. Preston	U.C.L.
J.E. Robinson	U.C.L.
K. Stephens	U.C.L.
T. Vertue	Department of Geology and Geophysics, Cambridge University

PERSONNEL (continued)

(iii) Oban (April 1) - Barry (April 12)

M. Beney	R.V.B.
H. Davies	U.C.L.
I. Innes	R.V.B.
E.J.W. Jones	U.C.L.
A.J. Lloyd	U.C.L.
A.C.S. Smith	U.C.L.
K. Stephens	U.C.L.

NARRATIVE

March 18. We left Barry at 0900 hrs and proceeded along the quickest route to the Irish Sea. Weather throughout the day was excellent, with only a low swell coming from the west. Coring and dredging were carried out in 50 metres of water south of Camarthen Bay, primarily for testing the deck equipment. The sparker produced poor results up until 2000 hrs when the EG and G 264 hydrophone array was brought in and replaced by the 263 array. The source of noise in the 264 was not immediately obvious. The air compressor was run for 3 hours during the day for airgun trials.

March 19. Throughout the day we steamed on a northerly course through the Irish Sea reaching the vicinity of Ailsa Craig at 2000 hrs. The excellent weather conditions of March 18 persisted and sparker and magnetometer records continued to be of high quality. At 1530 hrs we began testing one of the expendable sonobuoys aboard to set levels on our inboard receiving and recording equipment for refraction shooting to be carried out off the Hebrides. A 1.8-metre core was taken just to the south of Ailsa Craig using the U.C.L. free-fall trip mechanism. The Umel release did not work because the trigger arm was prevented from moving through its full swing by a horizontal strengthening bar placed just below the point of attachment to the main warp. After coring, we headed for Blackstones Bank.

March 20. We reached Blackstones Bank at 07.15 hrs and began a sparker and magnetometer run on a NW course across the feature to a point roughly 10 miles south of Skerryvore light. We headed SE for a further 10 miles and then crossed the shallowest part of the Bank near 56° 05'N, 7° 08'W. Four successful dredgings were made between 1400 and 2200 hrs. Between dredge stations the sparker and magnetometer were run. From 1515 to 1615 a sonobuoy was used in conjunction with the airgun for further tests of our refraction equipment. This time the sonobuoy was tied on 300 ft of line to a free-floating dhan buoy to facilitate recovery.

March 21. We continued with the sparker and magnetometer traverses off Blackstones Bank until 0200 hrs and then proceeded towards Oban, reaching there at 0954. Mr. Kennard and Mr. Retallick signed off and Mr. Tim Vertue signed on. We also picked up 120 fathoms of trawl warp to be used with our free-fall corer which the Marine Biological Station at Dunstaffnage had kindly collected and delivered to the ship. We left Oban at 1100 hrs and steamed through the Sound of Mull stopping along the way at four locations to take Shipek grabs for Pleistocene studies. Three dredge stations were also successfully completed in the vicinity of Ardnamurchan. After the last one (on Hawes Bank), we set course for Barra Head and to the west to begin our reconnaissance track across the continental margin at 57°N. The sparker and magnetometer data, together with other information we have from earlier cruises, were used to plan the locations of the seismic refraction lines.

March 22. In the early hours of the morning the weather steadily worsened because of depressions to the NW. Despite this, the sparker continued to give good records until we reached the outer part of the continental shelf. Progress along the 57°N line had become very slow by then. At 1800 hrs we replaced the sparker by the airgun in the hope of improving penetration. The reflection record still remained very noisy, however,

giving nothing more than a bottom return. At 2030 hrs we replaced the shorter EG and G set (the 263) by the 264, but the recording was clearly worse than before owing to frequent sharp spikes of interference which masked even the bottom echoes. Both hydrophone streamers were too noisy to use in the heavy seas.

