

S/35a/70

INSTITUTE OF GEOLOGICAL SCIENCES

GEOPHYSICAL DIVISION

MARINE GEOPHYSICS UNIT

REPORT NO. 3

Irish Sea

R.R.S. John Murray Cruise 1/70

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BY

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PERSONNEL

<u>1st leg</u>	N. Gully	I.G.S. (Party Chief)
	K. Floyd	I.G.S.
	M. Scouler	I.G.S.
	K. Robinson	School of Cosmic Physics, Dublin (1st half)
	D. Young	" " " " (2nd half)
	R. Wittington	Aberystwyth
	T. Fitton	R.V.U.
	D. Thomas	"
<u>2nd leg</u>	G. Day	I.G.S. (Party Chief)
	J. Sunderland	I.G.S.
	C. English	School of Cosmic Physics, Dublin (1st half)
	D. Inamdar	" " " " (2nd half)
	J. Parrish	Aberystwyth
	T. Fitton	R.V.U. (1st half)
	R. Weaver	" (2nd half)
	D. Thomas	"
	R. McQuillin	I.G.S. (from Dublin to Douglas)

This cruise was planned as a geophysical survey of part of the Irish Sea west of Anglesey. The area designated (see chart) was a continuation southward of the area west of the Isle of Man, surveyed in October 1969. Since this area was of interest to the Irish Republic the cruise was planned in conjunction with the School of Cosmic Physics, Dublin, and staff from that Institute took part in the cruise. Because the Geology Department, University College, Aberystwyth was interested in the area, they were invited to participate.

John Murray sailed from Barry on January 28th (day 028), recording gravity and magnetics in the southern half of the Irish Sea, until the weather deteriorated on day 029 and recording was suspended. On reaching the survey area later that day, it was possible to work in the partial shelter provided by the Lley Peninsula and line 18 was begun in Caernarvon Bay.

On day 030, M. Scouler who had become severely sick was landed at Holyhead and the survey continued. By mid-day on day 031 the weather had again deteriorated and the gravity and sparker records were considered worthless, so the ship sought shelter, anchoring in Swallow Cove, in the lee of Lambay Island.

On day 032 the gale continued and John Murray sailed for Dublin having completed lines 18, 19, 20, 21 and 22. By day 035 the weather had moderated and the survey was recommenced. On day 036 after steaming lines 1 and 3 engine trouble forced the abandonment of the programme and John Murray returned along line 28 to Dublin where the engine fault was rectified. However, similar trouble with the other engine necessitated a return to Barry where the ship docked on day 041. Line 29 was run en route.

The second half of the cruise began on day 044 when the ship left Barry after having been delayed 24 hours by gales. By day 045 the rough seas had abated somewhat and it was possible to obtain sparker records so line 1 was repeated. The gravimeter was now put into service, and the survey proceeded in improving weather conditions until day 048 when a westerly gale sprung up. Line 27 was run towards the coast and under the lee of the coast it was possible to complete the northern part of line 2 and run the additional lines 30, 31 and a westward extension of 21. John Murray entered Dublin as planned on day 049.

On the following day the weather report indicated that the wind was likely to moderate slightly and so it was decided to sail and attempt lines 33 and 26 with a view to working north-east of Anglesey if the southerly wind prevented work in the open sea. Weather conditions deteriorated on line 26 however, and work was finally abandoned when severe gales were forecast for the area. Before finding shelter west of the Isle of Man, storm force winds were experienced.

John Murray anchored in Laxey Bay in the evening of day 050 and the following day entered Douglas Harbour, where she was weather-bound until day 053 when a slight lull in the gales allowed passage to the Irish coast. An additional line (34) was run down the Irish coast and magnetometer heading corrections determined in Carmarthen Bay on the passage back to Barry where the ship docked on day 055.

INSTRUMENTS

Sparker. Nominally one R.V.U. and one I.G.S. set of E.G. & G. sparker equipment was on board. The I.G.S. hydrophone array was found to have broken leads, and some of the elements were not functioning. The section preamplifiers in the R.V.U. 264 array had different gains and some of the hydrophones gave no output. The summing box produced mains hum. However, the new R.V.U. 263C array was available and this was used with its own summing box on the I.G.S. 254 recorder. Fortunately the signal level was adequate on this cruise with the main amplifier gain set to x 1, but a variable gain preamplifier is desirable to prevent occasional overloading of the main amplifier at x 10 or x 100, when the signal level falls in deeper water. The R.V.U. 254 recorder tended to crease the record paper for no apparent reason. These occurrences emphasise the desirability of carrying spare equipment and the need of diligent repair and maintenance on shore.

A new nine candle sparkarray was tried during the cruise and appeared to produce clearer records. Satisfactory sparker records were obtained at a speed of seven knots for most of the second half of the cruise. It had been intended to use 16,000 joules to obtain deep penetration over a part of the area where sediments are known to extend to considerable depth, but time was not available. Most of the survey was run at 1000 joules.

