I.O.S.

R.R.S. DISCOVERY
CRUISE 60

26th FEBRUARY–22nd MARCH 1974

SEISMIC REFLECTION PROFILING ON THE ROCKALL PLATEAU AND IN THE SOUTH WESTERN APPROACHES

CRUISE REPORT NO. 8

1974

NATURAL ENVIRONMENT RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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WORMLEY, GODALMING, SURREY

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DATES

Sailed Barry, South Wales	26th February	Day 057
Arrived Barry, South Wales	22nd March	Day 081

SCIENTIFIC PERSONNEL

D.G. Roberts, Principal Scientist	I.O.S.
D.G. Bishop	I.O.S.
N.J. Olliff	I.O.S.
C. Flewellen	I.O.S.
D. Dobson	I.O.S.
P. Linscott	I.O.S.
A. Huxley	I.O.S.
A. Gray	I.O.S.
F. Bilimoria	I.O.S.
W. Strudwick	I.O.S.

SHIP'S OFFICERS

G.L. Howe	Master
P.J. McDermott	Chief Officer
A.G. Marsh	2nd Officer
S.P. Tilbury	3rd Officer
D.C. Rowlands	Chief Engineer Officer
M.S.E. Fox	2nd Engineer Officer
A.M. Hutchinson	3rd Engineer Officer
G.M. Batten	4th Engineer Officer
C.B.D. Prosser	5th Engineer Officer
D.J. Ditchburn	5th Engineer Officer
J.P. Roberts	Chief Electrician
A.B. Gaydon	2nd Electrical Officer

SUMMARY OF CRUISE INTENTIONS

General Scientific Objectives

The main objectives of the cruise were to execute seismic reflection profiles on the south west margin of the Rockall Plateau and in the south western approaches with the following aims:-

(1) To examine the nature of continent-ocean boundary on the south west margins of Rockall Plateau with particular emphasis on the relationship of spreading rate changes to the structural and stratigraphic history,

(2) intercomparison of the continental margin with the 76 Ma spreading discontinuity in the oceanic crust to the west of Porcupine Bank,

(3) comparative study of ensimatic rift margins at 52°21'N and 53°N 25°W,

(4) eastward extension of the Gibbs Fracture Zone and southward extension of the east margin of Rockall Plateau,

(5) comparative geological history of the Celtic Sea, Porcupine Seabight and Rockall Trough,

(6) JOIDES site surveys in the Hatton-Rockall Basin and in the Rockall Trough,

(7) dredging on Fangon Bank, Edoras Bank and Porcupine Bank.

Projects

(a) Seismic reflection profiling

Continuous seismic reflection profiling on all tracks.

(b) Magnetics and bathymetry

Magnetics and bathymetry were to be run on all tracks.

(c) Disposable sonobuoys

Disposable sonobuoys were to be used to obtain velocity data in areas of thick sediments.

(d) Dredging

Favourable sites on Porcupine Bank and the south west margins of Rockall Plateau were to be dredged for information on the deeper stratigraphy.

(e) Hydrographic winch trials

These were to measure the efficiency and performance of the new hydrographic winch.

(f) Noise level measurements

Intercomparison of noise levels in the IOS array and the small diameter Geomecanique array.

NARRATIVE

R.R.S. Discovery sailed from Barry Dock at 1000 and left Barry Roads at 1130/057. The P.D.R. fish was streamed at 1309/057 and the magnetometer at 1329/057; scientific watchkeeping began at 1500/057. At 1800/057 the 28v power supply in the magnetometer failed but by 2330 the magnetometer was functioning again. Overnight a westward magnetic profile was occupied en route to the start of the first seismic profile. During the night, at 0600/058, the magnetometer again became unserviceable. At 1000/058 we reached the start of the first seismic profile on the shelf south of Ireland and proceeded to stream the Geomecanique array and the 160 cu. in. airgun. Seismic reflection profiling began at 1329/058. Two disposable sonobuoy stations were occupied (8483 and 8484) but were unsuccessful due to aerial problems. Efforts to repair the magnetometer during the day were unsuccessful but showed the 5, 20 and 28v power packs were unserviceable and that there was also a fault in the pre-amp board. Overnight, the seismic traverse was continued across the mouth of the Porcupine Seabight and, during day 059, two sonobuoy stations (8485 and 8486) were occupied successfully. During day 060 the seismic profile continued westward along 50°N and clearly showed the oceanic basement at about 2.0 seconds depth. During the day the LORAN-C was locked on though the computer interface did not operate. The seismic reflection profile continued throughout day 061 passing over a large and thick sediment drift near 18°W and a steep scarp marking the 60 Ma spreading discontinuity. At 1830/061 we altered course to 329° making for the start of our next seismic profile. At 0620/062 we altered course to 090° to begin the return leg to Porcupine Bank. At 0720/062 we recovered the hydrophone and airgun to carry out the hydrographic winch trials in good weather. Measurements of armature voltage, tachometer and live load were made at 500 m intervals using a 120 lb load made up of Lucas weights. During the trial, the digital 'metres-out' counter reset itself at each pause during veering. The trial was completed by 1130/062 and at 1215 the IOS and Geomecanique arrays were streamed for comparative measurements of noise levels. At 1726/062, the airgun was streamed for a sensitivity comparison of the two arrays and at 1810/062 the IOS array was brought inboard before we continued the seismic profile to Porcupine Bank. Overnight the wind and sea state increased and at 0910/063 the electric Williams and James compressor stopped due to a faulty ball suction valve on the third stage pressure. Profiling continued using the RVB diesel compressor while repairs were made. However, at 1341/063 the thrust roller bearing on the centrifugal clutch of the RVB compressor seized due to lack of lubrication and we continued