March 23. At 0200 we reached the axis of the Rockall Trough and changed course to 000° to pass over the Anton Dohrn Seamount. At 0945 we arrived on its crest and dredged. We then steamed over to the western side of the seamount to lay a sonobuoy for shooting an west-east seismic refraction line. Shooting started at 1400 hrs and ended at 1640 hrs. After the sonobuoy had been recovered at 1830 hrs, we moved further west and attempted coring in 950 fathoms. The trigger release mechanism was actuated prematurely by ship motion during lowering so we tried again without a release by paying out wire at maxiumum rate. Only a thin smear of sediments was obtained on the outside of the core tube. After coring, we put the dredge over and successfully recovered material upslope of the core location. We then steamed eastwards for the next seismic refraction station on the edge of the Hebridean Shelf.

March 24. We arrived at the sonobuoy launching site on the outer part of the continental shelf at 1045 hrs. The sonobuoy was connected to a dahn buoy by 300 ft of line with pellets and was in the water with all systems working at 1100 hrs. We fired 13 charges on a northerly course away from the buoy in fairly rough seas, using 50lbs of Geophex at the end of the line. We were forced to return to the buoy because the radio-signal suddenly failed. The reason for this was apparent when we reached the sonobuoy: it had been flipped over on its float in the heavy swell. The buoy was brought on board, checked and placed in the water again. The southerly course was continued as we fired a further 23 charges. The buoys were finally recovered at 1700 hrs. For the

remainder of the day, we steamed westwards, coring at frequent intervals to investigate the nature of the sediments near the continental shelf break and upper part of the continental slope. Coring was abandoned at 2200 hrs owing to heavy seas which made recovery on deck dangerous. The ship was then headed on 075° for a further shelf crossing.

March 25. We continued on course 075° until 0445 hrs when we turned south to make for the position of our third seismic refraction line near 57°N, 8½°W. By 0700, however, the weather had deteriorated so much that we decided to head for shelter east of Barra until the winds and high seas had subsided a little. We arrived at Vatersay at midday and dropped anchor, remaining there for the rest of the day.

March 26. At 1000 hrs the ship began to shift anchor in the strong squalls that came over from the west. Captain Maw decided to head out immediately into more open waters off South Uist and to steam slowly until the weather moderated. Although our programme was not directly concerned with this area, we used the time in the most useful way we could. Throughout the day we took gravity cores in small depressions, possibly filled with thick glacial deposits and, during the afternoon, attempted to shoot a seismic line with an airgun to the west of the Minch fault off South Uist. The latter did not meet with any success because of the high seismic noise levels generated by rough seas. The sonobuoy was almost constantly overloaded with noise. At 2130 we took a core at our most northerly point (latitude 57° 30'N) and, to avoid duplication of work carried out by Glasgow University last year further north, we made our way south to Rhum to make an east-west traverse across the southern part of the Sea of Hebrides with magnetometer and sparker during the night.

March 27. At 1000 hrs we intended laying a sonobuoy to the east of Usinish Light to shoot a line west of the Minch fault. However, during the night

the winds had shifted to a more northerly direction and the sea state became such that shooting was impossible. Coring, also, could not be carried out. As the weather prospects for the next 48 hours were grim with force 8-9 winds continuing, we decided in consultation with Captain Maw to return to Oban. We docked in Oban at 1830 hrs. Mr. Fitton, Mr. Preston, Dr. Robinson and Mr. Vertue signed off.

April 1. In Oban we were joined by Mr. Beney, Mr. Davies, Dr. Lloyd and Mr. Smith. We left the dock at 0930, a day earlier than planned, to make up for the lost time on the first leg. On the passage out to the Sound of Mull we stopped briefly to take two gravity cores near Lismore, Island, for comparison with Pleistocene-Recent samples taken on the first leg. After passing Ardnamurchan, we made for Barra Head to begin a traverse across the continental margin at 56° 45'N. We started using the airgun at 1430 and obtained good penetration to the east of Barra Head until the airgun firing period rapidly increased. The trouble was traced to the air bottle at the output of the compressor. It is necessary to open the stop valve at the output only a fraction; otherwise the airgun drains the bottle quicker than air can be supplied from the compressor. Work started on a more satisfactory method of reducing the flow of air. Rough seas were experienced during the late evening. The sparker and magnetometer gave good recordings.