Gravity Meter. The R.V.U. LaCoste and Romberg gravity meter was installed for the cruise. This functioned satisfactorily during the first half of the cruise, except for occasional noisy sections of the gravity output. The trouble was traced to the 180° out of phase double potentiometer. Before leaving Barry for the second half the meter had been operating on shore mains overnight. Prior to switching over to ship's supply, it was observed that the light which indicates the equipment supply has failed was on, although the meter was running. After switching to ship's supply the power could not be tripped on and investigation showed that a considerable part of the wiring in the junction box had been damaged by overheating due to excessive current in the mains line.

The equipment should draw about 10 amps in normal use. We have found when operating on 50 Hz that the current must be increased to 12 to 13 amps in order to get 114 volts from the A.C. regulators, and that it is impossible to increase the voltage any higher with safety. To produce adequate torque on the platform the torque motor amplifiers must be fed with more than 115 volts. When the supply voltage falls the current rises, and both the ship's and shore supply in Barry are likely to vary. Prolonged use at excessive current had no doubt baked the insulation and a current surge produced by a fall in mains voltage finally destroyed it, initiating the wiring damage.

The greater part of the affected wiring was expertly restored by Mr. Hutton on passage to the survey area, so that no survey time was lost. Although heavier gauge wire was used to replace the high current carrying circuits this still gets warm in operation and is a cause for some concern.

The performance of the platform at 50 Hz is not satisfactory. The sea conditions resulting in open water from a force 5 wind produce enough movement in John Murray to make the gravity trace unreadable. I believe the most sensible course to follow at this juncture is to obtain an additional A.C. regulator, operating off 240 volts, 50 Hz, to supply up to 120 volts to the torque motor

amplifiers, when 60 Hz is not available. This should restore the platform torque. Alternatively, the amplifiers could be supplied by a static inverter producing 120 volts, 60 Hz. LaCoste and Romberg are prepared to supply a 400 Hz converter to run off 50 Hz for the gyro supply. This would increase the gyro speed and may further improve the platform performance.

The meter is too sensitive to high frequency acceleration and fluctuation in the ship's course (fishtailing). For the gravity output to be useable in small ships without additional filtering (which would require automatic data logging), the damping and the platform time constant need to be increased.

Magnetometer. The Varian magnetometer functioned satisfactorily throughout. On the way back to Barry an attempt was made to measure the magnetometer heading correction for the ship, which was made to pass a navigation buoy several times on the same course with the sensor at different distances behind the ship. This was done for the two principal courses used in the survey (326° and 236°) with the sensor at 170ft, 240ft, 305ft and 420ft astern. It was also done for 0° at 170ft and 180° at 170ft and 420ft. These data are not sufficient for a precise measurement but indicate that the effect of the ship is no more than a few gamma at 100 metres.

Side Scan Sonar. The Aberystwyth geological sonar was intalled and worked normally at the beginning of the cruise, but performance deteriorated and it was not working at all after returning to Barry. An attempt to realign the fish at sea was unsuccessful and the rig was withdrawn on the last visit to Dublin. The steering mechanism was siezed up, so the transducer was bolted approximately in place. Presumably it had become misaligned in the heavy seas. The I.G.S. transit sonar transducer was added to the rig and both systems worked on the way back from Douglas to Barry, but very little record had been obtained in the survey area. The E.G.&G. 254 recorder was tried on the transit sonar; the record was marked but no obvious echoes were recorded.

Digital Clock. The ship's clock was working on this cruise and was valuable in providing time marks for records. There was still a fault in the hours card which made the hours digit jump spontaneously from time to time. The standby battery supply was reinstated.

Track Plotter. The pens provided by the manufacturer are not satisfactory. It was operated using a felt tipped pen which produced satisfactory records.

Generators. These were needed to supply the sparker and worked perfectly except that on one occasion a generator stopped for no apparent reason.

Capstan. The after capstan is not suitable for hauling magnetometer or other similar cables, because the ribs have sharp edges. This should be altered so as to reduce the possibility of damage to cables.

Laboratories. It would be an advantage to have the same lock system as in Discovery whereby all scientists' keys fit at least the main laboratory lock.

Gravity Magnetic and Sparker Coverage

Line No	Gravity	Magnetom.	Sparker
1	✓	-	fix 12-19
1R	-	-	✓
2	✓	✓	✓
3	✓	✓	fix 1-31 " 46-48
4	✓	✓	✓
5(R)	✓	✓	✓
6	✓	✓	✓
7	✓	✓	✓
8	✓	✓	✓
18	✓	✓	✓
19	✓	✓	fix 12-31
20	✓	✓	✓
21	✓	✓	✓
22	✓	✓	✓
26	✓	✓	✓
27	✓	✓	✓
28	✓	✓	✓
29	✓	✓	-
30	✓	✓	✓
31	✓	✓	✓
32	✓	✓	-
33	✓	-	-
34	✓	✓	✓