profiling using the now repaired electric compressor. Throughout the afternoon of day 063 there was a progressive decrease in signal to noise on the Geomecanique array that was only optimised by changing the length of airgun tow to give the best signal. At 2044/063 repairs to the magnetometer were completed and total field values were recorded on disc. At 0018/064 the signal was lost on the Geomecanique hydrophone due to breakage of the cores caused by twisting of the array and cable; at 0415/064 the IOS array was streamed but gave a very noisy signal. Attempts to improve the signal by increasing the length of tow of the airgun, reducing speed and changing airguns were to no avail and at 1018 the array was recovered for a thorough check. The pre-amp was discovered to be oscillating and, although this was changed, there was no further improvement in signal. At 1914/064 course was set for the traverses across the Gibbs Fracture Zone to compensate for time lost in attempting to repair the IOS array. At 0900/065 the second IOS array was streamed and gave a much improved signal. Profiling began finally at 1620/065 due both to a main engine failure and the need to add more weights to the array to improve the signal. Overnight we continued profiling across the buried extension of the Gibbs Fracture Zone. At 0202/066 the main engines failed and all gear was recovered for security. At 0224 we continued profiling again in a southerly 45 kt wind. At 0812 the Williams and James compressor again failed due to a fault on the 3rd stage pressure and at 1206/066 we switched over to the Reavell compressor. At 1427/066 the Williams and James electric compressor was again repaired but the 3rd stage blow off pressure was reduced to 2900 psi to minimise wear on the suspect 2nd stage. During the day a broken connection in the Geomecanique array was located some 65 m down the cable. At 2310/066 we altered course on the next of the series of seismic and magnetic profiles across the Gibbs Fracture Zone. During day 067 further zig-zags were made as we headed progressively westward. At 0914/068 the high pressure switch on the Williams and James compressor failed due to blockage but was repaired quickly. During the day the break in the cores of the Geomecanique array was inspected and found to be beyond repair. At 1300/068 Discovery rendezvoused with Ocean Weather Ship Juliet who kindly took mail for delivery in the U.K. A further disposable sonobuoy was deployed (Stn 8487) using the ship's main aerial as a receiver but it was found that the ship's VHF aerial gave improved ranges. Overnight (068/069) we crossed the 60 Ma spreading discontinuity and began a seismic traverse toward the south west margin of Rockall Plateau, crossing the Gibbs Fracture Zone at 0600/069. Deteriorating weather conditions resulted

in a lower quality seismic record mainly due to the shallow depth of the array. An improvement in record quality was eventually made by adding further weights to the array. Throughout day 069 we continued our northward traverse toward the south west margin of Rockall Plateau locally achieving 2.0 seconds penetration and crossing a very steep fault scarp at the foot of the south west margin. Loss of time due to severe weather encountered during the earlier part of the cruise rendered the site survey in the Hatton-Rockall Basin impossible and a series of profiles were laid off across the south west margin of the Rockall Plateau. At 1532/070 we altered course to cross the south west margin of Rockall Plateau. At 0358/070 the Williams and James compressor failed but we carried on profiling using the Reavell compressor. During the day inspection of the Williams and James compressor showed the piston collar assembly had been rammed into the 3rd stage pressure cylinder head damaging it beyond repair. The Chief Engineer meanwhile repaired the RVB compressor by packing the clutch thrust roller bearing with oil and grease and profiling was continued using this supply. At 2129/071 we transferred to the Reavell compressor to minimise wear on the RVB compressor but at 2206/071 the Reavell compressor failed due to a blocked H.P. line. At 0236/072 we altered course to 090° to begin our eastward profile from 60 Ma crust to the south west margin of Rockall Plateau, occupying disposable sonobuoy station 8489. We continued eastward overnight occupying sonobuoy station 8490 on the northward extension of the Feni Ridge. At 1225/073 we crossed the crest of Lorien Bank and altered course southward to begin another traverse across the margin of Rockall Plateau. A plot of current vectors derived from satellites showed 90% of all currents lay to port indicating an error in the thwartships component of the E-M log. At 0010/074 the fan belt broke on the RVB compressor and at 0918 all outboard gear was recovered due to 60-70 kt winds and high seas. At 1155/074 the computer was shut down due to the severe motion; wave records were taken during the storm. By 1500/074 the weather had moderated considerably and the computer was restarted at 1544/074; the seismic gear and magnetometer were streamed at 1630/074. On streaming the IOS array was intermittent and the second IOS array was streamed even though it gave a very noisy poor quality record. At 0558/075 this hydrophone failed and at 0838/075 both hydrophone and airgun were brought inboard for maintenance and fault-finding. At 1200/075 the magnetometer was recovered due to 60-65 kt winds and severe swell and at 1241 gusts of 78 kts were recorded. Overnight (075/076) we hove to pending more moderate weather eventually proceeding northward to reoccupy our old track at 0930/076. At 1130/076 we streamed the IOS array for further tests eventually discovering sea water in the outboard Plessey plug was responsible for the intermittency. The plug was repaired and we began profiling at 1721/076 occupying