April 2. We continued through the early hours of the morning along 56° 45'N as far as the 100 fathom line and then at 0815 set a course for our next refraction line. We reached the vicinity of 57°N, $8\frac{1}{2}$°W at midday and laid a dhan buoy plus sonobuoy. Seas were moderate, but the wind was freshening. Shooting commenced in a northerly direction from the buoy at 1250. After 23 shots we returned to the buoy suspecting that it had turned over between shots 19 and 20. On reaching the buoys, we found that it had. We brought it to the ship's rail, tested it and laid it again. We continued firing in a southerly direction. By then, however,

the sea had risen considerably, winds reached force 7-8, and we were broadside to a heavy swell. We fired two 5lb shots and were then forced to abandon the line because of difficult conditions at the firing platform. Wet, opened explosive was dumped. Because of the high winds and seas, we were forced to the east of Barra again for shelter.

April 3 We continued to shelter off South Uist as gale force winds blew. When it was clear from the weather reports that no further work could be carried out for at least 24 hours, we dropped anchor in Loch Bay. The afternoon was used for maintenance of magnetometer, the EG and G hydrophone arrays and the airgun. A constriction was placed in the high pressure inlet part of the latter to reduce the flow of air from the bottle. Trials with the airgun over the side showed that the correct repetition rate can be achieved without a pressure drop in the air bottle.

April 4. We sheltered for the whole day in Loch Bay as gale force winds blew outside. The centre of a large depression passed over our area in mid-afternoon. Maintenance and testing of sonobuoys, the Plessey current meter and the bottom camera were carried out.

April 5. We left our anchorage and proceeded westwards to attempt working near the mouths of Loch Dunvegan and Loch Bay. The magnetometer and airgun were towed on a grid pattern and some dredging was carried out on a small magnetic knoll revealed by the survey. During the night a course was set for Barra Head in the hope that the weather would moderate sufficiently for us to continue our work to the west of the Hebrides.

April 6. Barra Head was reached at 1300 hrs. We steamed northwards for a point near 57°N, 7°45'W to lay a buoy to shoot a seismic line on supposed Lewisian terrain. We started shooting at 1800 hrs and completed

a split profile at 2100 hrs. After the buoy had been retrieved, the airgun and magnetometer were streamed and we headed westwards for a further crossing of the shelf and continental slope. The strong winds of earlier had subsided considerably by late evening, although the heavy swell coming from the west still persisted.

April 7. We cored twice near the 1000 fathom line on the continental slope during the morning. Unfortunately, we were unable to use the free-fall release mechanism because of premature triggering at the ship's rail owing to the heavy swell and we had to rely on a free-running winch. Despite this disadvantage, 1.5-2 metre cores were recovered. Our track continued westwards across the Rockall trough on to the Anton Dohrn Seamount to complete the survey started on the first leg.

April 8. The crossing of the Anton Dohrn Seamount was completed at 0200 hrs. We then steamed westwards to run along the seismic refraction line of the first leg since we had no magnetometer and airgun profiles from this particular part of the feature. During this crossing, we took four cores between 1050 metres and the crest. After the crossing, we dredged the eastern scarp and recovered approximately 1000lbs of rocks and organic material. A camera station was attempted next, but failed because the trigger mechanism failed to activate the strobe. At 1930 we started on a course to the east for our most northerly crossing of the Hebridean margin.

April 9. At 1000 hrs we arrived at the position of our last seismic refraction line after towing the magnetometer and airgun through the night. The sonobuoy was in the water at 1020 and we began firing 5lb charges on a southerly course away from the buoy. No arrivals were received after the first couple of shots, so we returned to the buoy. The reason for the failure was not immediately obvious so we placed another buoy in the water which gave excellent results. We fired charges out to

9 miles range and passed the buoy for a northerly run at 1450. At 8 miles range we were forced to return to the buoy because weather conditions had rapidly deteriorated. Force 8 winds were blowing during the recovery operation. As force 10 winds were forecast for later in the evening, we decided to steam for Barra Head to shelter.

April 10. It became quite obvious from the sea conditions and the weather forecasts that no further work could be carried out in our area for at least 48 hours. Because of the small amount of our allocated time left, our only course of action was to head for Barry. We reached an explosive dumping ground at 2100 hrs in the northern Irish Sea and threw overboard the small amount of explosives remaining.

April 11. On passage to Barry.