disposable sonobuoy station 8491 between 2044 and 2134/076. During the course of the eastward profile, we crossed the steeply faulted west margin of Porcupine Bank and crossed the basement forming the crest of Porcupine Bank before turning southward at 1630/077 to run down the axis of the Porcupine Seabight. During the latter part of day 077 and through day 078 disposable sonobuoy stations 8492-8495 were occupied in the Porcupine Seabight. Excellent seismic records showing 2.0-3.0 seconds penetration were obtained throughout this traverse despite severe weather. At 0030/079 we crossed the Goban Spur and altered course eastward for a seismic profile across the shelf edge. During the day, disposable sonobuoy stations 8496-8498 were occupied though 8498 was aborted due to lack of radio transmission from the buoy. All seismic gear was recovered at 3210/078 but the magnetometer and P.D.R. were run overnight until 1000/080 when all scientific watchkeeping ended to allow completion of engineering and editing work on the computer. R.R.S. Discovery arrived Barry Roads at 0700/081.

Bearing in mind the difficult weather conditions, hydrophone and compressor failures, this was a most successful cruise for the time of year. Some 2600 miles of good seismic profiles were taken and 16 sonobuoys were deployed for sediment velocity measurement. It is a real pleasure for me to thank and acknowledge the help and co-operation of Captain G.L. Howe, the officers and crew in difficult weather conditions. I would particularly like to thank the IOS scientists for their endeavours and teamwork.

1. Seismic Reflection Profiling

The seismic profiling system was operated for approximately 450 hrs covering some 2600 n.m. at speeds between 5 and 8 kts. The system consisted of:-

1. A Bolt Par 1500C 40 or 160 cu. in. airgun firing at intervals of 8 or 12 seconds at a pressure between 1000 and 1600 psi.

2. (a) An IOS hydrophone consisting of a 100 ft spring section joined to fair, 50 ft sensor sections and a 50 ft tail section, all nearly neutrally buoyant and towed on an 8-core weighted cable 500 yards long with an elastic strop connected to the starboard after boom to prevent surging.

(b) A Geomecanique hydrophone consisting of a 25 m spring section, 20 m linear weight (50 kg), 25 m spring section, two 50 m active sections and a 100 m tail rope.

3. An EPC 18" dry paper recorder displaying the data at a 4 or 8 second sweep.

4. Bell and Howell 3360 and 4010 tape recorders operating at tape speeds of $1\frac{7}{8}$ i.p.s.

Seismic profiling initially began with the new Geomecanique hydrophone. However, the buoy at the end of the tail rope became waterlogged and caused the array and tow cable to twist producing multiple breaks in the cores wrapped around the armouring. Multiple fracture of the cores prevented shipboard repair. The buoy used was as specified by the manufacturer but seems to have no function other than to keep the array straight and perhaps the end up. Severe corrosion affected the first connector of the hydrophone. Experience also suggests a longer and less vulnerable tow cable would be desirable. Prior to breakdown, excellent results were achieved with this array. Both IOS arrays gave trouble. One array gave an extremely poor signal. Tests on this array revealed an oscillating pre-amp. This was replaced though there was no subsequent improvement. The second array functioned satisfactorily but became intermittent on one occasion due to sea water in the outboard Plessey plug. This was repaired and the array gave in excess of 2.0 seconds penetration even in force 9-10 storms. It was not possible to tune the system to its maximum capability due to insufficient weight to give the required $\lambda/4$ depths. Although three compressors were on board, each gave trouble at one stage or another. The electric Williams and James compressor stopped several times due to a faulty ball suction valve in the 3rd stage; the fault was rectified by replacing the valve springs and its frequency reduced by lowering the blow off pressure to 2900 psi. Nonetheless it is clear that a fault must exist in the 2nd stage. Eventually, this compressor became unserviceable when the piston collar assembly was rammed into the 3rd stage cylinder head. The RVB compressor was used, as a back-up for the electric Williams and James compressor, but failed initially due to a seized clutch thrust roller bearing. The Chief Engineer packed the bearing with oil and grease and it functionned satisfactorily for the rest of the cruise but used c. 40 galls of diesel fuel per day. The Reavell compressor failed on one occasion due to a blocked H.P. line. The installation of the new compressors should resolve the problem of unreliability.

A desirable modification to the present double barrel drum for the hydrophones and high pressure bundle would be independently driven drums for the hydrophone and airgun. As the system now stands, it is necessary to retrieve the gun before the hydrophone in the event of hydrophone failure or bad weather.

Both Bell and Howell tape recorders gave trouble. In the case of the 4010, the recorder would not replay although newly delivered from Bell and Howell. In the case of the 3360 faulty plug-in boards caused trouble.

D.G.B.
D.G.R.

2. Disposable sonobuoys

Sixteen disposable sonobuoys were deployed during the cruise. The first two were unsuccessful due to the inadequate aerial constructed on board and suspended between the after trees. Subsequent stations were moderately successful using the ship's main radio aerial. However, the signal observed remained low. The ship's VHF aerial gave much better results although tuned to frequencies slightly lower than those used by the sonobuoys. With the VHF aerial, ranges of up to 12 km were achieved although the records were often noisy due to the bad weather. It was not possible to compute velocities on board owing to the failure of the replay facility on the 4010 record. The Mufax seismic recorder was used to monitor the station though it was not possible to show the direct wave because of the need to insert delays. The systems used on board consisted of VHF aerial, Eddystone receiver, Mufax 18" wet paper recorder, Rockland Filters (band pass 15-60 Hz), Bell and Howell 4010 tape recorder. A tuned VHF whip aerial mounted on the after cross trees would be a desirable improvement.

D.G.R.

3. Noise level measurements

The noise levels of the IOS 200 ft array and the new Geomecanique array towed simultaneously were recorded on magnetic tape and as $\frac{1}{2}$ octave spectra using the B & K analyser. Recordings were made at ship's speeds of 4, 6 and 8 knots going into the swell and at the same speeds with the swell on the port quarter. In addition to this comparison of noise levels, a cross-comparison of sensitivities of the two arrays was made using the bottom echo from the 160 cu. in. airgun in water depths of c. 1400 fms.

D.G.R.

4. Topographic and magnetic data

Soundings were taken throughout the cruise using the Mk III NIO Precision Echo-Sounder and an NIO Mk III towed fish. Soundings were manually entered into the computer at 6 minute intervals.

A Varian magnetometer was operated throughout most of the cruise and total magnetic field values were processed and stored on disc. The magnetometer failed twice. On the first occasion the pre-amp failed but was replaced using the spare board. On the second the spare board failed and the 5, 10 and 28v power supply blew. The pre-amp board was eventually repaired using an appropriate transistor and the power cube was replaced by a Startronic power supply. The magnetometer then worked well for the rest of the cruise although electrical pick up in the plot sometimes caused interference.

D.G.R.

5. Shipboard computer system

The computer hardware functioned very satisfactorily during cruise 60 despite very bad weather conditions. There was a period of about 3½ hours when the computer system was shut down owing to extremely bad weather conditions.

During the cruise the clock and the gyro interfaces were monitored. This was done to investigate some errors which occur in the system from time to time.

The satellite receiver went on the blink but was rectified and did not have any adverse effect on navigation. It was not possible to instal the new power supply for the satellite receiver because of a need to rewire inside the receiver. This will be done as soon as possible. Opportunity was also available to complete the drafts of manuals for the clock and the D5000 ANT interfaces.

F.B.

6. Data processing and editing

Several major problems were encountered when using the MPX-SHIP system. These may be summarised under the following three headings:-

(i) Navigation

It was originally intended that LORAN-C fixes should be calculated every twelve minutes and stored on disk so that a comparison could be made between them and the satellite fixes. This was found, however, to be impossible due to the limitations of the FIXF file. All attempts to by-pass these limitations proved ineffectual and eventually the use of LORAN-C was terminated.

The off-line navigation programs failed to work despite communication with the Institute and no navigation re-correction was possible during the cruise.

(ii) Profile Plotting

The general purpose profile plotting program did not work, thus a special program had to be written which suited the requirements at that time.

(iii) Data errors

Several errors in the data files were discovered. Some of the errors were directly attributable to the packing of data which occurs every day. The remaining errors which involve times in the file being repeated or going backwards could not be traced to any specific cause. The problem of repeated times affected the magnetic data as bad values were recorded at these times with good status.

The data was edited as far as possible on the ship but could not be completed due to the breakdown of the off-line course correction program.

7. Meteorological Observations

Daily meteorological readings were taken manually from the following instruments:-

(1) Bridge screen thermometers (port and stb'd)

(2) Bridge barometer

(3) M.O. Sea temperature (R.A.S.T.U.S.)