April 12. Arrived Barry 0800 hrs.

ACKNOWLEDGEMENTS

We thank Captain Peter Maw, the officers and crew of JOHN MURRAY for their conscientious efforts which allowed us to make maximum use of the ship-time available. We are indebted to Mr. J. Cleverly and Mr. B. Coulthard at Barry for their efficient support both before and during the cruise and to the Director of the Scottish Marine Biological Association station at Dunstaffnage for supplying trawl wire, without which our deep-water coring programme could not have succeeded. We also thank Professor D.T. Donovan for his encouragement throughout our investigations.

E.J.W. JONES

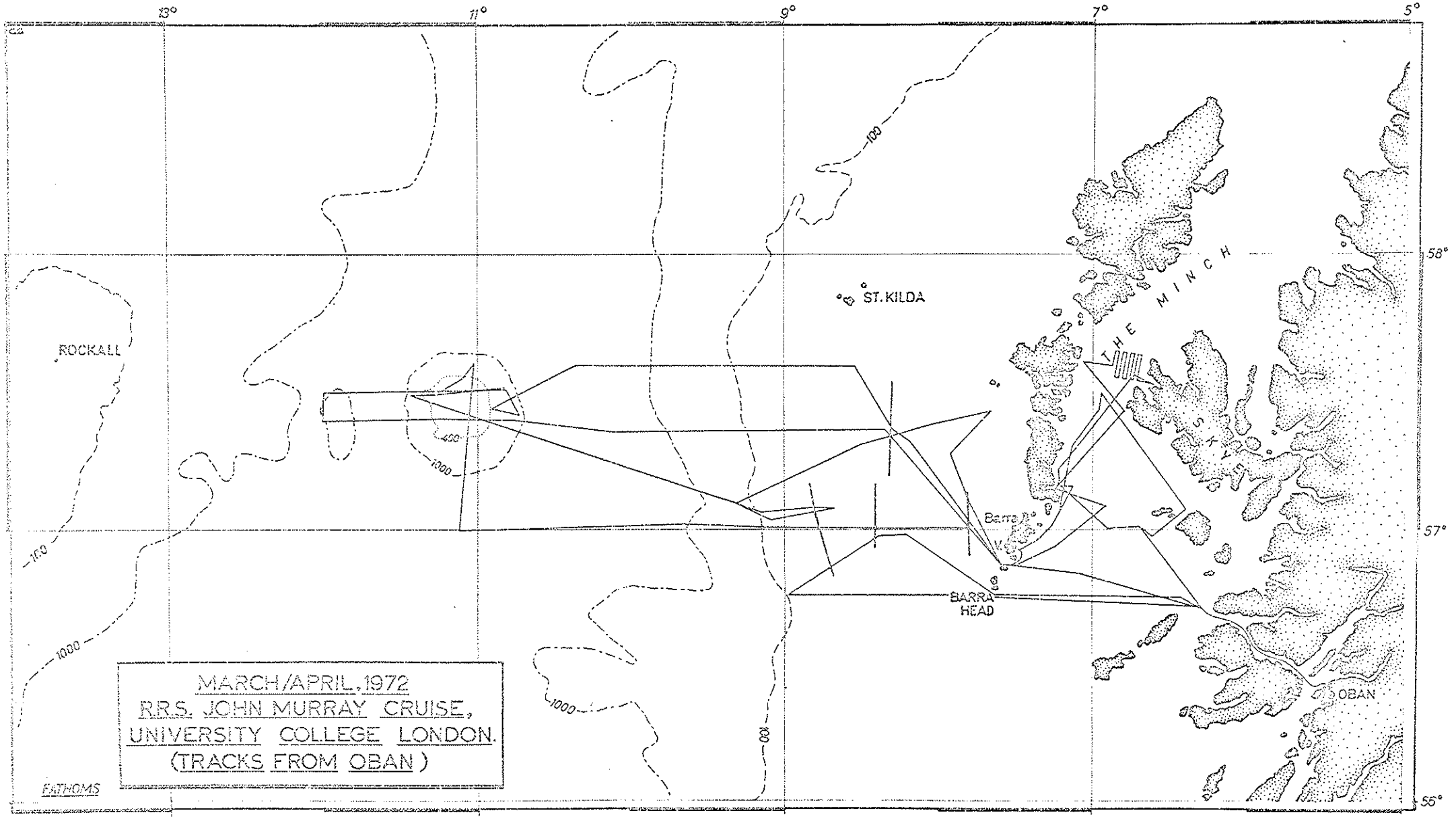
Table 1

SAMPLING STATIONS

Cores - 21
Dredges - 13
Grabs - 8

Station No.	Ship Time	Date	Lat. °N	Long. °W	Type of Station
5/72/1	1518	March 18	51°27.9'	4°45.6'	Core
5/72/2	1537	March 18	51°28.3'	4°46.1'	Dredge
5/72/3	1957	March 19	55°14.0'	5°6.5'	Core
5/72/4	1359	March 19	56°5.0'	7°10.0'	Dredge
5/72/5	1437	March 19	56°4.0'	7°12.0'	Dredge
5/72/6	2048	March 20	56°6.0'	7°13.0'	Dredge
5/72/7	2154	March 20	56°9.0'	7°7.0'	Dredge
5/72/8	1210	March 21	56°29.0'	5°37.8'	Grab
5/72/9	1300	March 21	56°31.1'	5°46.8'	Grab
5/72/10	1330	March 21	56°30.8'	5°49.9'	Grab
5/72/11	1453	March 21	56°33.4'	5°55.9'	Grab
5/72/12	1555	March 21	56°38.1'	6°2.5'	Grab
5/72/13	1655	March 21	56°40.3'	6°11.0'	Dredge