(4) Crawford bucket (taken on stb'd side)

These readings and the data produced by the computer were recorded in a meteorological log to provide a running comparison. All the 'scientific' meteorological instruments functionned well, requiring only general servicing. The only instrument that gave any trouble was the M.O. sea temperature read out (R.A.S.T.U.S.) which at the beginning of the cruise gave a reading of at least 1 °C difference to the actual sea temperature taken from the Crawford bucket and at the most 1.8 °C difference, but after a week the readings became accurate again.

There was only one day upon which meteorological readings could not be taken. This was day 074 when the prevailing weather conditions made it too dangerous.

Subsequent analysis of the comparison series obtained on the cruise has shown that the following instruments:-

(a) Wheelhouse top thermometer

(b) Hull thermometer (after 1st week's erratic readings)

(c) Barometer

were of reasonably good quality showing only minor deviations.

8. Electrical Hydrographic Winch Trial

The first test was carried out using the 4 mm wire rope with a Lucas weight (100 lb in water) as a sinker. The wire was paid out to a depth of 3,300 m, this limit being set by the depth of water. Measurements of armature and motor tacho-generator voltages were taken using Avometers. The tacho-generator output was converted to motor R.P.M. by using the tacho constant of 39 volts/1000 R.P.M. Simultaneous readings were also taken from the meter wheel statimeters and hauling rate meters, a stop watch check of the rate against the meter wheel gave a reading of 1 m/.96 secs compared with 1 m/sec from the rate meter.

The winch was stopped during paying out at depths of 1000 m, 2000 m and 3000 m to enable static tension readings to be taken. Running measurements were taken of all the parameters at the intermediate 500 m depths. Hauling was continuous and running measurements were made at 500 m intervals,

automatic control was used for paying out and manual control for hauling.

The Munro meter wheel counter did not operate owing to corrosion in the ball bearings of the horizontal drive shaft. These were replaced by brass bushes and the drive operated satisfactorily. The digital counters operated while the winch was running but when stopped for the static readings the hundred and thousand digits returned to zero.

Adverse weather conditions and shortage of time limited the trial to one test in the sea, to obtain further measurements and continue the running in of the new helical spur gears an alternative rig was arranged. The 4 mm wire was run in the normal way over the davit sheave and then led back over the $\frac{1}{4}$" cable accumulators then down the stand-pipe to the empty $\frac{1}{4}$" cable drum. This arrangement enabled the wire to be run from one drum to the other with measurements taken when hauling on the 4 mm drum.

The wire spooling on the 4 mm drum tended to be uneven with a build up at one end. This could be improved by decreasing the space between the rollers and adjusting the position of the traverse gear relative to the lead screw.

Measurements taken of the spool diameter for various lengths of cable on the drum gave longer lengths than that calculated using the perfect spooling equation in NIO report A.40. The wire diameter was measured and found to be slightly undersize which could account for this.

The static tensions for the 4 mm wire gave lower values than the estimated weights in water, confirming constant average velocity. The difference between the static and dynamic load figures indicate lower drag values than estimated using Kullenberg's equation.

Calculations based on the measurements taken indicate lower efficiencies than the specified values but more accurate measuring equipment would be required to obtain truer figures. The statimeter was calibrated against a spring balance after the tests and showed considerable hysteresis which would cause errors in the results.

The winch operated satisfactorily in both automatic and manual modes and ran very quietly apart from an occasional rattle from the parking brakes and a knock caused by the disc brake pad on the $\frac{1}{4}$" cable drum. The temperature of the gearbox was at a reasonable level after running for three hours.

I. STATION LIST

Stn. No.	Type	Day No.	Date	Time		Start		End		Depth Range						Remarks
				Start	End	Lat N	Long W	Lat N	Long W	UCF		CF		CM		
8483	DSB	058	27.2.74	1712	1732	50°23.57'N	09°51.5'W	50°23.35'N	09°54.71'W		66		67		122	Abortive due to poor reception.
8484	DSB	058	27.2.74	1920	2000	50°21.92'N	10°12.10'W	50°21.45'N	10°18.68'W		76		77		140	Abortive due to poor reception.
8485	DSB	059	28.2.74	1330	1600	50°03.83'N	12°46.68'W	49°59.89'N	13°08.35'W	1313	1398	1343	1430	2456	2615	Successful.
8486	DSB	059	28.2.74	1748	1819	49°59.74'N	13°24.39'W	49°59.64'N	13°29.89'W	1540	1518	1576	1553	2882	2840	Successful.
8487	DSB	068	9.3.74	1528	1730	51°58.28'N	20°22.66'W	51°46.03'N	20°23.26'W	1886	1990	1934	2042	3536	3734	Abortive - poor signal/noise.
8488	DSB	071	12.3.74	1601	1830	55°23.60'N	25°12.67'W	55°12.61'N	25°38.57'W	1590	1804	1620	1841	2962	3366	Successful - compressor stopped after 20 minutes.
8489	DSB	072	13.3.74	1300	1415	54°32.67'N	24°18.56'W	54°32.05'N	24°01.50'W	1636	1734	1667	1769	3048	3235	Successful.
8490	DSB	073	14.3.74	0742	0900	54°33.1'N	20°36.46'W	54°32.95'N	20°21.04'W	1470	1487	1502	1520	2746	2779	Successful.
8491	DSB	076	17.3.74	2044	2134	53°30.79'N	16°29.60'W	53°31.50'N	16°17.5'W	1440	1473	1516	1551	2693	2836	Successful.
8492	DSB	078	19.3.74	0647	0722	51°38.02'N	12°50.46'W	51°33.71'N	12°49.4'W	756	773	816	834	1413	1525	Poor and intermittent signal.
8493	DSB	078	19.3.74	1025	1155	51°13.71'N	12°51.77'W	51°03.81'N	12°51.81'W	1010	1080	1032	1104	1887	2018	Successful.
8494	DSB	078	19.3.74	1611	1700	50°33.52'N	12°51.34'W	50°27.48'N	12°49.91'W	1264	1306	1292	1335	2362	2441	Successful.
8495	DSB	078	19.3.74	2108	2200	49°55.8'N	12°53.4'W	49°48.8'N	12°54.8'W	1338	1276	1369	1305	2501	2386	Successful.
8496	DSB	079	20.3.74	0634	0744	49°36.13'N	11°54.17'W	49°38.43'N	11°44.08'W	554	498	567	509	1036	930	Successful.
8497	DSB	079	20.3.74	1500	1533	49°48.82'N	10°26.48'W	49°49.58'N	10°19.93'W	70	70	71	71	129	129	Successful.
8498	DSB	079	20.3.74	1940	1949	49°53.34'N	09°36.35'W	N.A.		N.A.						Abortive.