5/72/14	1745	March 21	56°40.5'	6°20.0'	Dredge
5/72/15	2118	March 21	56°46.0'	6°40.0'	Dredge
5/72/16	1013	March 23	57°33.3'	11°0.0'	Dredge
5/72/17	2105	March 23	57°31.2'	11°33.0'	Core
5/72/18	2300	March 23	57°30.5'	11°40.0'	Dredge
5/72/19	1751	March 24	57°08.0'	8°40.0'	Core
5/72/20	1857	March 24	57°6.5'	8°54.0'	Core
5/72/21	1930	March 24	57°4.6'	9°10.5'	Core
5/72/22	2145	March 24	57°6.3'	9°24.08'	Core
5/72/23	1300	March 25	56°55.6'	7°30.9'	Grab
5/72/24	0615	March 26	56°55.6'	7°30.9'	Grab
5/72/25	1828	March 26	57°18.8'	7°5.6'	Core
5/72/26	1842	March 26	57°18.6'	7°5.7'	Core

Station No.	Ship Time	Date	Lat. °N	Long. °W	Type of Station
5/72/27	1923	March 26	57°20.1'	7°5.5'	Core
5/72/28	1946	March 26	57°20.0'	7°5.4'	Core
5/72/29	2013	March 26	57°27.6'	6°57.2'	Core
5/72/30	2143	March 26	57°29.7'	6°55.4'	Core
5/72/31	1022	April 1	56°26.93'	5°33.2'	Core
5/72/32	1120	April 1	56°29.54'	5°38.22'	Core
5/72/33	1600	April 3	57°30.0'	6°34.5'	Grab
5/72/34	2015	April 5	57°36.0'	6°52.1'	Dredge
5/72/35	2108	April 5	57°36.2'	6°51.0'	Dredge
5/72/36	1054	April 7	57°20.3'	9°50.0'	Core
5/72/37	1418	April 7	57°23.50'	10°01.0'	Core
5/72/38	0958	April 8	57°25.0'	10°36.0'	Core
5/72/39	1038	April 8	57°24.5'	10°39.0'	Core
5/72/40	1125	April 8	57°24.0'	10°42.5'	Core
5/72/41	1332	April 8	57°24.8'	10°57.50'	Core
5/72/42	1730	April 8	57°25.0	10°43.0'	Dredge