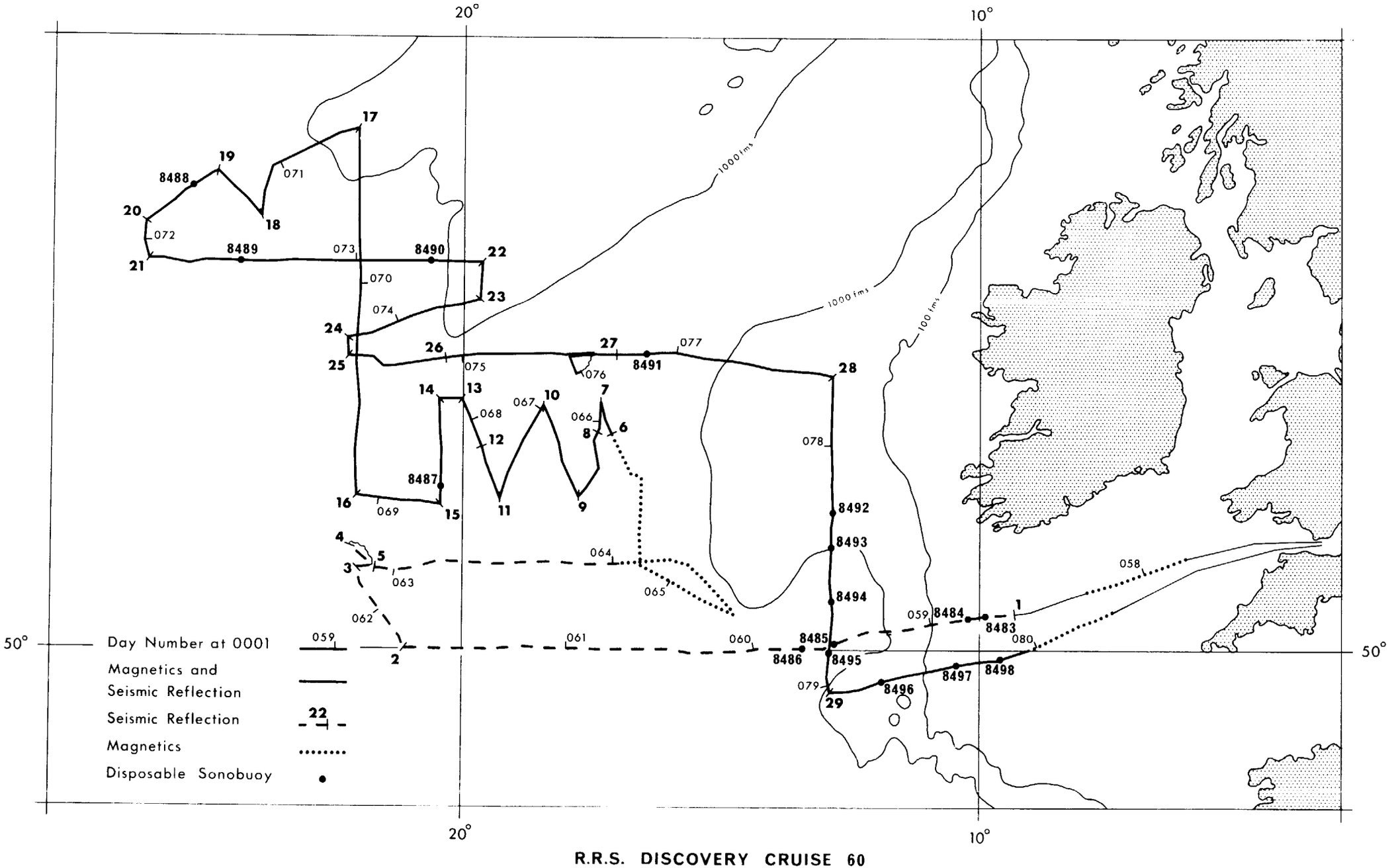
II. SEISMIC REFLECTION PROFILES

Traverse No. & Distance	Equipment Used	Date	Time Z/Day No		Lat N Long W to	Lat N Long W	Depth Range			Comments
			From	To			UCF	CF	CM	
1 (323 n m)	Airgun (160 cu in) Geomecc. array	27.2.74 to 2.3.74	1329/058	1830/061	50°25.32'N 09°19.56'W	50°0.53'N 21°04.33'W	66-2559	66-2639	120-4826	Celtic Sea to flanks of mid-ocean ridge.
2 (72)	Airgun (160 cu in) Geomecc. array	2.3.74 to 3.3.74	1830/061	0620/062	50°0.53'N 21°04.33'W	50°59.79'N 21°59.84'W	2161-1744	2221-1793	4061-3279	Flanks of mid-ocean ridge.
3 (9)	Airgun (160 cu in) Geomecc. array	3.3.74	0620/062	0720/062	50°59.79'N 21°59.84'W	50°59.15'N 21°50.02'W	1720-1767	1762-1811	3222-3311	Flanks of mid-ocean ridge to Porcupine Bank.
4 (20)	Airgun (160 cu in) Geomecc. array	3.3.74	1810/062	2149/062	51°14.72'N 22°08.79'W	51°58.94'N 21°40.18'W	1372-2506	1401-2583	2562-4723	
5 (205)	Airgun (160 cu in) Geomecc. array	3.3.74 to 5.3.74	2149/062	0018/064	51°58.94'N 21°40.18'W	51°02.0'N 16°58.0'W	2494-2484	2571-2560	4701-4681	0910 Compressor failure. 0018 Hydrophone failure. Remainder of profile aborted.
6 (26)	Airgun (40 cu in) IOS array	6.3.74	1650/065	2122/065	52°34.74'N 17°06.18'W	51°59.34'N 17°19.34'W	1970-1902	2022-1951	3697-3567	Profiles across the Gibbs Fracture Zone.
7 (25)	Airgun (40 cu in) IOS array	6.3.74 to 7.3.74	2122/065	0224/066	52°34.51'N 17°19.34'W	52°34.51'N 17°22.95'W	1907-2008	1956-2061	3577-3769	Profiles across the Gibbs Fracture Zone.
8 (38)	Airgun (40 cu in) IOS array	7.3.74	0224/066	1300/066	52°34.51'N 17°22.95'W	51°51.45'N 17°41.83'W	1994-2412	2047-2484	3743-4572	Profiles across the Gibbs Fracture Zone.
9 (70)	Airgun (40 cu in) IOS array	7.3.74	1300/066	2327/066	51°51.45'N 17°41.83'W	52°55.28'N 18°26.22'W	2400-1960	2472-2011	4520-3677	Profiles across the Gibbs Fracture Zone.

Traverse No. & Distance	Equipment Used	Date	Time Z/Day No		Lat N Long W to Lat N Long W		Depth Range			Comments
			From	To			UCF	CF	CM	
10 (73)	Airgun (40 cu in) IOS array	7.3.74 to 8.3.74	2327/066	1447/067	52°55.28'N 18°26.22'W	51°49.92'N 19°16.12'W	1708-2343	1750-2412	3200-4411	Profiles across the Gibbs Fracture Zone.
11 (78)	Airgun (40 cu in) IOS array	8.3.74	1447/067	2040/067	51°49.92'N 19°16.12'W	52°24.89'N 19°37.51'W	1846-2343	1893-2412	3461-4411	Profiles across the Gibbs Fracture Zone.
12 (75)	Airgun (40 cu in) IOS array	8.3.74 to 9.3.74	2040/067	0300/068	52°24.89'N 19°37.5'W	52°59.46'N 19°59.32'W	1299-1826	1328-1872	2428-3423	Profiles across the Gibbs Fracture Zone, & S. end of the Feni Ridge.
13 (16)	Airgun (40 cu in) IOS array	9.3.74 to 9.3.74	0300/068	0522/068	52°59.46'N 19°59.32'W	52°59.67'N 20°25.67'W	1430-1495	1463-1528	2675-2794	Profiles across Gibbs Fracture Zone and S. end of Feni Ridge.
14 (75)	Airgun (40 cu in) IOS array	9.3.74	0522/068	1746/068	52°59.67'N 20°25.67'W	51°44.84'N 20°23.45'W	1380-2050	1409-2105	2576-3849	Profiles across Gibbs Fracture Zone and S. end of Feni Ridge.
15 (62)	Airgun (40 cu in) IOS array	9.3.74 to 10.3.74	1746/068	0300/069	51°44.84'N 20°23.45'W	51°22.92'N 22°01.96'W	1660-2311	1700-2378	3108-4348	Gibbs Fracture Zone and 60 Ma spreading discontinuity.
16 (250)	Airgun (40 cu in) IOS array	10.3.74 to 11.3.74	0300/069	1532/070	51°22.92'N 22°01.96'W	56°01.43'N 22°0.44'W	2316- 677	2383- 685	4358-1252	Gibbs Fracture Zone to south west margin of Rockall Plateau.
17 (63)	Airgun (40 cu in) IOS array	11.3.74 to 12.3.74	1532/070	0640/071	56°01.43'N 22°0.44'W	55°02.54'N 23°53.14'W	654-1572	665-1601	1216-2927	South west margin of Rockall Plateau.
18 (35)	Airgun (40 cu in) IOS array	12.3.74	0640/071	1300/071	55°02.54'N 23°53.14'W	55°13.33'N 24°44.31'W	1180-1630	1198-1661	2190-3037	South west margin of Rockall Plateau.

Traverse No. & Distance	Equipment Used	Date	Time Z/Day No		Lat N Long W to Lat N Long W		Depth Range			Comments
			From	To			UCF	CF	CM	
19 (44)	Airgun (40 cu in) IOS array	12.3.74	1300/071	2129/071	55°13.33'N 24°44.31'W	55°0.34'N 26°09.46'W	1233-1879	1252-1919	2289-3509	South west margin of Rockall Plateau and Meury mid-ocean canyon.
20 (26)	Airgun (40 cu in) IOS array	12.3.74 to 13.3.74	2129/071	0236/072	55°0.34'N 26°09.46'W	54°34.74'N 26°06.62'W	1741-1932	1828-1974	3343-3610	Eastern flank of Gardar sediment drift.
21 (250)	Airgun (40 cu in) IOS array	13.3.74 to 14.3.74	0236/072	1225/073	54°34.74'N 26°06.62'W	54°31.57'N 19°37.57'W	998-1825	1012-1863	1850-3407	60 Ma isochron to south west margin of Rockall Plateau.
22 (27)	Airgun (40 cu in) IOS array	14.3.74	1225/073	1608/073	54°31.57'N 19°37.57'W	54°06.51'N 19°40.78'W	659- 706	673- 721	1230-1318	Lorien Bank.
23 (97)	Airgun (40 cu in) IOS array	14.3.74 to 15.3.74	1608/073	0530/074	54°06.51'N 19°40.78'W	53°41.03'N 22°12.57'W	702-2005	717-2057	1311-3761	Section across margin west of Lorien Bank.
24 (13)	Airgun (40 cu in) IOS array	15.3.74	0530/074	0711/074	53°41.03'N 22°12.57'W	53°28.49'N 22°11.91'W	2108-2074	2161-2125	3952-3886	Section across margin west of Lorien Bank.
25 (18)	Airgun (40 cu in) IOS array	15.3.74	0711/074	0918/074	53°28.44'N 22°11.91'W	53°28.35'N 21°45.14'W	2101-1936	2153-1985	3937-3630	76 Ma crust - Porcupine Bank. Aborted due to Storm 10.
26 (52)	Airgun (40 cu in) IOS array	15.3.74 to 16.3.74	2222/074	0558/075	53°27.89'N 20°17.85'W	53°31.0'N 18°54.84'W	1140-1341	1163-1369	2126-2503	Recontinuation of profile 21. Aborted again due to further Storm 10 and hydrophone failure.
27 (168)	Airgun (40 cu in) IOS array	17.3.74 to 18.3.74	1721/076	1630/077	53°29.3'N 17°05.12'W	53°15.16'N 12°50.54'W	1675- 80	1715- 81	3136- 148	Rockall Trough to Porcupine Seabight.

Traverse No. & Distance	Equipment Used	Date	Time Z/Day No		Lat N Long W to Lat N Long W	Depth Range			Comments
			From	To		UCF	CF	CM	
28 (227)	Airgun (40 cu in) IOS array	18.3.74 to 20.3.74	1630/076	0030/079	53°15.16'N 12°50.54'W to 49°29.79'N 12°53.97'W	170-1487	174-1521	318-2781	Southward section down Porcupine Seabight axis to Goban Spur.
29 (95)	Airgun (40 cu in) IOS array	20.3.74	0030/079	2310/079	49°29.79'N 12°53.97'W to 49°59.97'N 09°0.51'W	790- 68	808- 69	1477- 126	Goban Spur to Celtic Sea.



R.R.S. DISCOVERY CRUISE 60