13°
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ROCKALL
ST. KILDA
THE MINCH
SKYE
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100
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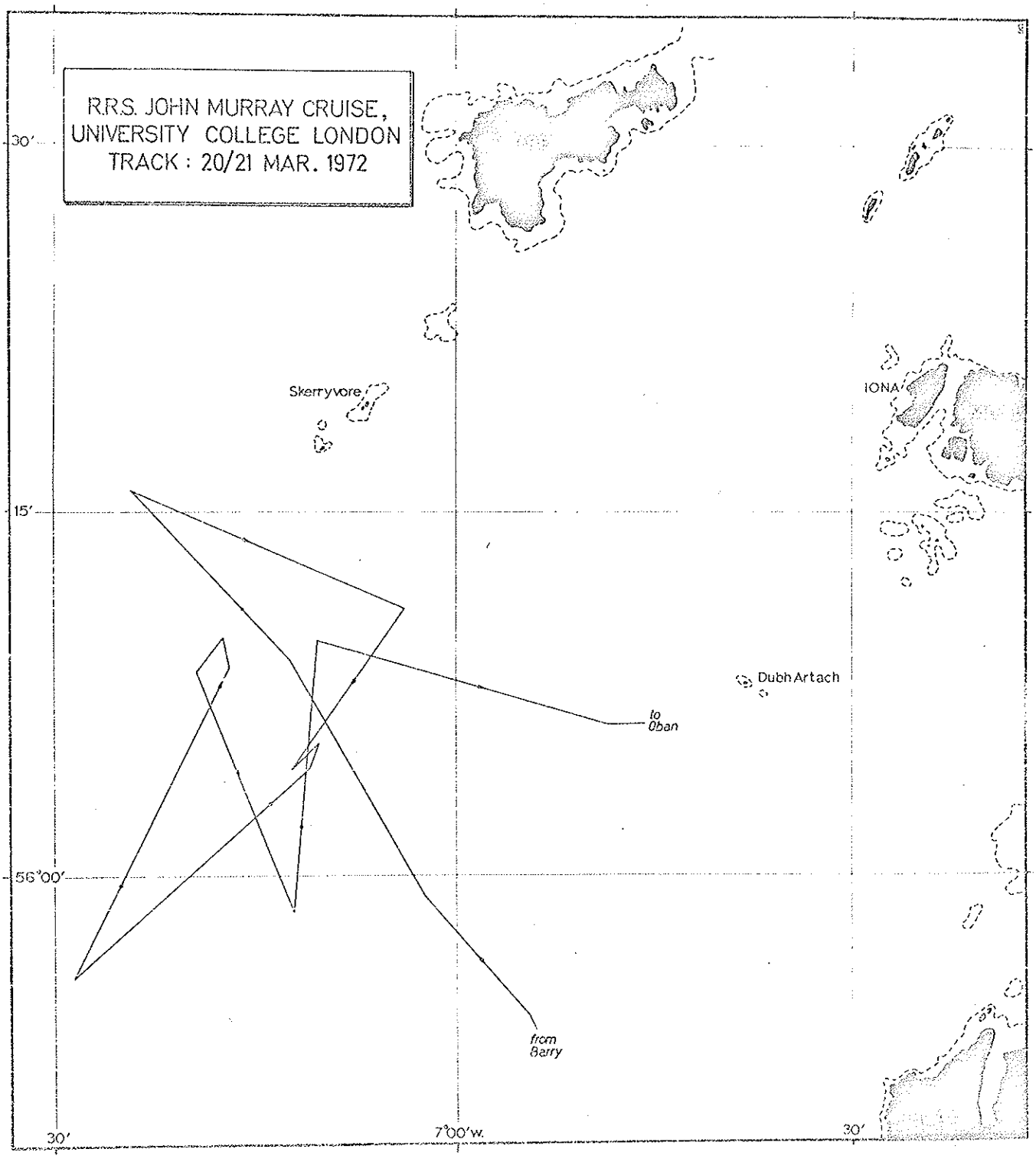
MARCH/APRIL, 1972
R.R.S. JOHN MURRAY CRUISE,
UNIVERSITY COLLEGE LONDON.
(TRACKS FROM OBAN)
FATHOMS


R.R.S. JOHN MURRAY CRUISE,
UNIVERSITY COLLEGE LONDON
TRACK : 20/21 MAR. 1972
30'
Skerryvore
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to Oban
56°00'
from Barry
30'
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30'